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* *Nomenclature of Amino-Acids*

In *Review Articles* it will be that agreed upon by the Editors of the *Journal of the Chemical Society* and of the *Biochemical Journal* published in *Biochem. J.*, 1948, **42**, 1.

In *Abstracts* the nomenclature will be that used in the paper being abstracted.

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LIST OF JOURNALS SCRUTINISED

(Arranged alphabetically according to Contracted Title)

Title of Journal	*Contracted Title*	*Last Number Scrutinised*	*Place of Publication*
Acta Agralia Fennica	Acta agral. fenn.	1955, **84,** No. 1	Helsinki, Finland
Acta Agriculturae Scandinavica	Acta Agric. scand.	1955, **5,** No. 3	Stockholm, Sweden
Acta Agronomica	Acta agronom., Colombia	1955, **5,** No. 2	Palmira, Colombia, South America
Acta Biologica Hungarica	Acta biol. hung.	1955, **6,** No. 1/2	Budapest, Hungary
Acta Chemica Scandinavica	Acta chem. scand.	1955, **9,** No. 5	Copenhagen, Denmark
Acta Chimica Hungarica	Acta chim. hung.	1955, **6,** No. 1/2	Budapest, Hungary
Acta Cientifica Venezolana	Acta cientif. venezol.	1954, **5,** No. 6	Caracas, Venezuela
Acta Gastro-Enterologica Belgica	Acta gastro-enterol. belg.	1955, **18,** No. 7/8	Brussels, Belgium
Acta Gerontologica	Acta gerontol.	1955, **5,** No. 4	Milan, Italy
Acta Leidensia	Acta leidensia	1954, **24**	Leyden, Holland
Acta Medica et Biologica	Acta med. biol.	1954, **2,** No. 2	Niigata, Japan
Acta Medica Hungarica	Acta med. hung.	1955, **6,** No. 3/4	Budapest, Hungary
Acta Medica Jugoslavica	Acta med. jugoslav.	1954, **8,** No. 3	Belgrade, Jugoslavia
Acta Medica Philippina	Acta med. philipp.	1953, **10,** No. 2	Manila, Philippines
Acta Medica Scandinavica	Acta med. scand.	1955, **152,** No. 2	Stockholm, Sweden
Acta Paediatrica	Acta paediat.	1955, **14,** No. 4	Stockholm, Sweden
Acta Paediatrica Belgica	Acta paediat. belg.	1955, **9,** No. 1	Brussels, Belgium
Acta Pathologica et Microbiologica Scandinavica	Acta pathol. microbiol. scand.	1955, **37,** No. 2	Copenhagen, Denmark
Acta Physiologica Hungarica	Acta physiol. hung.	1954, **6,** No. 4	Budapest, Hungary
Acta Physiologica Latino Americana	Acta physiol. Latino Amer.	1955, **4,** No. 1	Buenos Aires, Argentina
Acta Physiologica et Pharmacologica Neerlandica	Acta physiol. pharmacol. neerl.	1955, **4,** No. 1	Amsterdam, Holland
Acta Physiologica Scandinavica	Acta physiol. scand.	1955, **33,** No. 4	Stockholm, Sweden
Acta Radiologica	Acta radiol.	1955, **44,** No. 1	Stockholm, Sweden
Acta Scholae Medicinalis in Kioto	Acta Scholae med. Univ. Kioto	1955, **32,** No. 3	Kioto, Japan
Acta Societatis Medicorum Upsaliensis	Acta Soc. Med. upsalien.	1955, **60,** No. 1/2	Upsala, Sweden
Acta Veterinaria	Acta vet., Belgrade	1955, **5,** No. 2	Belgrade, Jugoslavia
Acta Vitaminologica	Acta vitaminol.	1955, **9,** No. 3	Milan, Italy
Advances in Biological and Medical Physics	Advances in Biol. Med. Phys.	1953, **3**	New York, U.S.A.
Advances in Carbohydrate Chemistry	Advances in Carbohydrate Chem.	1953, **8**	New York, U.S.A.
Advances in Enzymology	Advances in Enzymol.	1955, **16**	New York, U.S.A.
Advances in Food Research	Advances in Food Res.	1954, **5**	New York, U.S.A.
Advances in Protein Chemistry	Advances in Protein Chem.	1954, **9**	New York, U.S.A.
Advances in Veterinary Science	Advances in Vet. Sci.	1953, **1**	London, England
Agricultural Engineering	Agric. Eng.	1955, **36,** No. 8	St. Joseph, Mich., U.S.A.
Agricultural Gazette of New South Wales	Agric. Gaz. N.S.W.	1955, **66,** No. 5	Sydney, Australia
Agricultural Institute Review, Canada	Agric. Inst. Rev., Canada	1955, **1,** No. 4	Ottawa, Canada
Agricultural Review, The	Agric. Rev.	1955, **1,** No. 5	London, England
Agriculture, Journal of the Ministry of Agriculture	Agriculture, J. Minist. Agric. Engl.	1955, **62,** No. 6	London, England
Agrobiologiya	Agrobiologiya	1955, No. 1	Moscow, U.S.S.R.
Agronomy Journal	Agronom. J.	1955, **47,** No. 8	Washington, D.C., U.S.A.
Agronomia Lusitana	Agronom. lusitana	1954, **16,** No. 2	Alcobaca, Portugal
Akusherstvo i Ginekologiya	Akusherstvo Ginekol.	1955, No. 2	Moscow, U.S.S.R.
American Economic Review	Amer. Econ. Rev.	1955, **45,** No. 3	Menasha, Wis., U.S.A.
American Heart Journal	Amer. Heart J.	1955, **50,** No. 3	St. Louis, Mo., U.S.A.
American Journal of Anatomy	Amer. J. Anat.	1955, **96,** No. 2	Philadelphia, Pa., U.S.A.
American Journal of Clinical Nutrition	Amer. J. Clin. Nutrition	1955, **3,** No. 4	Allentown, Pa., U.S.A.
American Journal of Digestive Diseases	Amer. J. Digest. Dis.	1955, **22,** No. 8	Fort Wayne, Ind., U.S.A.
American Journal of Diseases of Children	Amer. J. Dis. Child.	1955, **90,** No. 2	Chicago, Ill, U.S.A.
American Journal of Medicine	Amer. J. Med.	1955, **19,** No. 2	New York, U.S.A.
American Journal of Medical Sciences	Amer. J. Med. Sci.	1955, **230,** No. 2	Philadelphia, Pa., U.S.A.
American Journal of Obstetrics and Gynecology	Amer. J. Obstet. Gynecol.	1955, **70,** No. 3	St. Louis, Mo., U.S.A.
American Journal of Ophthalmology	Amer. J. Ophthalmol.	1955, **39,** No. 3	Menasha, Wis., U.S.A.
American Journal of Orthopsychiatry	Amer. J. Orthopsychiat.	1955, **25,** No. 3	Menasha, Wis., U.S.A.
American Journal of Pathology	Amer. J. Pathol.	1955, **31,** No. 4	Ann Arbor, Mich., U.S.A.
American Journal of Physical Anthropology	Amer. J. Phys. Anthropol.	1955, **13,** No. 1	Philadelphia, Pa., U.S.A
American Journal of Physiology	Amer. J. Physiol.	1955, **181,** No. 3	Baltimore, Md., U.S.A.
American Journal of Surgery	Amer. J. Surg.	1955, **90,** No. 3	New York, U.S.A.

Title of Journal	*Contracted Title*	*Last Number Scrutinised*	*Place of Publication*
American Journal of Veterinary Research	Amer. J. Vet. Res.	1955, **16,** No. 60	Chicago, Ill., U.S.A.
Anais do Instituto de Medicina Tropical	An. Inst. Med. trop.	1955, **12,** No. 1/2	Lisbon, Portugal
Anales Instituto Nacional de Investigaciones Agronomicas Madrid	An. Inst. Nac. Invest. Agron. Madrid	1954, **3,** No. 4	Madrid, Spain
Analytical Chemistry	Anal. Chem.	1955, **27,** No. 9	Washington, D.C., U.S.A.
Analytica Chimica Acta	Anal. chim. Acta	1955, **13,** No. 3	Amsterdam, Holland
Analyst	Analyst	1955, **80,** No. 954	London, England
Anatomical Record	Anat. Rec.	1955, **122,** No. 1	Philadelphia, Pa., U.S.A.
Angewandte Chemie	Angew. Chem.	1955, **67,** No. 19/20	Weinheim, Germany
Annales de l'Institut National de la Recherche Agronomique. A. Annales Agronomiques	Ann. agronom.	1955, **6,** No. 3	Paris, France
Annals of Applied Biology	Ann. Appl. Biol.	1955, **43,** No. 2	Cambridge, England
Annales de Chimie	Ann. Chim., Paris	1955, **10,** June	Paris, France
Annals of Human Genetics	Ann. Human Genetics	1955, **20,** No. 1	London, England
Annales de l'Institut Pasteur	Ann. Inst. Pasteur	1955, **89,** No. 2	Paris, France
Annals of Internal Medicine	Ann. Int. Med.	1955, **43,** No. 2	Ann Arbor, Mich., U.S.A.
Annales Medicinae Experimentalis et Biologiae Fenniae	Ann. Med. exp. Biol. Fenn.	1955, **33,** No. 2	Helsinki, Finland
Annales Medicinae Internae Fenniae	Ann. Med. int. Fenn.	1955, **44,** No. 1	Helsinki, Finland
Annales de la Nutrition et de l'Alimentation	Ann. Nutrit. Alimentation	1955, **9,** No. 3	Paris, France
Annales d'Oculistique	Ann. Oculist.	1955, **188,** No. 8	Paris, France
Annals of Otology, Rhinology and Laryngology	Ann. Otol. Rhinol. Laryngol.	1955, **64,** No. 2	St. Louis, Mo., U.S.A.
Annales Paediatrici	Ann. paediat.	1955, **185,** No. 3	Basle, Switzerland
Annales Paediatriae Fenniae	Ann. Paediat. Fenn.	1954–55, **1,** No. 3	Helsinki, Finland
Annales de Parasitologie Humaine et Comparée	Ann. Parasitol.	1955, **30,** No. 4	Paris, France
Annales Pharmaceutiques Françaises	Ann. pharm. franç.	1955, **13,** May	Paris, France
Annals of Science	Ann. Sci.	1954, **10,** No. 4	London, England
Annales de la Société Belge de Médecine Tropicale	Ann. Soc. belg. Méd. trop.	1955, **35,** No. 1	Brussels, Belgium
Annali della Sperimentazione Agraria	Ann. Sper. agrar.	1954, **8,** No. 6	Rome, Italy
Annals of Surgery	Ann. Surg.	1955, **142,** No. 2	Philadelphia, Pa., U.S.A.
Annals of Tropical Medicine and Parasitology	Ann. Trop. Med. Parasitol.	1955, **49,** No. 2	Liverpool, England
Annales de l'Institut National de la Recherche Agronomique. S. D. Annales de Zootechnie	Ann. Zootech.	1955, **4,** No. 1	Paris, France
Annual Review of Biochemistry	Annu. Rev. Biochem.	1955, **24**	Stanford, Calif., U.S.A.
Annual Review of Medicine	Annu. Rev. Med.	1955, **6**	Stanford, Calif., U.S.A.
Annual Review of Microbiology	Annu. Rev. Microbiol.	1954, **8**	Stanford, Calif., U.S.A.
Annual Review of Physiology	Annu. Rev. Physiol.	1955, **17**	Stanford, Calif., U.S.A.
Antiseptic	Antiseptic	1955, **52,** No. 8	Madras, India
Antonie van Leeuwenhoek Journal of Microbiologie and Serology	Antonie van Leeuwenhoek J. Microbiol. Serol.	1955, **21,** No. 1	Amsterdam, Holland
Applied Statistics. A Journal of the Royal Statistical Society	Appl. Statistics	1955, **4,** No. 2	London, England
Archives of Biochemistry and Biophysics	Arch. Biochem. Biophys.	1955, **57,** No. 2	New York, U.S.A.
Archives of Disease in Childhood	Arch. Dis. Childhood	1955, **30,** No. 152	London, England
Naunyn-Schmiedebergs Archiv für Experimentelle Pathologie und Pharmakologie	Arch. exp. Pathol. Pharmakol.	1955, **226,** No. 3	Berlin : Göttingen : Heidelberg, Germany
Archivio di Fisiologia	Arch. Fisiol.	1954, **54,** No. 4	Florence, Italy
Archiv für Geflügelkunde	Arch. Geflugelk.	1955, **19,** No. 9/10	Stuttgart : Berlin, Germany
Archiv für Geschwulstforschung	Arch. Geschwulstforsch.	1955, **8,** No. 1	Dresden : Leipzig, Germany
Archiv für Gynäkologie	Arch. Gynäkol.	1955, **186**	Munich, Germany
Archiv. für Hygiene und Bakteriologie	Arch. Hyg., Berlin	1955, **139,** No. 2	Munich : Berlin, Germany
Archives of Industrial Health	Arch. Indust. Health	1955, **12,** No. 1	Chicago, Ill., U.S.A.
Archives de l'Institut Pasteur d'Algérie	Arch. Inst. Pasteur Algérie	1955, **33,** No. 2	Algiers, Algeria
Archives of Internal Medicine	Arch. Int. Med.	1955, **96,** No. 2	Chicago, Ill., U.S.A.
Archives Internationales de Pharmacodynamie et de Thérapie	Arch. internat. Pharmacodyn.	1955, **102,** No. 4	Ghent, Belgium
Archives Internationales de Physiologie	Arch. internat. Physiol.	1955, **63,** No. 2	Liège, Belgium
Archivio Italiano delle Malattie dell' Apparato Digerente	Arch. ital. Malat. Appar. diger.	1955, **21,** No. 4	Bologna, Italy
Archivio Italiano di Pediatria e Puericoltura	Arch. ital. Pediat. Puericolt.	1955, **17,** No. 4	Bologna, Italy
Archives des Maladies de l'Appareil Digestif et des Maiadies de la Nutrition	Arch. Mal. Appar. digest.	1955, **44,** No. 4	Paris, France
Archiva Medica Belgica	Arch. med. belg.	1955, **10,** No. 2	Brussels, Belgium
Archives of Neurology and Psychiatry	Arch. Neurol. Psychiat., Chicago	1955, **73,** No. 4	Chicago, Ill., U.S.A.
Archives of Pathology	Arch. Pathol.	1955, **60,** No. 1	Chicago, Ill., U.S.A.
Archives of Pediatrics	Arch. Pediat.	1955, **72,** No. 5	New York, U.S.A.
Archiv der Pharmazie	Arch. Pharm.	1955, **288,** July	Weinheim, Germany
Archiv for Pharmaci og Chemi	Arch. Pharm. Chem.	1955, **62,** Sept.	Copenhagen, Denmark
Archives Portugaises des Sciences Biologiques	Arch. portugaises Sci. biol.	1952–53, **11,** No. 1	Lisbon, Portugal
Archiv für Protistenkunde	Arch. Protistenkunde	1955, **100,** No. 5	Jena, Germany

Title of Journal	*Contracted Title*	*Last Number Scrutinised*	*Place of Publication*
Archiv für Psychiatrie und Nervenkrankheiten	Arch. Psychiat. Nervenkrankh.	1955, **193**, No. 3	Berlin : Heidelberg : Göttingen, Germany
Archivio di Scienze Biologiche	Arch. Sci. biol., Bologna	1955, **39**, No. 4	Bologna, Italy
Archives des Sciences Physiologiques	Arch. Sci. physiol.	1955, **9**, No. 1	Paris, France
Archiv für Tierernährung	Arch. Tierernährung	1955, **5**, No. 1	Berlin, Germany
Archivos Uruguayos de Medicina, Cirugia y Especialidades	Arch. urug. Med.	1954, **44**, No. 5/6	Montevideo, Uruguay
Archivos Venezolanos de Nutricion	Arch. venezol. Nutricion	1954, **5**, No. 2	Caracas, Venezuela
Arkhiv Patologii	Arkh. Patol.	1955, No. 2	Moscow, U.S.S.R.
Arquivos Brasileiros de Nutrição	Arq. brasil. Nutrição	1953, **9**, No. 4	Rio de Janeiro, Brazil
Australian Journal of Agricultural Research	Austral. J. Agric. Res.	1955, **6**, No. 4	Melbourne, Australia
Australian Journal of Biological Sciences	Austral. J. Biol. Sci.	1955, **8**, No. 2	Melbourne, Australia
Australian Journal of Botany	Austral. J. Botany	1955, **3**, No. 1	Melbourne, Australia
Australian Journal of Experimental Biology and Medical Science	Austral. J. Exp. Biol. Med. Sci.	1955, **33**, No. 3	Adelaide, Australia
Australian Journal of Marine and Freshwater Res.	Austral. J. Marine Freshwater Res.	1954, **5**, No. 3	Melbourne, Australia
Australian Journal of Zoology	Austral. J. Zool.	1955, **3**, No. 2	Melbourne, Australia
Australian Veterinary Journal	Austral. Vet. J.	1955, **31**, No. 7	Sydney, Australia
Bacteriological Reviews	Bacteriol. Rev.	1955, **19**, No. 2	Baltimore, Md., U.S.A.
Beiträge zur Pathologischen Anatomie und zur Allgemeinen Pathologie	Beitr. pathol. Anat.	1955, **115**, No. 2	Jena, Germany
Berliner und Münchener Tierärztliche Wochenschrift	Berl. Münch. tierärztl. Wochenschr.	1955, **68**, No. 18	Berlin, Germany
Bi-monthly Bulletin North Dakota Agricultural Experiment Station	Bi-m. Bull. N. Dakota Agric. Exp. Stat.	1954, **17**, No. 2	Fargo, N. Dak., U.S.A.
Biochemical Journal	Biochem. J.	1955, **61**, No. 1	London, England
Biochem. Zeitschrift	Biochem. Ztschr.	1955, **327**, No. 1	Berlin : Göttingen : Heidelberg, Germany
Biochimica et Biophysica Acta	Biochim. biophys. Acta	1955, **18**, No. 1	New York, U.S.A.
Biokhimiya	Biokhimiya	1955, **20**, No. 1	Moscow, U.S.S.R.
Biological Bulletin	Biol. Bull.	1955, **109**, No. 1	Lancaster, Pa., U.S.A.
Biologie Médicale	Biol. méd.	1955, **44**, No. 4	Paris, France
Biological Progress	Biol. Progr.	1952, **2**	New York, U.S.A.
Biological Reviews and Biological Proceedings of the Cambridge Philosophical Society	Biol. Rev.	1955, **30**, No. 3	Cambridge, England
Biometrics	Biometrics	1955, **11**, No. 2	Washington, U.S.A.
Biometrika	Biometrika	1955, **42**, No. 1/2	London, England
Blood, The Journal of Hematology	Blood, J. Hematol.	1955, **10**, No. 8	New York, U.S.A.
Die Bodenkultur	Bodenkultur	1954, **8**, No. 2	Munich, Germany
Boletim de Industria Animal	Bol. Indust. animal, São Paulo	1954, **14**, No. 1	São Paulo, Brazil
Boletin de Instituto Nacional de Investigaciones Agronomicas	Bol. Inst. Nac. Invest. agron., Madrid	1955, **15**, No. 32	Madrid, Spain
Bollettino dell'Istituto Sieroterapico Milanese	Bol. Ist. sieroterap. milan.	1955, **34**, No. 7/8	Milan, Italy
Boletin de la Oficina Sanitaria Panamericana	Bol. Ofic. sanit. panamer.	1955, **38**, No. 3	Washington, D.C., U.S.A.
Bollettino della Società Italiana di Biologia Sperimentale	Bol. Soc. ital. Biol. sper.	1954, **30**, No. 12	Naples, Italy
Brain. A Journal of Neurology	Brain	1955, **78**, No. 2	London, England
British Dental Journal	Brit. Dent. J.	1955, **99**, No. 6	London, England
British Heart Journal	Brit. Heart J.	1955, **17**, No. 3	London, England
British Journal of Animal Behaviour	Brit. J. Animal Behaviour	1955, **3**, No. 3	London, England
British Journal of Dermatology	Brit. J. Dermatol.	1955, **67**, No. 8/9	London, England
British Journal of Experimental Pathology	Brit. J. Exp. Pathol.	1955, **35**, No. 4	London, England
British Journal of Industrial Medicine	Brit. J. Indust. Med.	1955, **12**, No. 3	London, England
British Journal of Nutrition	Brit. J. Nutrition	1955, **9**, No. 3	London, England
British Journal of Ophthalmology	Brit. J. Ophthalmol.	1955, **39**, No. 9	London, England
British Journal of Pharmacology and Chemotherapy	Brit. J. Pharmacol. Chemotherap.	1955, **10**, No. 3	London, England
British Journal of Preventive and Social Medicine	Brit. J. Prev. Social Med.	1955, **9**, No. 2	London, England
British Journal of Radiology	Brit. J. Radiol.	1955, **28**, No. 333	London, England
British Journal of Surgery	Brit. J. Surg.	1955, **43**, No. 177	Bristol, England
British Journal of Urology	Brit. J. Urol.	1955, **27**, No. 2	Bristol, England
British Medical Bulletin	Brit. Med. Bull.	1955, **11**, No. 3	London, England
British Medical Journal	Brit. Med. J.	1955, No. 4941	London, England
British Veterinary Journal	Brit. Vet. J.	1955, **111**, No. 9	London, England
Bulletin de l'Académie Vétérinaire de France	Bull. Acad. vét. France	1955, **28**, No. 4	Paris, France
Bulletin of the Central Food Technological Research Institute	Bull. Central Food Technol. Res. Inst., Mysore	1954, **4**, No. 2	Mysore, India
Bulletin of the History of Medicine	Bull. Hist. Med.	1955, **29**, No. 4	Baltimore, Md., U.S.A.
Bulletin de l'Institut Agronomique et de Recherches de Gembloux	Bull. Inst. agronom. Gembloux	1955, **23**, No. 2	Gembloux, Belgium
Bulletin of the Institute for Medical Research, University of Madrid	Bull. Inst. Med. Res., Univ. Madrid	1954, **7**, No. 2	Madrid, Spain
Bulletin de l'Institut National d'Hygiène	Bull. Inst. nat. Hyg., Paris	1955, **10**, No. 2	Paris, France

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Bulletin Oxford University Institute of Statistics	Bull. Inst. Statistics Oxford	1955, **17**, No. 2	Oxford, England
Bulletin of the Johns Hopkins Hospital	Bull. Johns Hopkins Hosp.	1955, **97**, No. 1	Baltimore, Md., U.S.A.
Bulletin de Microscopie Appliquée	Bull. Microscop. appl.	1955, **5**, No. 1	Paris, France
Bulletin of the National Institute of Agricultural Sciences, Yahagi, Japan	Bull. Nat. Inst. Agric. Sci., Japan	1954, No. 8	Chiba, Japan
Bulletin de la Société de Chimie Biologique	Bull. Soc. Chim. biol.	1955, **37**, No. 5/6	Paris, France
Bulletin de la Société Chimique de France	Bull. Soc. chim. France	1955, No. 9	Paris, France
Bulletin de la Société de Pathologie Exotique	Bull. Soc. Pathol. exot.	1955, **48**, No. 1	Paris, France
Bulletin de la Société Scientifique d'Hygiène Alimentaire	Bull. Soc. sci. Hyg. aliment.	1955, **43**, No. 6	Paris, France
Bulletin of the Tokyo Medical and Dental University	Bull. Tokyo Med. Dent. Univ.	1955, **2**, No. 1	Tokyo, Japan
Bulletin of the World Health Organization	Bull. World Health Organiz.	1955, **13**, No. 1	Geneva, Switzerland
Calcutta Medical Journal	Calcutta Med. J.	1955, **52**, No. 6	Calcutta, India
Canadian Journal of Agricultural Science	Canad. J. Agric. Sci.	1955, **35**, No. 4	Ottawa, Canada
Canadian Journal of Biochemistry and Physiology	Canad. J. Biochem. Physiol.	1955, **33**, No. 4	Ottawa, Canada
Canadian Journal of Botany	Canad. J. Botany	1955, **33**, No. 4	Ottawa, Canada
Canadian Journal of Chemistry	Canad. J. Chem.	1955, **33**, No. 9	Ottawa, Canada
Canadian Journal of Comparative Medicine	Canad. J. Comp. Med.	1955, **19**, No. 8	Quebec, Canada
Canadian Journal of Microbiology	Canad. J. Microbiol.	1955, **1**, No. 7	Ottawa, Canada
Canadian Journal of Physics	Canad. J. Phys.	1955, **33**, No. 8	Ottawa, Canada
Canadian Journal of Technology	Canad. J. Technol.	1955, **33**, No. 5	Ottawa, Canada
Canadian Journal of Zoology	Canad. J. Zool.	1955, **33**, No. 4	Ottawa, Canada
Cancer Research	Cancer Res.	1955, **15**, No. 7	Chicago, Ill., U.S.A.
Časopis Lékařů Českých	Čas. Lék. čes.	1955, **94**, No. 32	Prague, Czechoslovakia
Cereal Chemistry	Cereal Chem.	1955, **32**, No. 4	Minneapolis, Minn., U.S.A.
Ceylon Journal of Medical Science	Ceylon J. Med. Sci.	1951–53, **8**, No. 3	Colombo, Ceylon
Ceylon Medical Journal	Ceylon Med. J.	1954, **2**, No. 4	—
Chemistry and Industry	Chem. and Indust.	1955, Sept. 17	London, England
Chemische Berichte	Chem. Ber.	1955, **88**, No. 9	Weinheim, Germany
Chemické Listy	Chem. listy	1954, **48**, No. 11	Prague, Czechoslovakia
Chemical Reviews	Chem. Rev.	1955, **55**, No. 4	Baltimore, Md., U.S.A.
Chemist-Analyst	Chemist-Analyst	1955, **44**, No. 1/2	Phillipsburg, N.J., U.S.A.
Child Development	Child Development	1955, **26**, No. 2	Champaign, Ill., U.S.A.
Chinese Medical Journal	Chinese Med. J.	1955, **73**, No. 3	Peking, China
Chronicle of the World Health Organization	Chron. World Health Organiz.	1955, **9**, No. 9	New York, U.S.A.
Circulation	Circulation	1955, **12**, No. 2	Baltimore, Md. U.S.A.
Circulation Research	Circulation Res.	1955, **3**, No. 4	Baltimore, Md. U.S.A.
Clinical Chemistry	Clin. Chem.	1955, **1**, No. 4	Baltimore, Md., U.S.A.
Clinical Science	Clin. Sci.	1955, **14**, No. 3	London, England
Colonial Plant and Animal Products	Colonial Plant Animal Prod.	1955, **5**, No. 1	London, England
Cornell Veterinarian	Cornell Vet.	1955, **45**, No. 3	Ithaca, N.Y., U.S.A.
Comptes Rendus Hebdomadaires de Séances de l'Académie des Sciences	C.R. Acad. Sci.	1955, **241**, No. 10	Paris, France
Comptes Rendus des Travaux du Laboratoire Carlsberg (Série Chimique)	C.R. Lab. Carlsberg (Sér. chim.)	1955, **29**, No. 21	Copenhagen, Denmark
Comptes Rendus des Travaux du Laboratoire Carlsberg (Série Physiologique)	C.R. Lab. Carlsberg (Sér. physiol.)	1955, **25**, No. 12	Copenhagen, Denmark
Comptes Rendus des Séances de la Société de Biologie	C.R. Soc. Biol.	1955, **149**, No. 7/8	Paris, France
Československá Fysiologie	Čsl. fisiol.	1954, **3**, No. 3	Prague, Czechoslovakia
Danish Medical Bulletin	Danish Med. Bull.	1955, **2**, No. 5	Copenhagen, Denmark
Dansk Tidsskrift för Farmaci	Dansk Tidsskr. Farm.	1955, **29**, Sept.	Copenhagen, Denmark
Dental Journal of Australia	Dent. J. Austral.	1955, **27**, No. 3	Sydney, Australia
Deutsches Archiv fur Klinsche Medizin	Deutsch. Arch. klin. Med.	1955, **202**, No. 2	Munich, Germany
Deutsche Medizinische Wochenschrift	Deutsch. med. Wochenschr.	1955, **80**, No. 33/34	Stuttgart, Germany
Deutsche Zeitschrift fur Verdauungs und Stoffwechselkrankheiten	Deutsch. Ztschr. Verdauungs- u. Stoffwechselkr.	1955, **15**, No. 2	Leipzig, Germany
Documenta de Medicina Geographica et Tropica	Doc. Med. geogr. trop.	1955, **7**, No. 3	Amsterdam, Holland
Doklady Akademii Nauk SSSR	Dokl. Akad. Nauk SSSR	1955, **102**, No. 5	Moscow, U.S.S.R.
East African Agricultural Journal of Kenya, Tanganyika, Uganda and Zanzibar	E. African Agric. J.	1955, **21**, No. 1	Nairobi, Kenya
East African Medical Journal	E. African Med. J.	1955, **32**, No. 5	Nairobi, Kenya
Economic Journal	Econ. J.	1954, **64**, No. 258	London, England
Economic Proceedings of the Royal Dublin Society	Econ. Proc. Royal Dublin Soc.	1953, **4**, No. 2	Dublin, Republic of Ireland
Economica	Economica	1954, **21**, No. 87	London, England
Empire Journal of Experimental Agriculture	Empire J. Exp. Agric.	1955, **23**, No. 90	Harpenden, England
Endeavour	Endeavour	1955, **14**, No. 55	London, England
Endocrinology	Endocrinology	1955, **57**, No. 2	Boston, Mass., U.S.A.
Enzymologia	Enzymologia	1954, **17**, No. 3	Amsterdam, Holland

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Experientia	Experientia	1955, **11**, No. 8	Basle, Switzerland
Experimental Cell Research	Exp. Cell. Res.	1955, **8**, No. 3	New York, U.S.A.
Experimental Medicine and Surgery	Exp. Med. Surg.	1955, **13**, No. 2	Basle, Switzerland
Experimental Parasitology	Exp. Parasitol.	1955, **4**, No. 4	New York, U.S.A.
Farm Economist	Farm Economist	1955, **8**, No. 1	Oxford, England
Farming in South Africa	Farming in S. Africa	1955, **30**, No. 351	Pretoria, South Africa
Federation Proceedings	Federation Proc.	1955, **14**, No. 2	Baltimore, Md., U.S.A.
Fiji Agricultural Journal	Fiji Agric. J.	1955, **26**, No. 1	Suva, Fiji
Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations	Fish. Res. Board Canada, Progr. Rep. Atlantic Coast Stat.	1955, No. 103	St. Andrew, N.B., Canada
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations	Fish. Res. Board Canada, Progr. Rep. Pacific Coast Stat.	1955, No. 62	Vancouver, B.C., Canada
Fiziologicheskii Zhurnal SSSR im. Sechenova	Fiziol. Zh. SSSR Sechenova	1955, **41**, No. 2	Leningrad, U.S.S.R.
Folia Haematologica	Folia haematol.	1955, **73**, No. 1	Leipzig, Germany
Food Research	Food Res.	1955, **20**, No. 4	Champaign, Ill., U.S.A.
Forskning og Forsøk i Landbruket	Forskning og Forsøk Landbruket	1955, **6**, No. 2	Oslo, Norway
Forsøgslaboratoriet København Beretning	Forsøgslab. København Beretn.	1955, No. 282	Copenhagen, Denmark
Frankfurter Zeitschrift für Pathologie	Frankfurter Ztschr. Pathol.	1955, **66**, No. 3	Munich, Germany
Gastroenterologia	Gastroenterologia	1955, **83**, No. 5	Basle, Switzerland
Gazetta Chimica Italiana	Gaz. chim. ital.	1955, **85**, No. 8	Rome, Italy
Geriatrics	Geriatrics	1955, **10**, No. 8	Minneapolis, Minn., U.S.A.
Gigiena i Sanitariya	Gigiena Sanit.	1955, No. 5	Moscow, U.S.S.R.
Glasgow Medical Journal	Glasgow Med. J.	1955, **36**, No. 8	Glasgow, Scotland
Albrecht von Graefes Archiv für Ophthalmologie	v. Graefes Arch. Ophthalmol.	1955, **156**, No. 5	Heidelberg : Berlin : Munich, Germany
Growth	Growth	1955, **19**, No. 1	Philadelphia, Pa., U.S.A.
Gunma Journal of Medical Sciences	Gunma J. Med. Sci.	1955, **4**, No. 1	Maebashi, Japan
Guy's Hospital Reports	Guy's Hosp. Rep.	1955, **104**, No. 2	London, England
Health Bulletin	Health Bull., Dept. Health Scot.	1955, **13**, No. 1	Edinburgh, Scotland
Helvetica Chimica Acta	Helv. chim. Acta	1955, **38**, No. 5	Basle, Switzerland
Helvetica Paediatrica Acta	Helv. paediat. Acta	1955, **10**, No. 3	Basle, Switzerland
Helvetica Physiologica Pharmacologica Acta	Helv. physiol. pharm. Acta	1955, **13**, No. 2	Basle, Switzerland
Hoppe-Seyler's Zeitschrift fur Physiologische Chemie	Hoppe-Seyler's Ztschr.	1955, **301**, No. 6	Berlin, Germany
Human Biology	Human Biol.	1955, **27**, No. 2	Baltimore, Md., U.S.A.
Human Relations	Human Relations	1955, **8**, No. 2	London, England
Indian Farming	Indian Farming	1955, **5**, No. 1	Delhi, India
Indian Journal of Agricultural Science	Indian J. Agric. Sci.	1955, **25**, No. 2	Delhi, India
Indian Journal of Dairy Science	Indian J. Dairy Sci.	1955, **8**, No. 2	Bangalore, India
Indian Journal of Malariology	Indian J. Malariol.	1955, **9**, No. 2	Calcutta, India
Indian Journal of Medical Research	Indian J. Med. Res.	1955, **43**, No. 3	Calcutta, India
Indian Journal of Pediatrics	Indian J. Pediat.	1955, **22**, No. 91	Calcutta, India
Indian Journal of Physiology and Allied Sciences	Indian J. Physiol. Allied Sci.	1954, **8**, No. 1	Calcutta, India
Indian Journal of Veterinary Science and Animal Husbandry	Indian J. Vet. Sci.	1955, **25**, No. 1	Delhi, India
Indian Medical Gazette	Indian Med. Gaz.	1954, **89**, No. 9	Calcutta, India
Instrument Practice : Technology : Instrumentation	Instrument Practice	1955, **9**, No. 9	London, England
International Journal of Leprosy	Internat. J. Leprosy	1954, **22**, No. 3	New Orleans, La., U.S.A.
International Labour Review	Internat. Labour Rev.	1955, **72**, No. 1	Geneva, Switzerland
Internationale Zeitschrift für Angewandte Physiologie Einschliesslich Arbeitsphysiologie	Internat. Ztschr. angew. Physiol. Arbeitsphysiol.	1955, **16**, No. 2	Berlin, Germany
Internationale Zeitschrift fur Vitaminforschung	Internat. Ztschr. Vitaminforsch.	1955, **26**, No. 1/2	Berne, Switzerland
Iryo	Iryo	1955, **9**, No. 3	Tokyo, Japan
Izvestiya Akademii Nauk SSSR, Seriya Biologicheskaya	Izv. Akad. Nauk SSSR, Ser. Biol.	1955, No. 3	Moscow, U.S.S.R.
Journal of Agricultural and Food Chemistry	J. Agric. Food Chem.	1955, **3**, No. 9	Washington, D.C., U.S.A.
Journal of Agricultural Science	J. Agric. Sci.	1955, **46**, No. 3	Cambridge, England
Journal of Agriculture of the University of Puerto Rico	J. Agric. Univ. Puerto Rico	1955, **39**, No. 1	Rio Piedras, Puerto Rico
Journal of Agriculture of Western Australia	J. Agric. W. Austral.	1955, **4**, No. 3	Perth, Australia
Journal of the American Chemical Society	J. Amer. Chem. Soc.	1955, **77**, No. 17	Washington, D.C., U.S.A.
Journal of the American Dietetic Association	J. Amer. Dietetic Assoc.	1955, **31**, No. 8	Baltimore, Md., U.S.A.
Journal of the American Medical Association	J. Amer. Med. Assoc.	1955, **159**, No. 2	Chicago, Ill., U.S.A.
Journal of the American Oil Chemists' Society	J. Amer. Oil Chem. Soc.	1955, **32**, No. 8	Champaign, Ill., U.S.A.
Journal of the American Pharmaceutical Association	J. Amer. Pharm. Assoc.	1955, **44**, Sept.	Washington, D.C., U.S.A.
Journal of the American Veterinary Medical Association	J. Amer. Vet. Med. Assoc.	1955, **126**, No. 942	Chicago, Ill., U.S.A.
Journal of Anatomy	J. Anat.	1955, **89**, No. 3	London, England
Journal of Animal Ecology	J. Animal Ecol.	1955, **24**, No. 1	Cambridge, England
Journal of Animal Science	J. Animal Sci.	1955, **14**, No. 3	Menasha, Wis., U.S.A.
Journal of the Animal Technicians Association	J. Animal Tech. Assoc.	1955, **5**, No. 3	London, England
Journal of Applied Physiology	J. Appl. Physiol.	1955, **8**, No. 1	Washington, D.C., U.S.A.

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Journal of the Association of Official Agricultural Chemists	J. Assoc. Off. Agric. Chem.	1955, **38**, No. 3	Washington, D.C., U.S.A.
Journal of the Australian Institute of Agricultural Science	J. Austral. Inst. Agric. Sci.	1955, **21**, No. 2	Sydney, Australia
Journal of Aviation Medicine	J. Aviation Med.	1955, **26**, No. 4	New Orleans, La., U.S.A.
Journal of Bacteriology	J. Bacteriol.	1955, **70**, No. 1	Baltimore, Md., U.S.A.
Journal of Biochemistry	J. Biochem., Tokyo	1954, **41**, No. 6	Tokyo, Japan
Journal of Biological Chemistry	J. Biol. Chem.	1955, **215**, No. 2	Baltimore, Md., U.S.A.
Journal of the British Grassland Society	J. Brit. Grassland Soc.	1955, **10**, No. 3	Aberystwyth, Wales
Journal of Cellular and Comparative Physiology	J. Cell. Comp. Physiol.	1955, **45**, No. 2	Philadelphia, Pa., U.S.A.
Journal of the Chemical Society, London	J. Chem. Soc.	1955, August	London, England
Journal of Clinical Endocrinology and Metabolism	J. Clin. Endocrinol.	1955, **15**, No. 8	Springfield, Ill., U.S.A.
Journal of Clinical Investigation	J. Clin. Invest.	1955, **34**, No. 8	Lancaster, Pa., U.S.A.
Journal of Clinical Pathology	J. Clin. Pathol.	1955, **8**, No. 3	London, England
Journal of Comparative Neurology	J. Comp. Neurol.	1955, **102**, No. 2	Philadelphia, Pa., U.S.A.
Journal of Comparative Pathology and Therapeutics	J. Comp. Pathol.	1955, **65**, No. 3	Croydon, Surrey, England
Journal of Dairy Research	J. Dairy Res.	1955, **22**, No. 2	London, England
Journal of Dairy Science	J. Dairy Sci.	1955, **38**, No. 8	Lancaster, Pa., U.S.A.
Journal of Dental Research	J. Dent. Res.	1955, **34**, No. 4	Baltimore, Md., U.S.A.
Journal of the Department of Agriculture, Republic of Ireland	J. Dept. Agric., Republic of Ireland	1952–53, **49**	Dublin, Republic of Ireland
Journal of the Department of Agriculture of South Australia	J. Dept. Agric. S. Austral.	1955, **58**, No. 11	Adelaide, Australia
Journal of the Department of Agriculture, Victoria	J. Dept. Agric., Victoria	1955, **53**, No. 8	Melbourne, Australia
Journal of Economic Entomology	J. Econ. Entomol.	1955, **48**, No. 3	Geneva, N.Y., U.S.A.
Journal of the Egyptian Medical Association	J. Egypt. Med. Assoc.	1955, **38**, No. 3	Cairo, Egypt
Journal of Endocrinology	J. Endocrinol.	1955, **12**, No. 4	London, England
Journal of Experimental Biology	J. Exp. Biol.	1955, **32**, No. 3	London, England
Journal of Experimental Medicine	J. Exp. Med.	1955, **102**, No. 2	Baltimore, Md., U.S.A.
Journal of Experimental Zoology	J. Exp. Zool.	1955, **128**, No. 3	Philadelphia, Pa., U.S.A.
Journal of the Faculty of Medicine, Baghdad, Iraq	J. Fac. Med. Baghdad	1955, **19**, No. 2	Baghdad, Iraq
Journal of Farm Economics	J. Farm. Econ.	1955, **37**, No. 3	Menasha, Wis., U.S.A.
Journal of the Farmers' Club	J. Farmers' Club	1955, No. 1	London, England
Journal of the Fisheries Research Board of Canada	J. Fish. Res. Board Canada	1955, **12**, No. 4	Toronto, Canada
Journal of General Microbiology	J. Gen. Microbiol.	1955, **13**, No. 1	London, England
Journal of General Physiology	J. Gen. Physiol.	1955, **38**, No. 6	New York, U.S.A.
Journal of Genetics	J. Genetics	1955, **53**, No. 2	Cambridge: London, England
Journal of Gerontology	J. Gerontol.	1955, **10**, No. 3	Ann Arbor, Mich., U.S.A.
Journal of Helminthology	J. Helminthol.	1955, **29**, No. 1/2	London, England
Journal of Horticultural Sciences	J. Hortic. Sci.	1955, **30**, No. 3	London, England
Journal of Hygiene	J. Hygiene	1955, **53**, No. 3	London, England
Journal of Immunology	J. Immunol.	1955, **75**, No. 2	Baltimore, Md., U.S.A.
Journal of the Indian Institute of Science	J. Indian Inst. Sci.	1955, **37**, No. 3	Bangalore, India
Journal of the Indian Medical Association	J. Indian Med. Assoc.	1955, **25**, No. 5	Calcutta, India
Journal of Infectious Diseases	J. Infect. Dis.	1955, **96**, No. 3	Chicago, Ill., U.S.A.
Journal of the Institute of Brewing	J. Inst. Brewing	1955, **61**, No. 4	Cambridge, England
Journal of Laboratory and Clinical Medicine	J. Lab. Clin. Med.	1955, **46**, No. 2	St. Louis, Mo., U.S.A.
Journal of Laryngology and Otology	J. Laryngol. Otol.	1955, **69**, No. 9	London, England
Journal of Mental Science	J. Mental Sci.	1955, **101**, No. 423	London, England
Journal of the National Cancer Institute	J. Nat. Cancer Inst.	1955, **16**, No. 1	Bethesda, Md., U.S.A.
Journal of Neuropathology and Experimental Neurology	J. Neuropathol. Exp. Neurol.	1955, **14**, No. 3	Baltimore, Md., U.S.A.
Journal of Neurophysiology	J. Neurophysiol.	1955, **18**, No. 2	Springfield, Ill., U.S.A.
Journal of Nutrition	J. Nutrition	1955, **56**, No. 3	Philadelphia, Pa., U.S.A.
Journal of Obstetrics and Gynaecology of the Britsh Empire	J. Obstet. Gynaecol. Brit. Empire	1955, **62**, No. 4	Altrincham, England
Journail of Organic Chemistry	J. Org. Chem.	1955, **20**, No. 7	Baltimore, Md., U.S.A.
Journal of the Osaka City Medical Center	J. Osaka City Med. Center	1954, **3**, No. 4	Osaka, Japan
Journal of the Oslo City Hospitals	J. Oslo City Hosp.	1955, **5**, No. 9	Oslo, Norway
Journal of Parasitology	J. Parasitol.	1955, **41**, No. 4	Lancaster, Pa., U.S.A.
Journal of Pathology and Bacteriology	J. Pathol. Bacteriol.	1955, **69**, No. 1/2	London, England
Journal of Pediatrics	J. Pediat.	1955, **47**, No. 3	St. Louis, Mo., U.S.A.
Journal of Pharmacy and Pharmacology	J. Pharm.	1955, **7**, Oct.	London, England
Journal of the Pharmaceutical Society of Japan	J. Pharm. Soc. Japan	1955, **75**, May	Tokyo, Japan
Journal of Pharmacology and Experimental Therapeutics	J. Pharmacol. Exp. Therap.	1955, **114**, No. 3	Baltimore, Md., U.S.A.
Journal of the Philippine Medical Association	J. Philippine Med. Assoc.	1955, **31**, No. 3	Manila, Philippines
Journal of Physical Chemistry	J. Phys. Chem.	1955, **59**, No. 9	Easton, Pa., U.S.A.
Journal of Physiology	J. Physiol.	1955, **129**, No. 2	London, England
Journal de Physiologie	J. Physiol., Paris	1955, **47**, No. 3	Paris, France
Journal of the Royal Agricultural Society of England	J. Roy. Agric.Soc. Engl.	1954, **115**	London, England

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Journal of the Royal Institute of Public Health and Hygiene	J. Roy. Inst. Pub. Health Hyg.	1955, **18,** No. 8	London, England
Journal of the Science of Food and Agriculture	J. Sci. Food Agric.	1955, **6,** No. 9	London, England
Journal of Scientific Instruments and of Physics in Industry	J. Sci. Instruments	1955, **32,** No. 9	London, England
Journal of Tropical Medicine and Hygiene	J. Trop. Med. Hyg.	1955, **58,** No. 8	London, England
Journal of Vitaminology	J. Vitaminol., Japan	1954/55, **1,** No. 2	Osaka, Japan
Japanese Journal of Experimental Medicine	Jap. J. Exp. Med.	1954, **24,** No. 5	Tokyo, Japan
Japanese Journal of Medical Science and Biology	Jap. J. Med. Sci.	1954, **7,** No. 6	Tokyo, Japan
Japanese Safety Forces Medical Journal	Jap. Safety Forces Med. J.	1955, **2,** No. 4	Tokyo, Japan
Karakulevodstvo i Zverovodstvo	Karakul. i Zver.	1955, **8,** No. 2	Moscow, U.S.S.R.
Keio Journal of Medicine	Keio J. Med.	1954, **3,** No. 4	Tokyo, Japan
Khirurgiya	Khirurgiya	1955, No. 4	Moscow, U.S.S.R.
Kitasato Archives of Experimental Medicine	Kitasato Arch. Exp. Med.	1953, **26,** No. 2/3	Tokyo, Japan
Klinicheskaya Meditsina	Klin. Med., Mosk.	1955, **33,** No. 6	Moscow, U.S.S.R.
Klinische Wochenschrift	Klin. Wochenschr.	1955, **33,** No. 28	Berlin : Göttingen : Heidelberg, Germany
Kobe Journal of the Medical Sciences	Kobe J. Med. Sci.	1954, **1,** No. 4	Kobe, Japan
Konevodstvo	Konevodstvo	1955, **25,** No. 6	Moscow, U.S.S.R.
Kungl. Lantbruksakademiens Tidskrift	Kungl. Lantbruksakad. Tidskr.	1955, **94,** No. 2/3	Stockholm, Sweden
Kungl. Lantbrukshögskolans Annaler	Kungl. Lantbrukshögsk. Ann.	1954, **21**	Upsala, Sweden
Kurume Medical Journal	Kurume Med. J.	1954, **1,** No. 3	Kurume-shi, Japan
Kyushu Memoirs of Medical Sciences	Kyushu Mem. Med. Sci.	1955, **6,** No. 1	Fukuoka, Japan
Laboratory Practice	Laboratory Practice	1955, **4,** No. 9	London, England
Landbouwkundig Tijdschrift	Landbouwk. Tijdschr.	1955, **67,** No. 8	Wageningen, Holland
Le Lait	Lait	1955, **35,** No. 346	Paris, France
Lancet	Lancet	1955, No. 6890	London, England
Langenbecks Archiv für Klinische Chirurgie	Langenbecks Arch. klin. Chirurg.	1955, **280,** No. 5	Berlin : Göttingen : Heidelberg, Germany
Il Lattante	Lattante	1955, **26,** No. 5	Parma, Italy
Laval Médical	Laval méd.	1955, **20,** No. 7	Quebec, Canada
Lebensmittel und Ernährung	Lebensmittel u. Ernährung	1955, **8,** No. 8	Vienna, Austria
Lékařské Listy	Lék. listy	1954, **9,** No. 24	Brno, Czechoslovakia
Justus Liebigs Annalen der Chemie	Liebigs Ann.	1955, **594,** No. 3	Weinheim, Germany
Maandschrift voor Kindergeneeskunde	Maandschr. Kindergeneesk.	1955, **23,** No. 7	Leyden, Holland
Maataloustieteellinen Aikakuskirja	Maataloust. Aikakausk.	1955, **27,** No. 2	Helsinki, Finland
Malayan Agricultural Journal	Malayan Agric. J.	1955, **38,** No. 2	Kuala Lumpur, Federation of Malaya
Manchester School of Economics and Social Studies	Manchester Sch. Econ. Social Studies	1955, **23,** No. 2	Manchester, England
Manx Journal of Agriculture	Manx J. Agric.	1955, **10,** No. 1	Peel, Isle of Man
Medical Clinics of North America	Med. Clins. N. Amer.	1955, **39,** No. 2	Philadelphia, Pa., U.S.A.
Medicina del Lavoro	Med. del Lavoro	1955, **46,** No. 5	Milan, Italy
Medical Journal of Malaya	Med. J. Malaya	1955, **9,** No. 4	Singapore, Federation of Malaya
Medical Journal of Osaka University	Med. J. Osaka Univ. (Engl. Ed.) (Jap. Ed.)	1955, **6,** No. 1 1955, **7,** No. 1/2	Osaka, Japan
Medical Officer	Med. Officer	1955, **94,** No. 13	London, England
Médecine Tropicale	Méd. trop.	1955, **15,** No. 3	Marseilles, France
Medicamenta	Medicamenta	1955, **24,** No. 274	Madrid, Spain
Medicine, Analytical Reviews of General Medicine, Neurology and Pediatrics	Medicine, Baltimore	1955, **34,** No. 2	Baltimore, Md., U.S.A.
Meldinger fra Norges Landbrukshøgskole	Meld. Norges Landbrukshøgsk.	1954, **34,** No. 6	Oslo, Norway
Memórias do Instituto Butantan	Mem. Inst. Butantan	1955, **53**	Rio de Janeiro, Brazil
Metabolism, Clinical and Experimental	Metabolism	1955, **4,** No. 4	New York, U.S.A.
Methods in Enzymology	Methods in Enzymol.	1955, **1**	New York, U.S.A.
Methods in Medical Research	Methods in Med. Res.	1954, **6**	Chicago, Ill., U.S.A.
Mie Medical Journal	Mie Med. J.	1953–54, **4,** No. 2	Tsu, Japan
Mikrobiologiya	Mikrobiologiya	1955, **24,** No. 3	Moscow, U.S.S.R.
Milbank Memorial Fund Quarterly	Milbank Mem, Fund Quarterly	1955, **33,** No. 3	New York, U.S.A.
Mitteilungen aus den Gebiete der Lebensmitteluntersuchung und Hygiene	Mitt. Geb. Lebensmittel. Hyg.	1955, **46,** No. 3	Basle, Switzerland
Molochnaya Promyshlennost	Mol. Prom.	1955, **16,** No. 4	Moscow, U.S.S.R.
Monatsschrift für Kinderheilkunde	Monatsschr. Kinderheilk.	1955, **103,** No. 6	Berlin : Göttingen : Heidelberg. Germany
Monthly Bulletin of the Ministry of Health and the Public Health Laboratory Service	Monthly Bull. Minist. Health and Pub. Health Lab. Serv.	1955, **14,** Sept.	London, England
Münchener Medizinische Wochenschrift	Münch. med. Wochenschr.	1955, **97,** No. 29	Munich, Germany

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North American Veterinarian	N. Amer. Vet.	1955, **36**, No. 9	Chicago, Ill., U.S.A.
Nagoya Journal of Medical Science	Nagoya J. Med. Sci.	1954, **17**, No. 6	Nagoya, Japan
Nagoya Medical Journal	Nagoya Med. J.	1954, **2**, No. 3	Nagoya, Japan
Nauku i Zhizn	Nauku i Zhizn	1955, **22**, No. 7	Moscow, U.S.S.R.
Nature	Nature	1955, **176**, No. 4481	London, England
Die Naturwissenschaften	Naturwissenschaften	1955, **42**, No. 16	Berlin : Göttingen : Heidelberg, Germany
Nederlands Melk en Zuiveltijdschrift	Nederlands Melk Zuiveltijdschr.	1955, **9**, No. 1	The Hague, Holland
Nederlandsch Tijdschrift voor Geneeskunde	Nederland. Tijdschr. Geneesk.	1955, **99**, No. 39	Amsterdam, Holland
Netherlands Journal of Agricultural Science	Netherlands J. Agric. Sci.	1955, **3**, No. 2	Wageningen, Holland
New England Journal of Medicine	New Engl. J. Med.	1955, **253**, No. 9	Boston, Mass., U.S.A.
Nordisk Medicin	Nord. Med.	1954, **52**, No. 52	Stockholm, Sweden
Nordisk Veterinärmedicin	Nord. Vet.-Med.	1955, **7**, No. 9	Stockholm, Sweden
Le Nourisson	Nourisson	1955, **43**, No. 1	Paris, France
Nutrition, Journal of Dietetics, Food Catering, Child Nutrition	Nutrition	1955, **9**, No. 3	London, England
New Zealand Agriculturist	N.Z. Agriculturist	1954, **8**, No. 5	Fielding, New Zealand
New Zealand Journal of Agriculture	N.Z. J. Agric.	1955, **91**, No. 1	Wellington, New Zealand
New Zealand Journal of Science and Technology	N.Z. J. Sci. Technol.	1955, **37**, No. 1	Wellington, New Zealand
New Zealand Veterinary Journal	N.Z. Vet. J.	1955, **3**, No. 2	Wellington, New Zealand
Onderstepoort Journal of Veterinary Research	Onderstepoort J. Vet. Res.	1954, **26**, No. 4	Pretoria, South Africa
Ophthalmologica	Ophthalmologica	1955, **130**, No. 1	Basle, Switzerland
Organic Reactions	Organic Reactions	1954, **8**	New York, U.S.A.
Österreichische Zeitschrift für Kinderheilkunde und Kinderfürsorge	Öst. Ztschr. Kinderheilk.	1955, **11**, No. 4	Vienna, Austria
Oxford Economic Papers	Oxford Econ. Papers	1955, **7**, No. 2	Oxford, England
Parasitology	Parasitology	1955, **45**, No. 1/2	London, England
La Pediatria	Pediatria	1955, **63**, No. 3	Naples, Italy
Pediatrics	Pediatrics	1955, **16**, No. 2	Springfield, Ill., U.S.A.
Pédiatrie	Pédiatrie	1955, **10**, No. 5	Lyons, France
Pediatriya	Pediatriya	1955, No. 3	Moscow, U.S.S.R.
Pflügers Archiv für die Gesamte Physiologie des Menschen und der Tiere	Pflügers Arch.	1955, **261**, No. 3	Berlin : Göttingen : Heidelberg, Germany
Pharmaceutical Bulletin	Pharm. Bull.	1955, **3**, No. 3	Tokyo, Japan
Pharmazeutische Zentralhalle für Deutschland	Pharm. Zentralhalle	1955, **94**, Sept.	Dresden : Leipzig, Germany
Philippine Journal of Animal Industry	Philippine J. Animal Indust.	1952, **13**, No. 4	Manila, Philippines
Philippine Journal of Science	Philippine J. Sci.	1955, **84**, No. 1	Manila, Philippines
Physiological Reviews	Physiol. Rev.	1955, **35**, No. 3	Baltimore, Md., U.S.A.
Physiological Zoology	Physiol. Zoöl.	1955, **28**, No. 3	Chicago, Ill., U.S.A.
Poultry Science	Poultry Sci.	1955, **34**, No. 3	Menasha, Wis., U.S.A.
Practitioner	Practitioner	1955, **175**, Sept.	London, England
Prensa Pediatrica	Prensa pediat.	1953–54, **4**, No. 25/26	Buenos Aires, Argentina
La Presse Médicale	Presse méd.	1955, **63**, No. 60	Paris, France
Priroda	Priroda	1955, No. 6	Moscow, U.S.S.R.
Problemy Tuberkuleza	Problemy Tuberk.	1955, No. 3	Moscow, U.S.S.R.
Proceedings of the British Society of Animal Production	Proc. Brit. Soc. Animal Prod.	1954	Edinburgh, Scotland
Proceedings of the Helminthological Society of Washington	Proc. Helminthol. Soc. Washington	1955, **22**, No. 2	Washington, D.C., U.S.A.
Proceedings of the Indian Academy of Sciences	Proc. Indian Acad. Sci.	1955, **42**, No. 2	Bangalore, India
Proceedings of the Japan Academy	Proc. Japan Acad.	1955, **31**, No. 7	Tokyo, Japan
Proceedings of the National Academy of Sciences	Proc. Nat. Acad. Sci., Washington	1955, **41**, No. 8	Washington, U.S.A.
Proceedings of the Nutrition Society	Proc. Nutrition Soc.	1955, **14**, No. 2	Cambridge, England
Proceedings of the New Zealand Society of Animal Production	Proc. N.Z. Soc. Animal Prod.	1954, **14**	Hamilton, New Zealand
Proceedings of the Royal Society (Series B)	Proc. Roy. Soc. [B]	1955, **142**, No. 914	London, England
Proceedings of the Royal Society of Medicine	Proc. Roy. Soc. Med.	1955, **48**, No. 9	London, England
Proceedings of the Society for Experimental Biology and Medicine	Proc. Soc. Exp. Biol. Med.	1955, **89**, No. 3	New York, U.S.A.
Proceedings of the Staff Meetings of the Mayo Clinic	Proc. Staff Meetings Mayo Clin.	1955, **30**, No. 17	Rochester, Minn., U.S.A.
Psychosomatic Medicine	Psychosomatic Med.	1955, **17**, No. 4	Philadelphia, Pa., U.S.A.
Public Health	Pub. Health	1955, **68**, No. 12	London, England
Public Health Reports	Pub. Health Rep., Washington	1955, **70**, No. 8	Washington, D.C., U.S.A.
Quaderni della Nutrizione	Quad. Nutrizione	1953, **13**, No. 2	Bologna, Italy
Quarterly Bulletin Michigan Agricultural Experiment Station	Quart. Bull. Michigan Agric. Exp. Stat.	1955, **37**, No. 2	East Lansing, Mich., U.S.A.
Quarterly Journal of Experimental Physiology	Quart. J. Exp .Physiol.	1955, **40**, No. 3	London, England
Quarterly Journal of Medicine	Quart. J. Med.	1955, **24**, No. 95	Oxford, England
Quarterly Journal of Microscopical Science	Quart. J. Microscop. Sci.	1955, **96**, No. 3	London, England
Quarterly Journal of Studies of Alcohol	Quart. J. Studies Alcohol	1955, **16**, No. 2	New Haven, Conn., U.S.A.

Title of Journal	*Contracted Title*	*Last Number Scrutinised*	*Place of Publication*
Quarterly Review of Agricultural Economics	Quart. Rev. Agric. Econ.	1955, **8,** No. 2	Canberra, Australia
Queensland Agricultural Journal	Queensland Agric. J.	1955, **80,** No. 5	Brisbane, Australia
Queensland Journal of Agricultural Science	Queensland J. Agric. Sci.	1954, **11,** No. 3	Brisbane, Australia
Recueil de Médecine Vétérinaire Publié par le Corps Enseignant de l'École d'Alfort	Rec. Méd. vét.	1955, **131,** No. 7	Paris, France
Recueil des Travaux Chimiques des Pays-Bas et de la Belgique	Rec. Trav. chim. Pays-Bas	1955, **74,** No. 7	Amsterdam, Holland
Recent Progress in Hormone Research	Recent Progr. in Hormone Res.	1955, **11**	New York, U.S.A.
Rendiconti Istituto Superiore di Sanità	Rend. Ist. Super. Sanità, Rome	1955, **18,** No. 3/4	Rome, Italy
Research and Experimental Record of the Ministry of Agriculture Northern Ireland	Res. Exp. Rec. Minist. Agric. N. Ireland	1955	Belfast, Northern Ireland
Research	Research	1955, **8,** No. 9	London, England
Revista de Agricultura	Rev. Agric., Costa Rica	1955, **28,** No. 3	San José, Costa Rica
Revista de la Asociación Argentina de Dietologia	Rev. Asoc. argent. Dietologia	1953, **11,** No. 43/44	Buenos Aires, Argentina
Revista de la Asociación Médica Argentina	Rev. Asoc. méd. argent.	1955, **69,** No. 800	Buenos Aires, Argentina
Revista da Associacao Medica de Minas Gerais	Rev. Assoc. Med. Minas Gerais	1952, **3,** No. 3/4	Belo Horizonte, Brazil
Revue Belge de Pathologie et de Médecine Expérimentale	Rev. belg. Pathol. Méd. exp.	1955, **24,** No. 4	Brussels, Belgium
Revue Canadienne de Biologie	Rev. canad. Biol.	1955, **14,** No. 1	Montreal, Canada
Revista Clínica Española	Rev. clín. española	1955, **57,** No. 5	Madrid, Spain
La Revue d'Oka, Agronomie, Médecine Vétérinaire	Rev. d'Oka	1955, **29,** No. 3	Canada
Review of Economics and Statistics	Rev. Econ. Statistics	1955, **37,** No. 3	Cambridge, Mass., U.S.A
Review of Economic Studies	Rev. Econ. Studies	1954–55, **22,** No. 3	Cambridge, England
Revue d'Élevage et de Médecine Vétérinaire des Pays Tropicaux	Rev. Élevage Méd. vét. Pays trop.	1955, **8,** No. 1	Paris, France
Revista Española de las Enfermedades del Aparato Digestivo y de la Nutricion	Rev. española Enferm. Apar. digest. Nutricion	1955, **14,** No. 4	Madrid, Spain
Revista Española de Fisiologia	Rev. española Fisiol.	1955, **11,** No. 1	Barcelona, Spain
Revista Española de Pediatria	Rev. española Pediat.	1955, **11,** No. 62	Saragossa, Spain
Revista de la Facultad de Farmacia y Bioquímica	Rev. Fac. Farm. Bioquím, Lima	1954, **16,** No. 63/64	Lima, Peru
Revista da Faculdade de Medicina Veterinaria	Rev. Fac. Med. Vet., São Paulo	1952, No. 4	São Paulo, Brazil
Revue des Fermentations et des Industries Alimentaires	Rev. Ferment. Indust. aliment.	1955, **10,** No. 3	Brussels, Belgium
Revista del Instituto Sulubridad y Enfermedades Tropicales	Rev. Inst. Sulubr. Enferm. trop., Mexico	1955, **15,** No. 1	Mexico, D.F., Mexico
Revista Médica de Chile	Rev. méd. Chile	1955, **83,** No. 5	Santiago, Chile
Revista Médico-Quirurgica de Oriente	Rev. méd.-quir. Orient.	1954, **17/18,** No. 8/9	Santiago, Cuba
Revista de Medicina Veterinaria	Rev. Med. vet., Buenos Aires	1954, **36,** No. 1	Buenos Aires, Argentina
Revue de Médecine Vétérinaire	Rev. Méd. vét., Toulouse	1955, **106,** July	Toulouse, France
Rhodesia Agricultural Journal	Rhodesia Agric. J.	1955, **52,** No. 3	Salisbury, Rhodesia
Rivista di Clinica Pediatrica	Riv. Clin. pediat.	1955, **55,** No. 4	Florence, Italy
Rivista dell'Istituto Sieroterapico Italiano	Riv. Ist. sieroterap. ital.	1955, **30,** No. 2	Naples, Italy
Rivista de Zootecnia	Riv. Zootec.	1955, **28,** No. 7/8	Milan, Italy
Roczniki Nauk Rolniczy	Rocz. Nauk rol. [B]	1955, **69,** No. 1	Warsaw, Poland
Roczniki Państwowego Zakłada Higieny	Rocz. Państwowego Zakł. Hig.	1955, **6,** No. 2	Warsaw, Poland
Royal Society for the Promotion of Health Journal	Roy. Soc. Promotion Health J.	1955, **75,** No. 8	London, England
Sankhyā, Indian Journal of Statistics	Sankhyā, Indian J. Statistics	1955, **15,** No. 1/2	Calcutta, India
Sbornik Československé Akademie Zěmědelské	Sborn. čsl. Akad. Zěměd.	1954, **27,** No. 4	Prague, Czechoslovakia
Sborník Lékařský	Sborn. lék.	1954, **56,** No. 1/2	Prague, Czechoslovakia
Sborník pro Pathofysiologii Trávení a Výživy	Sborn. pathofysiol. trav.	1954, **8,** No. 4	Prague, Czechoslovakia
Sborník Vysoké školy Zěmědelské v Brně	Sborn. vysoké šk. Zěměd., Brno	1953	Prague, Czechoslovakia
Schweizerische Medizinische Wochenschrift	Schweiz. med. Wochenschr.	1955, **85,** No. 30	Basle, Switzerland
Scientific Proceedings of the Royal Dublin Society	Sci. Proc. Roy. Dublin Soc.	1955, **27,** No. 1	Dublin, Republic of Ireland
Science	Science	1955, **122,** No. 3165	Baltimore, Md., U.S.A.
Scottish Agriculture	Scot. Agric.	1955, **35,** No. 1	Edinburgh, Scotland
Scripta Medica	Scripta med.	1954, **27,** No. 1/2	Brno, Czechoslovakia
Shikoku Acta Medica	Shikoku Acta Med.	1955, **6,** No. 5	Tokushima, Shikoku, Japan
South African Journal of Laboratory and Clinical Medicine	S. African J. Lab. Clin. Med.	1955, **1,** No. 1	Cape Town, South Africa
South African Journal of Medical Sciences	S. African J. Med. Sci.	1954, **19,** No. 4	Johannesburg, South Africa
South African Medical Journal	S. African Med. J.	1955, **29,** No. 36	Cape Town, South Africa
Social and Economic Studies	Social Econ. Studies	1954, **3,** No. 2	Jamaica
Southern Medical Journal	Southern Med. J.	1955, **48,** No. 7	Birmingham, Ala., U.S.A.
Sovetskaya Meditsina	Sovet. Med.	1955, No. 5	Moscow, U.S.S.R.
Soviet Studies	Soviet Studies	1955, **7,** No. 1	Oxford, England
Lo Sperimentale	Sperimentale	1954, **104,** No. 9/10	Florence, Italy
Lo Sperimentale, Sezione di Chimica Biologica	Sperimentale, Sez. Chim. biol.	1954, **5,** No. 3/4	Florence, Italy
Spisy Fakulty Veterinární	Spisy fak. vet.	1953, **1,** No. 22	Brno, Czechoslovakia

Title of Journal	*Contracted Title*	*Last Number Scrutinised*	*Place of Publication*
Stain Technology	Stain Technol.	1955, **30**, No. 4	Geneva, N.Y., U.S.A.
Surgery	Surgery	1955, **38**, No. 2	St. Louis, Mo., U.S.A.
Surgery, Gynecology and Obstetrics	Surg. Gynecol. Obstet.	1955, **101**, No. 2	Chicago, Ill., U.S.A.
Tasmanian Journal of Agriculture	Tasmanian J. Agric.	1955, **26**, No. 2	Hobart, Tasmania
Terapevticheskii Arkhiv	Terap. Arkh.	1955, **27**, No. 2	Moscow, U.S.S.R.
The Summary	The Summary	1953	London, Ont., Canada
Tidsskrift for det Norske Landbruk	Tidsskr. norske Landbruk	1955, **62**, No. 8	Oslo, Norway
Tijdschrift voor Diergeneeskunde	Tijdschr. Diergeneesk.	1955, **80**, No. 18	Utrecht, Holland
Tohoku Journal of Experimental Medicine	Tohoku J. Exp. Med.	1955, **62**, No. 1	Sendai, Japan
Tokushima Journal of Experimental Medicine	Tokushima J. Exp. Med.	1954, **1**, No. 3	Tokushima, Japan
Transactions of the Faraday Society	Trans. Faraday Soc.	1955, **51**, No. 9	Aberdeen, Scotland
Transactions of the Royal Highland Society of Scotland	Trans. Roy. Highl. Agric. Soc. Scot.	1953, **65**	Edinburgh, Scotland
Transactions of the Royal Society of New Zealand	Trans. Roy. Soc. N.Z.	1955, **82**, No. 5	Wellington, New Zealand
Transactions of the Royal Society of Tropical Medicine and Hygiene	Trans. Roy. Soc. Trop. Med. Hyg.	1955, **49**, No. 4	London, England
Tropical Agriculture. The Journal of the Imperial College of Agriculture, Trinidad	Trop. Agric., Trinidad	1955, **32**, No. 3	St. Augustine, British West Indies
Universidade do Brasil Instituto de Nutrição Trabalhose e Pesquisas	Univ. Brasil Inst. Nutrição Trab. e Pesq.	1952, **5**	Rio de Janeiro, Brazil
Vestnik Oftalmologii	Vestn. Oftalmol.	1955, **34**, No. 3	Moscow, U.S.S.R.
Vestnik Otorinolaringologii	Vestn. Otorinolaringol.	1955, **17**, No. 4	Moscow, U.S.S.R.
Vestnik Venerologii i Dermatologii	Vestn. Venerol. Dermatol.	1955, No. 2	Moscow, U.S.S.R.
Veterinarski Archiv	Vet. Arhiv.	1955, **25**, No. 5/6	Zagreb, Jugoslavia
Veterinary Medicine	Vet. Med.	1955, **50**, No. 9	London, England
Veterinary Record	Vet. Rec.	1955, **67**, No. 38	London, England
Veterinary Reviews and Annotations	Vet. Rev.	1955, **1**, No. 1	Weybridge, England
Veterinariya	Veterinariya	1955, **32**, No. 5	Moscow, U.S.S.R.
Veterinářství	Veterinářství	1954, **4**, No. 11	Brno, Czechoslovakia
Virchows Archiv für Pathologische Anatomie	Virchows Arch.	1955, **327**, No. 3	Berlin : Göttingen : Heidelberg, Germany
Vitamins and Hormones	Vitamins and Hormones	1954, **12**	New York, U.S.A.
Voeding	Voeding	1955, **16**, No. 9	Amsterdam, Holland
Voprosy Pitaniya	Vop. Pitan.	1955, No. 3	Moscow, U.S.S.R.
Výživa Lidu	Výž. lidu	1954, **9**, No. 12	Prague, Czechoslovakia
West African Medical Journal	W. African Med. J.	1955, **4**, No. 2	Ibadan, Nigeria
West Indian Medical Journal	W. Indian Med. J.	1954, **3**, No. 2	Jamaica, B.W.I.
Wiener Klinische Wochenschrift	Wien. klin. Wochenschr.	1955, **67**, No. 27	Vienna, Austria
Yale Journal of Biology and Medicine	Yale J. Biol. Med.	1955, **27**, No. 6	New Haven, Conn., U.S.A.
Yokohama Medical Bulletin	Yokohama Med. Bull.	1955, **6**, No. 2	Yokohama, Japan
Yorkshire Bulletin of Economic and Social Research	York. Bull. Econ. Social Res.	1955, **7**, No. 1	Hull, England
Zhurnal Analiticheskoi Khimii	Zh. Anal. Khim.	1954, **9**, No. 4	Moscow, U.S.S.R.
Zhurnal Nevropatologii i Psikiatrii im. S.S. Korsakova	Zh. Nevropatol. Psikhiat. Korsakova	1955, **55**, No. 4	Moscow, U.S.S.R.
Zhurnal Obschhei Biologii	Zh. Obshchei Biol.	1954, **15**, No. 5	Moscow, U.S.S.R.
Zoologicheskii Zhurnal	Zool. Zh.	1955, **34**, No. 3	Moscow, U.S.S.R.
Zootechnia. Acta Societatis Internationalis Veterinariorum Zootechnicorum	Zootechnia	1954, **3**, No. 6	Madrid, Spain
Zootecnica e Veterinaria, la Fecondazione Artificiale	Zootec. Vet.	1955, **10**, No. 6	Milan, Italy
Zeitschrift für die Gesamte Experimentelle Medizin	Ztschr. ges. exp. Med.	1955, **126**, No. 2	Berlin : Göttingen : Heidelberg, Germany
Zeitschrift für die Gesamte Innere Medizin	Ztschr. ges. inn. Med.	1955, **10**, No. 11	Leipzig, Germany
Zeitschrift für Hygiene und Infektionskrankheiten	Ztschr. Hyg. Infektionskr.	1955, **141**, No. 6	Berlin : Göttingen : Heidelberg, Germany
Zeitschrift für Immunitätsforschung und Experimentelle Therapie	Ztschr. Immunitätsforsch.	1955, **112**, No. 2	Jena, Germany
Zeitschrift für Kinderheilkunde	Ztschr. Kinderheilk.	1955, **76**, No. 5/6	Berlin : Göttingen : Heidelberg, Germany
Zeitschrift für Lebensmittel-Untersuchung und -Forschung	Ztschr. Lebensmittel-Untersuch. Forsch.	1955, **102**, No. 3	Munich, Germany
Zeitschrift für Physiologische Chemie (*see Hoppe-Seyler's Ztschr.*)			
Zeitschrift für Tierernährung und Futtermittelkunde	Ztschr. Tierernährung Futtermittelk.	1955, **10**, No. 3	Hamburg, Germany.
Zeitschrift für Tierzüchtung und Züchtungsbiologie	Ztschr. Tierzücht. Züchtungsbiol.	1954/55, **64**, No. 4	Berlin : Hamburg, Germany
Zeitschrift für Tropenmedizin und Parasitologie	Ztschr. Tropenmed. Parasitol.	1955, **6**, No. 1	Stuttgart, Germany
Zeitschrift für Tuberkulose	Ztschr. Tuberk.	1955, **106**, No. 2	Leipzig, Germany
Zeitschrift für Vitamin-, Hormon- und Fermentforschung	Ztschr. Vitamin-, Hormon- Fermentforsch.	1955, **7**, No. 1	Vienna : Innsbruck, Austria
Züchtungskunde	Züchtungskunde.	1955, **27**, No. 3	Stuttgart, Germany

This is to ***announce*** a new section

in

NUTRITION ABSTRACTS AND REVIEWS

SYMPOSIA

PROCEEDINGS AND CONGRESS REPORTS

It has been the policy of the Editorial Board from the beginning to give full bibliographical references to relevant papers read at meetings of Societies and Congresses but not to give abstracts. So great has the volume of such proceedings become that it has been impossible in recent years to cover all such meetings and the space required to deal with the more important has been excessive. It was therefore proposed, and approved by the Commonwealth Agricultural Bureaux Review Conference, 1955, that we should devote a new section to such reports, giving authors' names and the subject, but not the full title, of papers on nutrition. In this way subscribers can be given an even more complete cover of Society meetings and Congresses in less space, so that there will be more to devote to the growing volume of important full papers on research.

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EARLY NUTRITIONAL RESEARCHES ON BERIBERI LEADING TO THE DISCOVERY OF VITAMIN B_1

BY

B. C. P. JANSEN

LABORATORY OF PHYSIOLOGICAL CHEMISTRY OF THE UNIVERSITY OF AMSTERDAM AND THE NETHERLANDS INSTITUTE OF NUTRITION

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INTRODUCTION

WE may say that the modern science of nutrition originated from or at least was greatly stimulated by the beriberi research. In the 19th century the classical science of nutrition was built up by formidable experimental work and scientific interpretation by several great men and in a great many laboratories, chemical, physiological and veterinary.

Voit, one of the founders of the classical science of nutrition, realised in 1881 that that science was founded on experiments with natural foodstuffs and not with pure proteins, carbohydrates, fats and mineral salts. He wrote on page 19 of *Hermann's Handbuch der Physiologie*: "Jedoch wäre es wohl möglich und ganz verdienstvoll, die Grundversuche . . . mit den reinen Stoffen zu wiederholen, obwohl sich dabei sicherlich im Wesentlichen keine anderen Resultaten ergeben werden" (Voit, 1881). Lunin, a pupil of Bunge in Basle, soon afterwards made the experiments that Voit had predicted as unnecessary, but the result was unexpected. Lunin fed mice on a diet purified as far as possible, consisting of pure casein, pure carbohydrates, fats and mineral salts, in the proportion in which those ingredients occurred in milk powder. Young mice did not grow well on the mixture and all died in a short time. On the other hand, mice on a milk powder diet grew well and remained healthy (Lunin, 1881). Therefore, Lunin came to the conclusion that a natural food such as milk must contain, besides the known, principal ingredients, small quantities of unknown substances essential to life. His statement was so much in contradiction to the classical theory that at first it made little impression on the scientific world. Lunin's chief, Professor Bunge, had been doing important work on the nutritive importance of sodium chloride and other mineral salts and so thought that perhaps a wrong proportion of the mineral salts was responsible for his pupil's odd results. It was only after decades that the famous American nutrition workers Osborne and Mendel (1911; 1913) took protein-free milk powder as a source of mineral

salts in suitable proportion, and realised that it contained unknown ingredients, essential to life.

Historically, it was chiefly researches on the cause of beriberi that put an end to acceptance of the former classical theory of nutrition.

Of great importance for the acceptance by the scientific and medical world of the idea that small amounts of specific accessory constituents of the diet have indispensable functions was the support given to it by the biochemist, Hopkins. Hopkins had found that the addition of a small quantity of milk was essential for the growth and wellbeing of mice given a purified artificial diet (Hopkins, 1912).

Beriberi

Beriberi was known for centuries in several Far-Eastern rice-eating countries. Already in the year 1611 the first Governor-General of the Dutch East India Company wrote that in the Dutch East Indies there was a disease named beriberi which caused paralysis in the hands and feet. Later, Bontius in Batavia, the capital of the former Dutch East Indies, now Djakarta in Indonesia, was the first European physician to write about this disease (Bontius, 1642). In those early days only sporadic cases were seen, but the situation changed for the worse in the nineteenth century after the introduction of machine-milled rice. In all rice-eating peoples several diseases with different names were recognised by the end of the nineteenth century as being identical with beriberi or *kakke*, as it was called in Japan.

Scheube (1882) and Baelz (1882), two physicians working in Japan, were the first to make extensive studies of *kakke* and to perform autopsies. They were especially impressed by the diminished activity of the patients, which they ascribed to a peripheral, multiple, subacute neuritis. Later Pekelharing and Winkler (1887) performed scores of autopsies and found that degeneration of the peripheral nerves was always present. The nucleated sheath of Schwann remained intact, but the axis-cylinder was present only near the nodes of Ranvier, where the medullary substance had often disappeared over a large area.

Pathologists agree that the essential changes in beriberi fall into three groups: changes in the nervous system, changes in the heart function, anasarca and effusion.

In general, three forms of beriberi are distinguished, the dry, the wet, and the cardiac or pernicious, but the forms are often mixed. In the dry form, nerve degeneration leading to paralysis is the most obvious sign. In the wet form, oedema is the sign by which the disease is easily recognised even by laymen. Each of these types can change into the other and when the wet changes into the dry, the patient may lose several pounds in weight by profuse urination; paralysis may then appear. In the early stages dry beriberi is often characterised by an unsteady gait; in mild forms the extensors alone are involved and there is toe drop. Both the wet and the dry type of beriberi may suddenly change to the cardiac or pernicious form, which, if not properly treated, leads to a painful death in a few hours (see p. 10).

Rice and its Processing

The ears of rice after harvesting are threshed so that the grains, usually called "paddy", are shed. Three layers can be distinguished in a husked rice grain. The outer layer or pericarp is very thin and is known as the "silverskin"; in many kinds of rice it is white, but in others it is grey or red or nearly black. The middle layer, the sub-pericarpal or aleurone layer, contains the greater part of the fat and part of the proteins of the grain. The third and innermost layer constitutes the largest part of the rice grain and consists chiefly of starch. At one end of the grain is the embryo or germ.

The paddy grains after being freed from the husks are processed in different ways. Before the introduction of steam-powered rice mills the husked rice was pounded by the farmers themselves with a wooden pestle in a wooden mortar, usually formed from the hollowed-out trunk of a tree. After the hulls had been removed from the grain, the mixture was placed on trays and tossed skilfully into the air. The rice fell back into the tray and the wind carried away the hulls. By this process a great deal of the outer layer was left on the grain. It is possible in this way to remove all the pericarp, sub-pericarp and germ, but it takes so long that it is done only in special cases. In the latter half of the nineteenth century steam-powered mills were introduced in the larger cities of rice-eating countries. The mills removed all the outer layers of the rice grain and the resulting product was the familiar polished, white rice containing no significant amount of the sub-pericarp or germ.

In Malaya and in some regions of India the paddy is processed differently. Fletcher (1909) described it in this way: "The unhusked grain or paddy is soaked in water for twelve to twenty-four hours or even longer. It is then heated in vessels containing water over a slow fire until the husks burst. The third stage in the preparation consists of spreading out the grain and drying it in the sun; when this has been completed, it should be possible to separate the husks from the seed by light rubbing between the palms of the hands. The rice is then husked by pounding, or is taken to the mills, where

the same process is effected by the millstone, but it is not polished by the rapidly revolving stones against the fine wire gauze after the manner of the white rice." The rice processed in this way is called " cured " or " parboiled " rice. In later years, the whole process became industrialised, and its product, called " converted rice ", was used on a large scale in the Southern United States. By the methods now available for estimating the content of vitamin B_1, it has been shown that converted or parboiled rice has nearly the same vitamin B_1 content as crude rice.

A by-product of the rice mills is rice bran, known in Malaya as " *dedek* ", which contains the pericarp, the aleurone layer and the germ. It is sold as feed for fowls and pigs.

Rice is not rich in proteins, containing only from 5 to 8 per cent., but they are of good nutritive value with a high percentage of essential amino-acids. The content of fat is less than 1 per cent., and of mineral salts 1 per cent. or less, so that rice is predominantly a carbohydrate food.

Early Researches on the Cause of Beriberi

Until the end of the nineteenth century two causes of beriberi were suggested, infection and intoxication, and early research was consequently directed towards one or other of them.

The German physicians Baelz (1882) and Scheube (1882), who worked in Japan, formed the opinion that beriberi was a *panneuritis endemica* (Baelz, 1882), caused by an infection. The frequency of the disease in such crowded places as prisons, barracks, plantations and ships pointed to infection. Many other investigators tried to prove that beriberi was an infectious disease and some even designated certain micro-organisms as the specific cause. But, in the long run, nobody has been able to sustain the claim to have isolated a specific causative microbe.

Other scientists attempted to find a specific chemical poison in the rice diet and present in the rice, because beriberi was a disease particularly prevalent among rice-eating communities. Examples of diseases caused by poisonous or poisoned foods were known, such as lathyrism and ergotism. Thus it was thought that rice might contain a toxin or might become poisonous by processing or storing. It was not suspected by anyone that deficiency of an essential food component in the processed rice might be the cause of beriberi because, according to the contemporary theory of nutrition, all the necessary components of a diet were known and were present in rice, though perhaps the protein content was somewhat low.

In 1873 the Dutch naval doctor, van Leent, studied the morbidity and mortality from beriberi in the Indian and European crews of the Dutch navy. He found a far greater mortality among the Indians than among the Europeans, which he ascribed to differences between the diets; that of the Indians consisted chiefly of rice while that of the Europeans was more mixed and contained larger amounts of protein and fat. He therefore changed the diet of the Indians to that of the Europeans, a measure which led to a great reduction in the beriberi morbidity among the Indian crew (van Leent, 1880).

About ten years later, Takaki, chief of the medical service of the Japanese navy, introduced similar changes into the diet of the Japanese navy personnel, the amount of rice being reduced to 175 g. a day. Takaki's reform of the former rice diet produced a great reduction in the incidence of beriberi in the Japanese navy also, and the disease was finally eradicated (Takaki, 1887; 1906).

Schaumann (1908), working in the Tropenhygienisches Institut at Hamburg, made extensive investigations on the cause of beriberi and came to the conclusion that it was a metabolic disease caused by deficiency of organic phosphorus compounds and insufficient absorption of them from the gut.

Modern View of the Cause of Beriberi

Modern investigations on the cause of beriberi originated in the work of the Dutch investigators, Eijkman and Grijns, in Batavia, now called Djakarta.

As has already been shown, beriberi occurred sporadically until the middle of the nineteenth century, but after about 1870, with the introduction of the steam-powered rice mills, the incidence of the disease rose steeply, chiefly in prisons and barracks. In Java, prisons existed where a sentence of longer than three months was equivalent to capital punishment, because after that time nearly all the prisoners developed beriberi and died. The war against the pirates in Atjeh in the north of Sumatra became seriously hampered, because soldiers who had remained longer than three months in the barracks were attacked by beriberi. In those circumstances the Dutch Government in 1886 sent to the Dutch East Indies a commission, consisting of a neurologist, Dr. C. Winkler, and a hygienist and bacteriologist, Prof. C. A. Pekelharing, to investigate the cause of beriberi and to advise on remedies against it. The commission had as assistant a young military surgeon, Dr. Christian Eijkman. After a thorough examination, Pekelharing thought he had discovered the cause of beriberi in a microbe, a coccus, which he found in beriberi patients but not in healthy people (Pekelharing and Winkler, 1887). The obvious remedy was, therefore, disinfection

of the barracks and prisons. The commission then returned to Holland.

Pekelharing was not, however, fully convinced that he had found the specific remedy. He therefore urged the Government to exempt Dr. Eijkman from military service and to give him the opportunity to continue research on beriberi. He was even granted a small laboratory in the military hospital at Batavia, with the grand name of Laboratory for Pathological Anatomy and Bacteriology. Here Eijkman tried to confirm the infection theory of the commission by inoculating fowls as experimental animals with supposedly infectious material such as blood and urine from beriberi patients or with material from corpses of patients who had died from beriberi.

From the work of several investigators and of Eijkman himself, it was known that polyneuritis was one of the signs of beriberi, so Eijkman examined his fowls for polyneuritis. At first he did not find any sign of a disease like beriberi in the fowls. They were being fed at the time on crude rice. After some months, however, when they were being fed on the boiled, polished rice that was left over from the hospital table, he observed signs that reminded him of human beriberi, particularly in regard to polyneuritis. By staining with osmic acid according to the methods of Marchi, he found the same appearances in nerves from the polyneuritic fowls as in nerves from human beings who had died from beriberi. It was, however, not only birds inoculated with the supposed infecting bacilli which showed the signs, but also non-infected, control fowls. Six months later, all the diseased fowls recovered and none showed fresh signs. The question was, what could have caused the appearance and later the disappearance of the polyneuritis? It had appeared about a month after the introduction of white, polished rice into the diet of the fowls. Some months later a new chief of the hospital forbade the use of the hospital luxury rice for the animals. The fowls were then again fed on cheap, crude rice and some weeks later the epizoötic ceased completely.

Was it possible that the change in the kind of rice might have caused the change in the health of the fowls? The possibility was easily tested. Eijkman took two groups of non-inoculated fowls; one group was fed on crude rice, the other on white, polished rice from which the germ and pericarp had been removed. The result was decisive; the birds given polished rice showed the beriberi-like signs, those given crude rice remained healthy (Eijkman, 1890; a short account in German, 1897*a*).

In order to examine whether possibly a toxic substance had been developed in the white, polished rice during storage, crude rice was milled and polished in the laboratory. The white, polished rice thus obtained produced polyneuritis in the fowls, which could be cured by giving the germ and pericarp separated from the crude rice by the milling process. The addition of rice hulls or other indigestible material like chalk or small pebbles to the polished rice did not prevent or cure the polyneuritis. It was found that the protein content of the germ and pericarp of the rice was somewhat higher than that of polished rice, and it was possible that the polyneuritic signs might have been caused by deficiency of protein. Eijkman therefore fed fowls on a diet with several kinds of sago, which was composed almost exclusively of carbohydrate. On the sago diet too the fowls became polyneuritic, but on a meat diet they remained healthy. Addition to a diet of polished rice of an amount of meat sufficient to make the total protein content of the mixture higher than that of crude rice did not prevent the beriberi-like signs in the fowls. In the course of his work Eijkman was astonished to find in experiments with potato starch that the birds did not show any sign of polyneuritis with that form of carbohydrate food (Eijkman, 1890).

The experiments just described contradicted the theory held at first by Eijkman, that the polyneuritic signs were caused by a toxic substance, present in the carbohydrate-rich food or produced from it by micro-organisms in the gut. He ascribed the fact that potato starch was not deleterious to its being less easily fermented in the gut, for he could demonstrate that rice starch was much more easily attacked by yeast than potato starch. It is, however, probable in the light of subsequent work that the protective action of the potato starch may have been due to its known tendency to cause a state of refection, in which growth is encouraged of the bacterial flora that produces B vitamins in the gut (Fridericia *et al.*, 1927; Kon and Watchorn, 1928).

By his first investigations Eijkman demonstrated that *polyneuritis gallinarum* depended on the kind of rice that was eaten by the birds. But he was not yet convinced that the mortal disease, human beriberi, could be explained in the same way. In the first article in which he described his experiments with fowls, Eijkman discussed the question whether his conclusions from his animal experiments could have any connection with the cause of beriberi in human beings. He summed up several ways in which *polyneuritis gallinarum* resembled human beriberi, especially in the degeneration of the peripheral nerves, but he concluded that no fact was known to compel the admission that beriberi had a connection with the diet as close as had been demonstrated for *polyneuritis gallinarum* (Eijkman, 1890).

Eijkman did not consider it allowable to make experiments with human beings, but the idea

occurred to him that perhaps a huge experiment had already been in existence for a long time without anyone being aware of it, for it was known that in some prisons beriberi was frequent, while others were almost free of it. Was it possible that in these human subjects also the frequency of beriberi had anything to do with the kind of rice that they consumed? Eijkman therefore asked his friend Dr. A. G. Vorderman, who, as an inspector of the civil medical service in Java had the medical supervision of the jails, to inquire into the frequency of beriberi in different prisons and into the kind of rice the prisoners consumed. The result of the investigation was clear-cut. In the jails where the prisoners themselves milled the rice, so that crude rice was eaten, only sporadic cases of beriberi were seen; in the jails where machine-milled, white, polished rice was supplied, there were 30 times as many cases of beriberi as in the jails provided with hand-milled rice (Vorderman, 1897; see also Eijkman, 1897*b*). Vorderman distinguished 3 kinds of rice: crude rice containing almost all the pericarp and germ, half-milled rice containing part of the pericarp and the germ, and white, polished rice from which all the pericarp and germ had been removed in the machine mills. Of 37 jails supplied with crude rice, 36 were free from beriberi, but in one there were some cases that had been transferred; of the 12 jails with half-milled rice, beriberi was found in 5, but in less than 1 per cent. of the inmates; of the 52 jails with polished rice, beriberi was present in 37 and in many of them scores of the inmates were affected.

Formerly, imported rice had been suspected of causing beriberi, but the researches of Vorderman showed that the degree of milling and not the origin of the rice was the important factor in connection with beriberi. In 1897 he found evidence also that crude rice was able not only to prevent but also to cure incipient beriberi. That consumption of machine-milled rice was the only causative factor in beriberi was proved in a certain prison in the village of Tulung Agung, where 5·8 per cent. of the prisoners were found with beriberi. After no change except replacement of the polished rice in the diet by crude rice, even without disinfection beriberi disappeared.

In 1896 Eijkman, who had been working very hard for 8 years in the tropics, went on leave to Europe and some years later he was appointed Professor of Hygiene at the University of Utrecht in Holland. Grijns, a young medical surgeon, was appointed by the Government of the Netherlands Indies to the laboratory in Batavia to continue Eijkman's investigations.

By the work of Eijkman, completed by that of Vorderman, it had become evident that *polyneuritis gallinarum* and beriberi in man were caused by a diet consisting predominantly of white, polished rice and that the disease could be prevented or cured by a diet containing crude rice if the morbid condition had not progressed too far. But in what did the deleterious influence of the polished rice consist? Eijkman was still inclined to think of a toxic substance, produced in the gut from the carbohydrate-rich food, probably by micro-organisms, a poison which could act on the nervous system, while the pericarp of the rice contained an antidote (Eijkman, 1897*a*).

Eijkman had shown (1893) by his rejection of the theory of "tropical anaemia", held for centuries, that he did not hesitate to accept the right conclusions from experimental data even when they were in contradiction to a generally accepted theory. Nevertheless he hesitated to abandon the simple, classical theory of nutrition, and tried to explain the established facts by a complex view. Some years later, when he had been compelled to change this view, he took as motto for a lecture "*simplex non veri sigillum*" (simplicity is no sign of truth) (Eijkman, 1913 *a*, *b*).

Grijns was commissioned by the Netherlands Indies Government to investigate the physiological and pharmacological properties of the tannin contained in unpolished, red rice and possibly of other constituents which might require to be considered in relation to the etiology of beriberi. It was not required that he should keep strictly to the letter of his commission, but that his investigation, by discovering the connection between diet and polyneuritis, should aim at getting an insight into the etiology of the neuritis which would make it possible to obtain rational control of the disease.

Grijns (1901) continued Eijkman's experiments with fowls. He began by studying the influence of the mineral salts present in the rice pericarp, and was able to demonstrate that the occurrence of polyneuritis in fowls fed entirely on polished rice could not be considered a result of salt starvation. He further proved that neither protein starvation nor mineral starvation could be the cause of polyneuritis. In contradiction to the view originally held by Eijkman, Grijns showed that the development of polyneuritis was not connected with a particular kind of starch in the diet, for buffalo meat autoclaved at 120° C. for 2 hours produced polyneuritis in fowls. This last experiment excluded the possibility that the polyneuritis could be caused by infected food.

Grijns tested on fowls some substances known to be helpful in beriberi in man. When *katjang idjoe*, the name in Java for the green bean of *Phaseolus radiatus*, was added to the diet the birds were protected against polyneuritis.

In his first publication describing experiments conducted since 1896, after discussing all the

former theories on the cause of beriberi, Grijns (1900) came to the conclusion that very little was known about the metabolism of the peripheral nervous system but, from the comparatively small extent of the blood supply to the nerves, a low metabolic rate might be assumed. If, further, for the maintenance of the peripheral nervous system a certain substance or group of substances was indispensable, but was not indispensable for the metabolism of muscles, it might be assumed that the amount necessary was very small. We cannot therefore, be surprised that such substances had hitherto escaped detection by chemical analysis. Thus Grijns was the first scientist who clearly expressed the theory that in food there occur in small quantities unknown organic substances, essential for health. He called them protective substances. Casimir Funk afterwards coined the name " vitamine " for them, because the supposed antineuritic vitamine, which he believed that he had isolated, proved to be an amine (Funk, 1911 ; 1914). It has since become clear that Funk did not isolate the antiberiberi but the antipellagra vitamin, nicotinic acid, and that several members of the new class of substances were not amines at all. Drummond (1920) later proposed to drop the terminal e and call them vitamins, a proposal which has been adopted generally.

Grijns went on leave in 1904 and for the first years after his return, by the orders of a new chief, his activities were confined to routine work. Some years later he had the opportunity to resume research and repeated the experiments of Eijkman designed to discover an infectious origin of fowl polyneuritis. With de Haan he demonstrated the absence of specific antibodies in the blood in human beriberi and in fowl polyneuritis (Grijns and de Haan, 1909). The results of all his attempts to obtain evidence that fowl polyneuritis is an infectious disease or is caused by toxins were negative and were in accordance with his theory of the absence of protective substances from the diet. Grijns attempted to isolate the protective substance first from *katjang idjoe*, the green bean of *Phaseolus radiatus*, and later from *dedek*, the rice polishings containing the pericarp and germ obtainable from the rice mills (Grijns, 1935). Soon afterwards, when he had just obtained a fine new laboratory, his health, after a long stay in the tropics, forced him to return to Europe.

Beriberi is seen mostly in regions where polished rice is the staple food of the population. In countries where people consume very large quantities of other highly milled cereals, beriberi may occasionally occur. The nearly exclusive consumption of highly milled wheat was found to cause beriberi in Newfoundland, when poor fishermen sold their fish in order to buy the pure white wheaten flour (Little, 1912 ; see also Aykroyd, 1930). Holst (1911–12) showed that beriberi occurred among Norwegian sailors consuming a great deal of white bread baked from wheaten flour or wheat and rye flour in equal proportion.

Confirmation and Extension of the Work of Eijkman and Grijns

Braddon (1909) in Malaya recorded that thousands of Tamils, natives of Southern India, migrated yearly to Malaya while still greater numbers of Chinese had been pouring into the same region. In conditions of toil, fatigue, exposure, influence of climate and place, there was no single condition affecting the Chinese to which the Tamil was not equally exposed. Of 16,716 cases of beriberi admitted to the Government hospitals, 16,325 or 97·5 per cent. were Chinese and 0·5 per cent. were Tamils. The Tamils were consumers of cured (parboiled) rice, the Chinese never ate cured rice but only polished rice. So it was obvious that the white, polished rice caused beriberi, and that cured rice was innocuous. Braddon came to the conclusion that the presence of a poison in white, polished rice could explain all the phenomena of beriberi.

Between 1906 and 1908 Fraser and Stanton watched the effect of white rice compared with that of parboiled rice in the diet of about 300 Javanese coolies engaged in road construction in a remote part of the district of Negri Sembilan in the Malay States, described as " virgin jungle ". Rice accounted for about 60 per cent. of the calories in the food supplied, which was the same for all the workers, except that different groups working in different places received either white rice or parboiled rice. Among 273 coolies receiving parboiled rice no case of beriberi occurred ; among 220 receiving white rice 20 developed the disease, but could be cured when parboiled rice was substituted in their diet. Subjects consuming parboiled rice did not contract the disease when in contact with beriberi patients. It was concluded that beriberi in the Malay Peninsula " has, if not its origin, at least an intimate connection with white rice " (Fraser and Stanton, 1909).

Vedder in his book on beriberi (1913, p. 144) wrote : " I have been authoritatively informed that Fraser and Stanton, in the course of their work on beriberi, performed a large number of human experiments, in which they tried by every conceivable method, including insect transmission, to infect healthy individuals from beriberi patients. These experiments were all negative, but were unfortunately suppressed by the Government for political reasons."

Fletcher conducted trials from 1905 to 1908 in the Kuala Lumpur Lunatic Asylum to test the

three following theories of the causation of beriberi: the theory of place-infection; the theory of contagion and of transmission by parasites such as bugs and lice; and the dietetic theory, which included as possible causes nitrogen starvation and presence of a poison in rice. To test the dietary theory, he divided the patients into two groups, one of which was given the best quality of white, polished rice obtainable, while the other had cured (parboiled) rice. All other food and conditions were the same for both groups. In connection with the theory of place-infection, it is interesting to note that in a ward which had been a "hot-bed of beriberi" and was later occupied for 18 months by patients having a cured rice diet, not a single case of beriberi occurred during the whole of that time. Of 219 patients receiving cured rice, not one was attacked by beriberi; at the start of the experiment, 4 were already suffering from beriberi, but during the trial they were restored to health. Of 226 patients receiving polished rice, 65 were attacked by beriberi. From this experiment Fletcher concluded that "white polished rice, although of the best quality, is a cause of beriberi, acting either by some poison which it contains or by a starvation due to some defect in the nutritive value of such rice" (Fletcher, 1909).

Distribution of the Antineuritic Substance

Cooper (1912; 1914), working in the Lister Institute in London, investigated the amounts of different raw foodstuffs which were sufficient to prevent polyneuritis for a definite period in pigeons fed on polished rice. For the prevention of beriberi he recommended egg yolk, heart muscle, liver, nuts, barley and lentils as suitable foodstuffs with which to supplement a polished rice diet. In 1914 Braddon and Cooper, working in the same Institute, wrote: "It is now taken as definitely settled that the disease beriberi is essentially privatory in origin, resulting from a deficiency in the food supply of a substance or substances the precise nature of which is at present unknown" (Braddon and Cooper, 1914). They further demonstrated that the absolute amount of antineuritic material required by the organism depended on the total calorie value of the diet, and in particular was increased with increase in the proportion of carbohydrate.

First Attempts to isolate the Antineuritic Substance

When Grijns had come to the conclusion that the preventive and curative action of crude, unpolished rice must be ascribed to an unknown chemical substance or substances present in the outer layers (silverskin) of the rice grain, he tried to isolate this material. He began his experiments with *dedek*, the offal from the steam-powered rice mills, which contains a mixture of silverskin and germ. He worked also with extracts of several kinds of bean which, in his experiments with fowls, had been shown to contain the protective substance. He was unable, however, to achieve very thorough fractionation (Grijns, 1935).

Hulshoff Pol (1907) extracted *katjang idjoe* beans with water, precipitated the solution with basic lead acetate, removed the lead from the precipitate with sulphuric acid and evaporated the filtrate. By this procedure he obtained a more or less crystalline substance which he called "X-acid", but the preparation was far from pure and 1 g. was required to cure *polyneuritis gallinarum*.

The most important work on isolation was that of Funk (1911; 1913; 1914) working at the Lister Institute in London. He succeeded in isolating a crystalline substance which was active in curing polyneuritis in pigeons. As is shown later (p. 8), the cure of these pigeons is not an absolute criterion of the antineuritic value of a preparation. As already mentioned, Funk coined for this substance the name of vitamine, because his substance was chemically an amine and considered to be essential for life (*cf.* under "Nomenclature", p. 10).

Hofmeister (1920) in Strasbourg extracted rice polishings with acidulated 80 per cent. alcohol. The solution, after purification and removal of the fats, was treated with potassium bismuth iodide, the precipitate was freed from choline and treated with Ag_2CO_3, and the silver was eliminated by HCl or H_2S. He obtained deliquescent, slightly red-coloured crystals which were active in curing polyneuritis in pigeons in doses of from 5 to 10 mg.

The Japanese investigators Suzuki, Shimamura and Odake (1912) treated an extract of rice bran with phosphotungstic acid. The precipitate was decomposed with barium hydroxide and acidified with sulphuric acid, and the filtrate was evaporated under reduced pressure. By further fractionation with tannic acid and picric acid, a more or less crystalline mass was obtained of the picrate of "oryzanine", as the Japanese workers called their antineuritic substance. It was active in a dose of 10 mg. daily. Drummond and Funk (1914) could not confirm the Japanese results.

R. R. Williams, working in the Bureau of Chemistry in the Philippine Islands, made several efforts to isolate the antineuritic substance (Chamberlain, Vedder and Williams, 1912). In earlier work Chamberlain and Vedder (1911), working in the same Bureau of Chemistry in Manila, had described their chemical investigation of a neuritis-preventing extract of rice polishings, and proved that the neuritis-preventing principle was soluble in cold water and in cold 95 per cent. alcohol, was dialysable and was adsorbed by bone

black or animal charcoal. By experiments with fowls the phosphate, the inorganic salts and the sucrose contained in this extract were shown to be inactive, but the workers then concluded that: "A preliminary examination showed that the extract was of so complex a nature as to render a direct search for the neuritis-preventing substance impracticable". After adsorption on animal charcoal the active principle could not be removed from the charcoal by elution with water, absolute alcohol or ether.

Isolation of a Pure Crystalline Antineuritic Vitamin

When I went to Java in the beginning of 1917 I had the good luck to work in the newly built, large laboratory of the Dutch East Indian Medical Service. There I met Grijns who, however, soon had to return to Holland because of ill health. At that time we knew already from the first attempts to isolate the protective substance that it was not a protein, that it was dialysable and therefore had a relatively small molecule, and that it was probably an organic base. We knew further that the *dedek* or rice bran, the mixture of pericarp and germ from the steam-powered rice mills, was a good source of the unknown substance.

I found that extraction of *dedek* with water acidulated with 3 per cent. hydrochloric acid gave a solution that cured polyneuritic fowls; 30 per cent. alcohol was usually added for protection against bacteria and moulds. Water and alcohol were evaporated below 50° C. and by experiments with fowls it was proved that almost all of the protective substance was present in the extract.

It had been found, however, by several investigators, that if an injection with a certain extract is followed by a temporary cure of polyneuritis in fowls, it affords no evidence that the extract contains the vitamin. Thus Eijkman and van Hoogenhuyze (1916) found that injection with a solution of potassium and sodium chloride brought about a temporary cure, at least with pigeons, and Theiler, Green and Viljoen (1915) found that injection even of sterilised water had a similar effect. In experiments expressly undertaken for the purpose, I was able fully to confirm these observations.

As long as the vitamin was not isolated we were dependent on the biological method and had to use prophylactic and not curative tests. It seemed that the biological method might be improved in two ways, thereby making it less dependent on circumstances and more accurate.

The first way was to seek as criterion some milder sign which might be evident before the outbreak of manifest polyneuritis. It might be possible that some such sign could be found, appearing after the fowl had been fed on polished rice for some time, but disappearing promptly and specifically after administration of the protective substance. In order to find such signs, it would be necessary to study closely changes in metabolism and in the composition of the body fluids. An additional result of such an inquiry might be perhaps to give a better knowledge of the nature of beriberi and might eventually lead to the discovery of methods of detecting human beriberi before it manifested itself clinically, so that measures might be taken to arrest the disease in its early stages. As far as I had been able to discover in the literature, this subject had been studied only sporadically and almost nothing had been reported.

There was, however, one statement in the literature that encouraged me to make further experiments, the discovery by Ramoino (1916) that the respiratory quotient of fowls fed on polished rice was considerably below normal. Dr. Mangkoewinoto and I were not, however, able entirely to confirm this result. The respiratory quotient on a diet of polished rice was sometimes low but the fall was not constant and was, therefore, not suitable as a criterion for diagnosing early polyneuritis (Jansen and Mangkoewinoto, 1920).

A second way to improve the biological method would be to discover some animal much more susceptible than fowls to lack of the antineuritic vitamin, and liable in consequence to sicken more quickly and more consistently. Rice-birds (*Padda oryzivora*), used by Ottow (1915), did not fulfil these conditions; sometimes there was an even longer period than with pigeons before signs of illness appeared and, in addition, individual differences were much greater. Many other small Javanese birds failed to show any greater susceptibility. In the end, however, in bondols or *nonnetjes* (*Munia maja*) I found a species of bird which is much more susceptible than fowls. The latter, when fed on polished rice showed no manifest sign of polyneuritis after several weeks, but not one of the scores of bondols that were kept on the same food remained healthy for longer than 12 days; they usually developed polyneuritis within 10 days. Moreover they are very small, weighing only about 12 g., so that 10 could be kept in one cage. The signs of polyneuritis were just as characteristic as with fowls or pigeons. If a bondol with incipient polyneuritis was allowed to fly, it generally did so in circles. On feeding the birds on crude rice a speedy and complete recovery generally occurred. Another advantage of these small birds was that they required less of any material to be tested. From 1920 all tests for estimating the content of protective substance present in the many fractions obtained from rice polishings were made by feeding bondols on a

basal diet of polished rice, supplemented with the fraction to be tested for its vitamin content [1] (Jansen, 1920).

The different kinds of polished rice obtainable in the market at Batavia were not all quite free from the protective substance so, in preparing our basal diet, we first washed the rice for 24 hours in running water to remove the last traces of pericarp. We found that the vitamin content of the rice was thus reduced to a constant low amount. After drying, 2 per cent. of a mixture of inorganic salts (Osborne and Mendel, 1913) and 0·25 per cent. of cod liver oil were added to the dry rice.

My chief, Dr. W. T. de Vogel, Director of the Netherlands Indies Health Service, and his successor, Dr. van Lonkhuyzen, both encouraged research, and the latter put the necessary funds at my disposal when the work grew more extensive and larger equipment became necessary. About that time Dr. Donath joined me and we were able to train as technicians several Javanese and Chinese young men, who very ably and industriously helped us. In the end we were able to extract the *dedek* in vessels holding a cubic metre of extracting fluid and to obtain every week the extract from 100 kg. of *dedek*. This extract contained all the active substance from the *dedek*, but also much, about 20 kg., of impurities. Seidell (1916) had already demonstrated that the vitamin could be selectively adsorbed by Lloyd's reagent, a variety of fuller's earth. We tried the different kinds of fuller's earth that could be obtained in Java and in the end succeeded in adsorbing the vitamin on a fuller's earth called "acid clay", obtained from Cheribon in Java.

The extract from 100 kg. of *dedek* was diluted to 300 litres, brought to p_H 4·5 and stirred by an electric stirrer with 3 kg. of acid clay. Experiments with bondols showed that most of the vitamin was adsorbed. To extract the vitamin from the acid clay, it was treated with baryta at p_H 12 to 13. As the vitamin had proved to be unstable in alkaline solution, elution had to be performed at a low temperature, by adding ice to the baryta solution and working as speedily as possible. Elution was therefore made with small portions directly passed into cold dilute sulphuric acid. In that way an acid fluid was obtained containing about 100 g. dry material and retaining 80 per cent. of the activity of the original 100 kg. of *dedek*, nearly a 1000-fold concentration. For the further purification we were much helped by the work of scientists who had tried to purify extracts and especially by Barger's monograph on *The simpler natural Bases*, which had recently been published (Barger, 1914). In Chapter 8 of this book several methods were outlined for the isolation of these bases. As there were indications that the vitamin we were seeking was perhaps such a base we tried to fractionate the filtrate from the acid clay, using several of these methods one after another, and each time determining, by tests with bondols, in which precipitate or filtrate the greater part of the vitamin was present. We thus obtained substances in which the activity per mg. became higher and higher. We used silver sulphate and baryta, phosphotungstic acid, platinic chloride and picrolonic acid. Other methods suggested by Barger were tried also, but gave no improvement. When the fraction was almost chemically pure, we obtained nice crystals by treatment with gold chloride.

The first precipitate obtained with platinic chloride, after decomposition, gave a substance with such great activity that all of 10 bondols remained healthy for 23 days when the washed white rice diet was enriched with 8 μg. per 2 g., which was the quantity of rice eaten daily by a healthy bondol. When the vitamin was obtained pure, it was found that a bondol needed 2 μg. of it daily. The solids of the platinic chloride fraction, therefore, contained about 25 per cent. of the vitamin. The preparation could be further purified by crystallisation from alcohol and acetone, and at last we obtained about 100 mg. of a chemically pure substance with m.p. 253° C. Recrystallisation did not give a higher melting-point or greater activity in the bondol test. The results of experiments with pigeons confirmed the antineuritic activity of the crystals we had isolated (Jansen and Donath, 1926).

As soon as we were convinced that the isolated crystals were the protective substance or vitamin itself, we sent some scores of milligrams to Utrecht, to Professor Eijkman, the originator of the idea that beriberi is caused by the lack of a substance which is present in the pericarp of rice. Eijkman (1927) confirmed in preventive and curative experiments on pigeons and cocks that the crystals were antineuritically active, and that addition of from 2 to 4 mg. per kg. to white polished rice was sufficient to restore its antineuritic activity. After congratulating us, Eijkman wrote that he was astonished that so small a quantity of a pure chemical substance was active. He himself and many others had come to the opinion that protection against polyneuritis and beriberi was not due to one substance but to a mixture of two or more because, in all former attempts to purify the active extracts, the workers came at last to a point where further purification seemed to destroy the activity. Eijkman was now, however, convinced that his

[1] When I met J. C. Drummond after my return to Europe he told me that after my first publication of the suitability of *Munia maja* for this type of experiment, he tried to obtain some in London, but the price was prohibitive, about £1 a pair. In Batavia we paid a halfpenny for one.

former opinion was wrong and that all the antineuritic activity was present in one pure chemical substance.

In the Medical Laboratory at Batavia a micro-apparatus for making an elementary analysis was available and with it we obtained for the purified crystalline hydrochloride the empirical formula $C_6H_{10}ON_2HCl$; the formula was confirmed by analysis of the crystalline gold double salt, but at that time the presence of sulphur in the molecule was missed.

The preparation of the pure antineuritic vitamin had been a very expensive process, and the product was much too costly for use in prevention of human beriberi. The Medical Laboratory in Batavia, therefore, issued three preparations for combating human beriberi. The first consisted of acid clay that had been activated by treatment with the crude extract from rice polishings. This powder was pressed into tablets of 0·25 g., 4 of which contained the vitamin from 30 g. of *dedek*. The results of animal experiments showed that the activated acid clay yielded its vitamin to the alkaline contents of the intestines. In human beings it proved to be equally active.

For use in infantile beriberi we prepared an extract from the activated acid clay, one ml. of which contained the vitamin corresponding to 300 g. of *dedek*; 0·1 ml. was, therefore, an adequate daily dose for a man. This small quantity has no influence on the taste of the food.

For the treatment of cardiac beriberi we prepared ampoules containing 1 mg. of the almost pure vitamin in solution. When a cardiac crisis of beriberi is heralded by precordial pain, palpitation and cyanosis, quick action is necessary, since the condition is responsible for most of the fatalities that occur in beriberi. After injection of the contents of an ampoule, patients who appeared to be at the point of death from cardiac failure were promptly and permanently relieved.

One of the cardinal signs of human beriberi, not seen in birds, is the pronounced tendency for accumulation of watery exudates or transudates, manifested in oedema. It is the principal sign by which beriberi is recognised by peoples where it is indigenous. By giving the tablets of the acid clay adsorbate prepared from rice polishings to patients with oedema from beriberi, it was found that this sign, too, soon disappeared.

Five years after our isolation of the pure vitamin from rice polishings Windaus and his collaborators in Göttingen isolated the pure, crystalline antineuritic substance from yeast (Windaus *et al.*, 1931). They demonstrated the presence of sulphur in the molecule and gave the tentative formula $C_{12}H_{17}ON_3S$. It took about four more years before three separate groups of investigators almost simultaneously achieved synthesis and the structural formula was established. The three groups of investigators were Williams and Cline (1936) at Rahway, Andersag and Westphal (1937) at Elberfeld, and Todd and Bergel (1937) in Edinburgh. The synthetic antineuritic vitamin proved to be identical with the crystalline material obtained from rice polishings or from yeast. The structural formula was found to be that of a pyrimidine ring linked by a methyl group to a thiazole ring. Synthetic hydrochlorides or nitrates of the antineuritic vitamin are now being produced cheaply in quantity and used to enrich polished rice. The milling industry, which had been responsible for the frequent occurrence of beriberi, is thus able now to combat the disease by restoring the substance originally removed from the crude rice in the milling process.

Nomenclature

We have seen that Funk introduced the name "vitamine" because he thought that the water-soluble substance isolated by him and supposed to be the antineuritic factor was an amine, and was essential for life.

Holst (1907) in Christiania (now Oslo) studied the ship beriberi of Norwegian sailors and found that it had signs like those of the beriberi seen in rice-eating countries, and other signs like those of the long known scurvy. Holst therefore travelled to Batavia to discuss the problem with Grijns, taking as experimental animals not birds but guineapigs. With his collaborator, Frölich, he had come to the conclusion from their experiments that guineapigs given a diet of polished rice developed a condition that was identical in all essentials with human scurvy (Holst and Frölich, 1907). The condition was not prevented or cured with rice polishings but with raw cabbage or other vegetables or fruits. So Holst predicated the existence of another essential substance, later the anti-scorbutic vitamin.

In 1909 Stepp had shown that a lipoid substance was essential for the existence of mice (Stepp, 1909; 1912). In 1913 McCollum and Davis showed that a fat-soluble accessory substance was essential for the growth of rats, and in 1915 that a water-soluble substance also was necessary (McCollum and Davis, 1913; 1915). It was proposed to call the two factors fat-soluble A and water-soluble B (McCollum and Kennedy, 1916).

Thus by 1920 three different vitamins had been recognised of which two were not amines at all but, since the name "vitamine" had come into general use, Drummond (1920) suggested that the final e should be dropped. His suggestion found general acceptance, so that now this new class of physiologically important substances is everywhere known as vitamins.

It was a lucky chance that the Far-Eastern investigators of polyneuritis worked with birds that got polyneuritis in a few weeks on a diet of polished rice. If they had used rats or other mammals, it would have taken much longer to find the cause of polyneuritis since rice has many other deficiencies. In the course of their experiments Eijkman and Grijns had often seen what they called " croupous inflammation of the nasal and pharyngeal cavities and of the eyes", which later proved to be xerophthalmia from lack of vitamin A (Grijns, 1935). American and English investigators worked chiefly with rats as experimental animals, and on a rice diet the rats died from other deficiencies before showing signs of neuritis. It thus became obvious that in nature there were other water-soluble vitamins besides the antineuritic vitamin. Distinction was, therefore, made between the antineuritic, heat-labile vitamin B_1 and a heat-stable vitamin B_2. Later, when many other water-soluble vitamins had been found, the name vitamin B complex was introduced.

Even before vitamin B_1 was isolated, many names had already been given to it, oryzanine by Suzuki and his colleagues (Suzuki *et al.*, 1912), toruline by Edie and his colleagues (Edie *et al.*, 1912) and antineuritine by Hofmeister (1920). In 1937, when many other B vitamins had already been isolated, I proposed the name " aneurine ", which was adopted in several European countries. In the United States, however, there was opposition because the name aneurine was an abbreviation of antineuritic vitamin and, therefore, perhaps suggestive of a therapeutic substance, such names being forbidden by the Council on Pharmacy and Chemistry. The workers in Merck's team, at Rahway, who had synthesised vitamin B_1, therefore suggested the more purely chemical name " thiamine ", to indicate that the vitamin is a sulphur-containing substance.

At the International Physiological Congress in 1938 at Zürich, an afternoon was devoted to discussing the name to be adopted internationally for the antineuritic vitamin, but without result. After the Second World War the Commission on the Nomenclature of Biological Chemistry of the International Union for Pure and Applied Chemistry, at its session in New York in 1951, unanimously adopted the name " thiamine ".

Historical Survey of Events

1873 Van Leent was apparently the first to conclude that the type of diet had something to do with the origin of beriberi. By reducing the ration of rice in the diet of the sailors in the Dutch navy, he was able to eradicate beriberi almost entirely from the warships (van Leent, 1880).

1883 Takaki independently produced the same results in the Japanese navy (Takaki, 1887; 1906).

1890 Eijkman proved that *polyneuritis gallinarum* depended on the kind of rice the birds were given to eat. Consumption of white polished rice caused polyneuritis ; on crude rice the fowls remained healthy (Eijkman, 1890).

1896 Vorderman, after a survey of Javanese prisons at Eijkman's request, stated that human beriberi depended on the kind of rice eaten, in the same way as *polyneuritis gallinarnm.* Eijkman and Vorderman therefore concluded that a diet of cooked, steam-milled, polished rice was the cause of human beriberi (Vorderman, 1897).

1900 Grijns, continuing the work of Eijkman, decided that *polyneuritis gallinarum* was caused by a partial hunger, that is to say, a deficiency of a protective substance. He began experiments to isolate such a substance from beans or rice polishings, and proved that the hypothetical antineuritic substance was destroyed by autoclaving (Grijns, 1901 ; 1935).

1911 Funk, believing he had isolated the pure antineuritic substance, coined the name " vitamine " for it. About a quarter of a century later it was shown by Elvehjem and his colleagues that Funk's substance, nicotinic acid amide, was not the antineuritic but the antipellagra vitamin (Elvehjem *et al.*, 1937). Funk stated his opinion that besides beriberi there were other nutritional deficiency diseases, such as scurvy, pellagra and rickets, which might perhaps be due to a deficiency of the antineuritic substance or of other vitamines (Funk, 1912).

1926 Isolation of the chemically pure, antineuritic substance by Jansen and Donath (1926).

1929 R. A. Peters and his collaborators demonstrated that the head retraction and opisthotonus of pigeons fed on polished rice were of central and not of peripheral nerve origin, and that vitamin B_1 played a special part in the metabolism of carbohydrates and in tissue oxidations (Kinnersley and Peters, 1929 ; Gavrilescu and Peters, 1931 ; Peters, 1936).

1931 Adoption of the activity of 10 mg. of activated acid clay as the international unit for vitamin B_1 by the Health Organisation of the League of Nations (League of Nations, 1931).

1936 Chemical method for estimating vitamin B_1 by the thiochrome reaction described by Jansen (1936).

1936–37 Determination of the structure, and synthesis, of vitamin B_1, almost simultaneously by Williams and Cline (1936), Todd and Bergel (1937) and Andersag and Westphal (1937).

1937 Identification by Lohmann and Schuster (1937) of the pyrophosphoric ester of vitamin B_1 with cocarboxylase, the coenzyme of carboxylase, which is the enzyme involved in the decarboxylation of pyruvic acid in the metabolism of carbohydrates.

1938–40 Adoption of the activity of 3 μg. of pure synthetic vitamin B_1 chloride hydrochloride as the international unit for vitamin B_1 by the Health Organisation of the League of Nations (League of Nations, 1938 ; 1940).

1943 Allowance of thiamine recommended as about 0·5 mg. per 1000 Cal. of the diet by the Food and Nutrition Board of the National Research Council in Washington (National Research Council, U.S.A., 1943).

1946 Enrichment of milled rice (Williams-Waterman Fund, 1950).

1949 Investigation in Bataan (Philippine Islands) of the influence of enriched rice on beriberi (Food and Agriculture Organization, 1954).

1951 Adoption of the name thiamine by the Commission on the Nomenclature of Biological Chemistry of the International Union for Pure and Applied Chemistry.

Conclusion

From the historical summary just given we see how long it took before the new idea of essential trace nutrients in nutrition was accepted and before its consequences were given practical application.

During the period of the researches on thiamine many other vitamins were discovered and the whole picture of the science of nutrition became changed. At the moment we know that for correct nutrition at least fifty nutrients are required in balanced proportions, and that we are not yet at the end of the list. Since the Second World War tables have been drawn up of recommended dietary allowances for some of these nutrients.

Education in applying this newer knowledge of nutrition has conferred great benefits on the health of humanity. The most spectacular effects have been seen in the United Kingdom where, during the second world war, the government sought and accepted the advice of nutritional experts on how to maintain satisfactory nutrition for the whole population within the limitations of the necessary system of food supply and distribution, with the consequence that during the war the state of health of the civil population improved considerably in spite of war-time difficulties. We cannot, however, say even now that the nutrition of the Western civilised countries is perfect. Very few persons in those countries go through life without dental disease and we become more and more convinced that imperfect dentition depends on our modern food (see, *e.g.*, Sognnaes, 1949). It is known that aborigines who change their primitive type of diet to include modern, refined foodstuffs pay for the change with deterioration of their teeth. Probably traces of certain nutrients (mineral salts and perhaps organic nutrients) play a part in the caries-producing nature of the diet (Wynn *et al.*, 1953).

The life expectation of the Western nations has increased considerably in the last half century, a change probably due largely to improvement in the diet. Nevertheless, a man who in these days has reached the age of seventy years has not so very many more years to live than his septuagenarian grandfather of half a century ago. There are signs that the quantity and quality of the diet are important in old age, but gerontology is a chapter in the science of nutrition which is only now beginning to be written. Many nutrition workers hold the opinion that the so-called degenerative diseases, particularly arteriosclerosis and hypertensive cardiovascular disease, are connected with faulty nutrition.

So we see that, although the idea of the need for trace nutrients in our food has taken several decades to gain recognition from scientists and the medical profession, it has already led to a great improvement in the health of the nations, and there is still room for much research before all the fruits of the idea can be harvested.

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CHEMICAL

APPARATUS

1

MIWA, T. and ZEITLIN, H. **Inexpensive glass chamber for one- and two-dimensional ascending paper chromatography.** *Anal. Chem.*, 1955, **27,** 1357. [Chem. Dept., Univ. Hawaii, Honolulu.]

2

GRÜNWALD, H. Skleněný rozprašovač. [**An all-glass sprayer.**] *Chem. listy*, 1955, **49,** 1235. [Biol. Inst. ČAV, Prague.]

A glass sprayer of simple construction, which is easy to clean and permits regulation of the size of the drops of spray, is described.

A. Jančařik (Czechoslovakia).

3

PŘISTOUPIL, I. Jednoduchý rozprašovač pro chromatografii. [**A simple sprayer for chromatography.**] *Chem. listy*, 1955, **49,** 136. [Inst. Haematol., Prague.]

4

SOLMS, J. Kontinuierliche Papierchromatographie. [**Continuous paper chromatography.**] *Helv. chim. Acta*, 1955, **38,** 1127–1133. [Agrik. Chem. Inst., Techn. Hochsch., Zürich.]

An apparatus is described in which the developing solvent flows down the surface of a paper cylinder rotating about a vertical axis and the mixture to be analysed is applied to the surface at a fixed position. The eluates are collected in a series of stationary receivers. The procedure has been applied to mixtures of lithium and potassium chlorides, xylose and galactose, and methylene blue and fuchsin.—H. G. Bray.

5

WILLIAMS, F. G. (Jr.), PICKELS, E. G. and DURRUM, E. L. **Improved hanging-strip paper-electrophoresis technique.** *Science*, 1955, **121,** 829–830. [Specialized Instruments Corp., Belmont, Calif.]

An apparatus and a technique for paper electrophoresis are described which prevent distortion of the pattern on drying and give a high degree of reproducibility.—H. G. Bray.

6

MARHA, K. and JENŠOVSKÝ, L. Automatický registrační fotometr. [**Automatic recording photometer.**] *Chem. listy*, 1955, **49,** 926–929. [Inst. Work Hyg., Prague.]

ANALYTICAL METHODS

General

7

LINDNER, K. Anwendung von Mischfarben bei Titration farbiger Lösungen. [**Use of neutral colours in the titration of coloured solutions.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102,** 37–39. [Staat. Inst. Ernährungswiss., Budapest.]

To avoid difficulties in the titration of coloured solutions, the use of non-interfering dyes of the complementary colour is suggested. As an example the estimation by titration with 2 : 6-dichlorophenolindophenol of ascorbic acid in tomatoes, rose hips, beetroot and pink potatoes is discussed; the dyes used are solutions of Patentblau A (Schultz No. 827) and Lichtgrün R (Schultz No. 765), 0·1 or 0·01 g. dye per 100 ml. water. Recovery of added ascorbic acid was accurate within 3 per cent.

W. M. Deans.

8

NARAYANAN, E. K. and MENON, P. S. **A method for partition chromatography using paper of uniform water saturation.** *Indian J. Med. Res.*, 1955, **43,** 359–363. [Central Res. Inst., Kasauli.]

Paper strips kept horizontally over parallel strips of wet fabric in a sealed measuring cylinder attained uniform water saturation. Partition coefficients calculated from this method support the theory of Consden *et al.* (*Biochem. J.*, 1944, **38,** 224) that separation of substances on paper is due to partition rather than adsorption. The method is recommended for the estimation of standard R_F values.—A. Hepburn.

9

CARLES, J. Nouvelle technique de chromatographie circulaire. [**New circular chromatography technique.**] *Bull. Soc. Chim. biol.*, 1955, **37,** 521–524. [Lab. Veg. Physiol., Inst. Catholique, Toulouse.]

10

BELL, J. M. **A comparison of peroxide- and oxygen-bomb calorimetry of feedstuffs.** *Canad. J. Agric. Sci.*, 1955, **35,** 366–370. [Dept. Animal Husb., Univ. Saskatchewan, Saskatoon.]

The corrections which are necessary for data obtained by the 2 methods of bomb calorimetry are considered. Values are given for 16 samples

analysed with both types of equipment; they included maize starch, cereal grains, mixed feeds and faeces from both ruminant and non-ruminant animals. Results for the peroxide- were consistently higher than for the oxygen-bomb calorimeter. Conditions other than proportion of ash to organic matter may influence the findings but, from these results and taking the oxygen method as standard, covariance analysis of percentage error by the second method with percentage ash gave a correlation coefficient which was significant. A regression equation was calculated which gave a good agreement between values after adjustment of the peroxide-bomb data. Further investigation with feeds high in ash content may be necessary.

D. Harvey.

See also Absts. 4, 5.

Carbohydrate Constituents

11

JONES, J. K. N. **Chemistry of the carbohydrates.** *Annu. Rev. Biochem.*, 1955, **24,** 113–134. [Dept. Chem., Queen's Univ., Kingston, Ont.]

12

MÜLLER, K. and TÄUFEL, K. Die Reversion der Saccharide und ihre Bedeutung für die Analytik der Kohlenhydrate. 2. Konstitutionelle und analytische Betrachtungen. [**The reversion of sugars and its importance in analysis of carbohydrates. 2. Constitutional and analytical considerations.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **100,** 437–441. [Inst. Ernährungsforsch., Potsdam-Rehbrücke.]

For part 1 see Abst. 4534, Vol. 25.

A number of disaccharides, *e.g.*, trehalose, maltose, cellobiose, gentiobiose, are formed when a concentrated solution of glucose is heated with HCl. To avoid reversion during hydrolysis in analytical procedures the concentration of the saccharide in the hydrolysis mixture should not exceed 1 per cent.—H. G. Bray.

13

FORIST, A. A. and SPECK, J. C. (Jr.) **Ceriometric determination of sugars.** *Anal. Chem.*, 1955, **27,** 1166. [Kedzie Chem. Lab., Michigan State Coll., E. Lansing.]

Two procedures are described for the detection of small changes in sugar concentration. The sugars are oxidised by ceric perchlorate and the excess reagent is removed by addition of oxalate or arsenite; the excess of the latter is titrated with ceric perchlorate, with nitro-ferroin as indicator.

H. G. Bray.

14

DISCHE, S. **Colour production and stability in the Folin and Wu method of blood glucose estimation.** *J. Clin. Pathol.*, 1955, **8,** 253–261. [R.A.F. Inst. Pathol. Trop. Med., Halton, Aylesbury, Bucks.]

Conditions, *e.g.*, concentration of phosphomolybdate reagent, temperature, affecting density of colour are discussed. A simplified modification of the original procedure in which fading is obviated is described.—H. G. Bray.

15

RAYMOND, P. Détermination du saccharose et du lactose dans le chocolat. [**Estimation of sucrose and lactose in chocolate.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1955, **46,** 246–250. [Lab. N.V.P. de Gruyter en Zoon, Bois-le-Duc, Holland.] German and English summaries.

The chocolate is clarified with potassium ferrocyanide and zinc hydroxide. The filtrate is treated with an alkaline copper reagent; cuprous oxide is precipitated, separated and dissolved in nitric acid and Cu is estimated by titration with disodium ethylenediaminetetra-acetate, using murexide as indicator. The optical rotation of the filtrate is measured before and after acid hydrolysis. From these observations the sucrose and lactose contents can be calculated.—H. G. Bray.

16

GROSS, D. **Paper electrophoresis of polyhydric alcohols.** *Nature*, 1955, **176,** 362–363. [Res. Lab., Tate and Lyle, Ltd., Ravensbourne, Westerham Rd., Keston, Kent.]

Paper electrophoresis at high voltage enabled several mixtures of polyhydric alcohols and sugars to be separated. Examples given are the separation of dulcitol, mannitol, sorbitol and erythritol, and separation of the latter 3 from mannose, fructose, glucose and sorbose.—A. Hepburn.

17

CERBULIS, J. **Paper chromatography of sugar alcohols and their glycosides.** *Anal. Chem.*, 1955, **27,** 1400–1401. [Stephen F. Whitman and Son, Inc., Philadelphia 5, Pa.]

The solvent mixture used is a mixture of *n*-propanol, ethyl acetate and water (7 : 1 : 2) and the detecting reagent *p*-anisidine, which on heating gives white spots against a light brown background. R_F values are given for a number of polyols.

H. G. Bray.

18

KENNEDY-RIPON, A. J. and MAPES, R. E. A. **The examination of commercial sorbitols, with special reference to their suitability for diabetic diets.** *Analyst*, 1955, **80,** 568. [Frank Cooper, Ltd., Botley Rd., Oxford.]

Sorbitol produced by the reduction of starch hydrolysates contains starch and glucose. A copper reduction method is described in which precipitated cuprous oxide is isolated and estimated

by titration with permanganate. The tables of Sichert and Bleyer (*Ztschr. anal. Chem.*, 1936, **107,** 328) are used for the calculation of glucose, maltose and dextrin content.—H. G. Bray.

19

THALER, H. Das Filtrieren der Rohfaser. [**Filtration of crude fibre.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1955, **46,** 251–254. [Deutsch. Forschungsanst. Lebensmittelchem., Munich.] French and English summaries.

The fibre is filtered through a glass crucible containing a pad of filter paper pulp. Fat is removed by washing with organic solvents.—H. G. Bray.

Nitrogenous Constituents

20

DIXON, J. P. **The determination of microgram quantities of organic nitrogen.** *Anal. chim. Acta*, 1955, **13,** 12–15. ["Shell" Research, Ltd., Thornton Res. Centre, Chester.] French and German summaries.

A modified Kjeldahl procedure is described. The ammonia removed by steam distillation is estimated by reaction with hypobromite, the excess of which is estimated iodimetrically. Nitro-, nitroso- and azoxy-compounds and phenylhydrazines are treated with hydriodic acid and red phosphorus before digestion.—H. G. Bray.

21

BEAUCHENE, R. E., BERNEKING, A. D., SCHRENK, W. G., MITCHELL, H. L. and SILKER, R. E. **The quantitative estimation of amino nitrogen by determination of bound copper with the flame photometer.** *J. Biol. Chem.*, 1955, **214,** 731–739. [Kansas Agric. Exp. Stat., Manhattan.]

A washed copper phosphate suspension was added to an amino-acid solution or protein hydrolysate in a centrifuge tube, the excess reagent was removed by centrifuging and the supernatant fluid was analysed for amino-N by flame photometer with a standard copper curve. A number of plant materials and 16 amino-acids were studied. The method compared well with a spectrophotometric method modified from that of Woiwod (Abst. 4350, Vol. 19), and was more rapid.—A. Hepburn.

22

KAINZ, G. and SCHÖLLER, F. Über den Anwendungsbereich der Aminostickstoffbestimmung mittels salpetriger Säure. [**The range of applicability of the estimation of amino-nitrogen with nitrous acid.**] *Hoppe-Seyler's Ztschr.*, 1955, **301,** 259–268. [2. Chem. Lab., Univ. Vienna.]

An investigation was made of the behaviour of compounds which give high or low results in the Van Slyke amino-N estimation. Deamination by low and high concentrations of nitrite was studied and the causes of the discrepancies are discussed.—H. G. Bray.

23

OGSTON, A. G. **Chemistry of proteins, peptides, and amino acids.** *Annu. Rev. Biochem.*, 1955, **24,** 181–206. [Dept. Biochem., Univ. Oxford.]

24

KALOUS, V. and ŠTOKR, J. Sledování vysolování bílkovin pomocí polarografické bílkovinné reakce. [**Analytical control of the salting-out of proteins by the polarographic protein reaction.**] *Chem. listy*, 1955, **49,** 567–570. [Inst. Phys. Chem., Karel's Univ., Prague.]

25

GAEBLER, O. H., BEHER, W. T., SIGLER, J. W. and GALPIN, R. R. **Reproducibility and validity of sodium sulfate fractionation of proteins in plasma and knee joint fluid.** *Clin. Chem.*, 1955, **1,** 105–109. [Edsel B. Ford Inst. Med. Res., Detroit, Mich.]

26

MACKAY, M. E. **The fractionation of mammalian serum proteins with ether.** *Biochem. J.*, 1955, **60,** 475–481. [Med. Res. Counc. External Sci. Staff, Lister Inst., London.]

27

SAIFER, A. and ZYMARIS, M. C. **Effect of shaking on the accuracy of salt fractionation methods for serum albumin.** *Clin. Chem.*, 1955, **1,** 180–189. [Dept. Biochem., Div. Labs., Jewish Chron. Dis. Hosp., Brooklyn, N.Y.]

The effect of shaking procedures on the extent of albumin denaturation is discussed.—H. G. Bray.

28

PIANTANIDA, M., MENIGA, A. and MUIĆ, N. **A contribution to paper-strip chromatography of proteins.** *Arch. Biochem. Biophys.*, 1955, **57,** 334–339. [Div. Immunol. Chemotherap., Inst. Med. Res., Jugoslav Acad. Sci. Arts, Zagreb.]

Protamine, bovine serum albumin and human γ-globulin were separated by use of a citrate buffer gradient in 10 steps of ionic strength $3{\cdot}0 \times 10^{-3}$ to 3·0.—H. G. Bray.

29

FRIJTAG DRABBE, C. A. J. v. and REINHOLD, J. G. **Application of zone electrophoresis to analysis of serum proteins. Technique for horizontal strip method and evaluation of its precision and accuracy.** *Anal. Chem.*, 1955, **27,** 1090–1095. [William Pepper Lab. Clin. Med., Univ. Pennsylvania, Philadelphia.]

30

NEELY, R. A. and NEILL, D. W. **Accuracy and reproducibility of paper protein electrophoresis.** *Nature*, 1955, **176**, 33–34. [Dept. Biochem., Royal Victoria Hosp., Belfast.]

With the technique described for blood protein fractions the total protein concentration of the solution applied to the paper should be 4 g. per 100 ml. Naphthalene black is better than bromophenol blue as staining reagent. The degree of accuracy which can be achieved is ± 5 per cent.

H. G. Bray.

31

DREVON, B. and DONIKIAN, R. Précision obtenue dans l'electrophorèse sur papier des protèines seriques (Étude statistique). [**Precision obtained in paper electrophoresis of serum proteins (a statistical study).**] *Bull. Soc. Chim. biol.*, 1955, **37**, 605–612. [Lab. Pharm. Chim., Fac. Méd. Pharm., Lyons.]

32

ANDERSCH, M. A. and BARBUSCA, F. **A graphic method for the conversion of transmission curves to a corrected density curve for the calculation of proteins separated by paper electrophoresis.** *J. Lab. Clin. Med.*, 1955, **45**, 958–962. [Div. Clin. Pathol., Dept. Med., Sch. Med., Univ. Maryland, Baltimore.]

33

YEOMAN, W. B. **The estimation of protein in cerebrospinal fluid using the M.R.C. photometer.** *J. Clin. Pathol.*, 1955, **8**, 252. [Dept. Pathol., Frenchay Hosp., Bristol.]

The Medical Research Council grey wedge photometer was found to be suitable for the turbidimetric estimation of protein in cerebrospinal fluid and for other procedures in which comparison with standard protein tubes is normally necessary.

H. G. Bray.

34

ROHRLICH, M., ADLER, G. and KRAMM, O. Versuche zur chemischen Differenzierung der Eiweiss-stoffe des Weizens und Roggens. 1. Untersuchungen der Eiweiss-stoffe mit Natriumhypochlorit. [**Chemical differentiation of the proteins of wheat and rye. 1. Studies of the proteins with sodium hypochlorite.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102**, 85–97. [Versuchsanst., Getreideverwertung, Berlin.]

A manometric method is described for the measurement of the carbon dioxide and nitrogen evolved when proteins are treated with hypochlorite. The effect of the salt concentration of the medium and of the presence of different anions and cations on the reaction was studied. Results are given for the reactions of different proteins and protein fractions and for the effect of heat on the sensitivity of proteins to hypochlorite.—H. G. Bray.

35

SCHNEIDER, G. and SPARMANN, G. Über die Trennung von Pflanzenproteinen mit Hilfe der Hochspannungs-Papierelektrophorese. [**Separation of plant proteins by high-tension paper electrophoresis.**] *Naturwissenschaften*, 1955, **42**, 391. [Bot. Inst., Justus Liebig Hochsch., Giessen.]

With a borate buffer of *p*H 11·5 and a potential difference of 1500 volts, separation of protein fractions in plant materials can be achieved in 1·5 to 3 hr.—H. G. Bray.

36

GROSS, D. **Paper electrophoresis of amino-acids and oligopeptides at very high potential gradients.** *Nature*, 1955, **179**, 72–73. [Res. Lab., Tate and Lyle, Ltd., Ravensbourne, Westerham Rd., Keston, Kent.]

The potential gradient used is 130 to 200 volts per cm. Results obtained with this technique are illustrated. The chief advantage is the reduction of the time necessary for separation, *e.g.*, 30 min. for basic amino-acids and 8 to 15 min. for the preliminary separation of some amino-acids.

H. G. Bray.

37

HOLEYŠOVSKÝ, V. Š. F. O aminokyselinách a peptidech. 15. Preparativní isolace některých aminokyselin z hydrolysátu želatiny. [**Amino-acids and peptides. 15. Preparation of some amino-acids from gelatine hydrolysates.**] *Chem. listy*, 1955, **49**, 243–248. [Inst. Org. Chem. ČAV, Prague.]

Pure optically active amino-acids, L-proline, DL-hydroxyproline, L-valine, and a mixture of leucine and *iso*leucine, were prepared from gelatine hydrolysates by a modification of Fischer's method of distillation and chromatography on a cellulose column.—A. Jančařik (Czechoslovakia).

38

MUELLER, G. C., BOWMAN, G. and HERRANEN, A. **Desalting amino acid solutions by ion exchange.** *Anal. Chem.*, 1955, **27**, 1357–1358. [McArdle Mem. Lab., Med. Sch., Univ. Wisconsin, Madison.]

Amino-acids and cations are adsorbed together on the hydrogen form of Dowex 50 and most of the amino-acids are then eluted free from salts with 0·8 *N* HCl in 55 per cent. ethanol. By the procedure described 15 amino-acids were recovered quantitatively, and others by a modification of the method. The process was successfully applied to perchloric acid extracts of rat tissues.—H. G. Bray.

39

KRISHNAMURTHY, K. and SWAMINATHAN, M. **Quantitative determination of amino acids by circular paper chromatography.** *Anal. Chem.*, 1955, **27**, 1396–1399. [Central Food Technol. Res. Inst., Mysore.]

A procedure for the separation of 16 amino-acids by means of 5 different solvent mixtures is described.—H. G. Bray.

40

BARROLLIER, J. Ein Ninhydrinreagenz für quantitative Aminosäurebestimmungen auf Papierchromatogrammen. [**A ninhydrin reagent for quantitative estimation of amino-acids in paper chromatograms.**] *Naturwissenschaften*, 1955, **42**, 416. [Hauptlab. Schering A.G., West Berlin.]

The reagent consists of 75 mg. cadmium chloride, 6 ml. water, 0·3 ml. glacial acetic acid, 100 ml. acetone and 2 g. ninhydrin, combined in that order. It keeps well, but should be changed when a pink colour appears.

Paper chromatograms with up to 2×10^{-7} moles amino-acid per sq. cm. paper are soaked in the reagent and hung at room temperature for 24 hr. The dye can be extracted with methanol for colorimetry, or estimated on the paper (Barrollier, *Naturwissenschaften*, 1955, **42**, 126). The absorption maximum for all amino-acids except proline and hydroxyproline is 509 mμ.—D. Duncan.

41

CIFONELLI, J. A. and SMITH, F. **Detection of amino acids on paper chromatograms.** *Anal. Chem.*, 1955, **27**, 1501–1502. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

Some amino-acids which are not easily distinguished by the usual methods of one-dimensional chromatography, *e.g.*, glycine and serine, threonine and alanine, valine and methionine, may be identified by the procedure described. Dried chromatograms are treated with periodate and then with benzidine or starch-iodide reagents under different conditions. Mixtures of *tert.*-amyl alcohol, *n*-propanol and water are recommended as second solvents (after phenol) in two-dimensional chromatography, or in one-dimensional chromatography.

H. G. Bray.

42

BURMA, D. P. and CHAKRABORTTY, H. C. **Effect of the distance moved by the solvent on the R_F values in circular chromatography.** *Anal. chim. Acta*, 1955, **13**, 248–252. [Bose Res. Inst., Calcutta.] French and German summaries.

If the chromatography chamber is completely saturated the R_F values of amino-acids in phenol-water and butanol-acetic acid-water systems are independent of the distance travelled by the solvent.—H. G. Bray.

43

SUBRAMANIAN, N. and LAKSHMINARAYAN RAO, M. V. **A simple buffered solvent system for the two-dimensional paper chromatography of amino acids.** *J. Sci. Indust. Res. India*, 1955, **14**C, No. 2, 56–58. [Central Food Technol. Res. Inst., Mysore.]

44

KRAUT, H., KOFRÁNY, E., TELSCHOW, H. and WEBER, M. Aminosäurebestimmung in Nahrungsmitteln durch Chromatographie am Stärkesäulen. [**Estimation of amino-acids in foods by chromatography on starch columns.**] *Hoppe-Seyler's Ztschr.*, 1955, **301**, 165–184. [Abt. Ernährungsphysiol., Max-Planck-Inst. Arbeitsphysiol., Dortmund.]

The application of the Moore and Stein procedure to foods was investigated. The values obtained for the amino-acids in 6 materials had a mean deviation of $\pm$ 4·5 per cent. It was possible to account for 95 to 98 per cent. of the amino-N in casein and milk hydrolysates and for 90 to 95 per cent. in wheat flours and barley.—H. G. Bray.

45

IYER, G. Y. N. **Estimation of free amino acids in normal human plasma by paper-chromatography.** *Indian J. Med. Res.*, 1955, **43**, 189–193. [Med. Coll., Trivandrum.]

Of free amino-acids in human plasma, alanine, glutamic acid, glutamine, glycine, serine and tyrosine were separated on one paper chromatogram and *iso*leucine, leucine, phenylalanine and valine on another. The acids were estimated by colorimetric examination of the spot eluates.

A. Hepburn.

46

GORBACH, G., DEDIC, G. and PHILIPPI, E. H. Zur Bestimmung von freien Aminosäuren in biologischem Material. [**Estimation of free amino-acids in biological material.**] *Hoppe-Seyler's Ztschr.*, 1955, **301**, 185–190. [Inst. Biochem. Technol. Lebensmittelchem., Tech. Hochsch., Graz.]

The efficiency of precipitation of casein, blood fibrin, egg albumin and edestin from aqueous solutions containing free amino-acids by several precipitants was studied. Phosphomolybdic acid precipitated all the proteins almost quantitatively, while the amino-acids remained in solution. Phosphotungstic acid was almost as efficient in precipitating proteins and did not affect amino-acids. Calcium fluoride, sodium tungstate and trichloroacetic acid were less effective as protein

precipitants and still did not precipitate amino-acids.—H. G. Bray.

47

WISEBLATT, L. and MCCONNELL, W. B. **The estimation of β-hydroxy amino acids by a micro-diffusion method.** *Canad. J. Chem.*, 1955, **33,** 1452–1453. [Prairie Reg. Lab., Nat. Res. Counc. Canada, Saskatoon, Sask.]

The sample is treated in the outer chamber of a Conway microdiffusion unit with periodic acid, glycine and metaborate; the inner chamber contains a solution of boric acid. The ammonia liberated is estimated by titration of the contents of the inner chamber after 5 hr. In control experiments recoveries of serine ranged from 99·7 to 100·4 and of threonine from 99·5 to 100·3 per cent. Hydroxylysine, glucosamine and ethanolamine give ammonia under the conditions described.—H. G. Bray.

48

CECIL, R. **The estimation of cysteine and cystine by potentiometric titration with mercuric chloride.** *Biochim. biophys. Acta*, 1955, **18,** 154–155. [Dept. Biochem., Univ. Oxford.]

The procedure is simple and rapid. Amalgamated gold wire is used for the electrodes and titration can take place in the presence of oxygen and chloride.—H. G. Bray.

49

WENGER, P. E., MONNIER, D. and FARAGGI, S. Dosage de l'histidine. 1. Étude polarographique et dosage du dinitrofluorobenzène. [**Estimation of histidine. 1. Polarographic study and estimation of dinitrofluorobenzene.**] *Anal. chim. Acta*, 1955, **13,** 89–99. [Lab. Chim. Minérale, Univ. Geneva.] English and German summaries.

50

TROLL, W. and LINDSLEY, J. **A photometric method for the determination of proline.** *J. Biol. Chem.*, 1955, **215,** 655–660. [May Inst. Med. Res., Jewish Hosp. Assoc., Cincinnati, Ohio.]

In this modification of the method of Chinard (Abst. 1233, Vol. 23) applied to protein hydrolysates, urine and plasma, the amino-acids lysine, hydroxylysine and ornithine, which interfere with the reaction between proline and ninhydrin, were removed by shaking with Permutit.—A. Hepburn.

51

PERRY, H. M. (Jr.) and GOLDSTEIN, G. **Studies on primary amines. 3. Limiting and optumim conditions for quantitative determination by the ninhydrin method.** *J. Lab. Clin. Med.*, 1955, **45,** 963–972. [Dept. Int. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

For previous parts see Absts. 55, Vol. 24; 794, Vol. 25.

52

LEYKO, W. and GROSS, S. Związki adeninowe krwi ludzkiej. 1. Oznaczenia polarograficzne i spektrofotometryczne adeniny we krwi odbiałczonej. [**Adenine compounds of human blood. 1. Polarographic and spectrophotometric estimations of adenine in protein-free blood filtrates.**] *Acta biochim. polon.*, 1955, **2,** 155–168. [Inst. Biochem., Univ. Łódź.] English and Russian summaries.

See also Abst. 93.

Lipoid Constituents

53

HERB, S. F. **Application of ultraviolet spectrophotometry to the analysis of fats and derivatives.** *J. Amer. Oil Chem. Soc.*, 1955, **32,** 153–158. [E. Reg. Res. Lab., Philadelphia, Pa.]

A review in which the present status, applications and limitations of the more commonly used methods are discussed.—G. A. Garton.

54

STÄHLI, H. Über die Bestimmung der Jodzahl. [**Estimation of iodine number.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1955, **46,** 121–162. [Lab. ASTRA Fett- und Ölwerke, Steffisburg.] French and English summaries.

A critical examination of several methods. The most reliable results were obtained by the use of a modified Wijs solution.—H. G. Bray.

55

GODFRAIN, J. C. Une méthode sinacide de dosage de la matière grasse du lait utilisant le matériel Gerber. [**A method without acid for the estimation of fat in milk using the Gerber material.**] *Rev. Méd. vét., Toulouse*, 1955, **106,** 370–372.

Milk is shaken in a butyrometer with a mixture of detergents, amyl alcohol and Scarlet R and placed in a water-bath at 100° C. for 6 min. After centrifuging and heating for 5 min. at 70° C., the fat globules form a pink layer which is easily seen in the butyrometer.—A. Hepburn.

56

SALWIN, H., BLOCH, I. K. and MITCHELL, J. H. (Jr.) **Rapid determination of fat in meat products.** *J. Agric. Food Chem.*, 1955, **3,** 588–593. [Quartermaster Food and Container Inst. Armed Forces, Chicago, Ill.]

A modified Babcock procedure is described in which a mixture of perchloric and acetic acids is used for digestion of the sample and separation of a clear fat column. An estimation takes about 30 min. Results obtained agree with those obtained by the dry solvent technique recommended by the Association of Official Agricultural Chemists (" Official Methods of Analysis ", 7th ed., 1950, p. 359).—H. G. Bray.

57

HART, P. C. Onderzoekingen omtrent de zachtheid van bacon. 1. Methoden van onderzoek en plaats van bemonstering. [**Studies on the softness of bacon. 1. Methods of investigation and place of sampling.**] *Landbouwk. Tijdschr.*, 1955, **67**, 420–426. [Inst. Veeteeltk. Onderzoek T.N.O.] English summary.

Hardness, or softness, of fat is judged by prodding with the thumb. For chemical investigation fat is extracted from the fatty tissue with light petroleum or, more rapidly and with several samples being processed at one time, in an autoclave at 138° C. and steam pressure of 2·25 atmospheres. After the fat is dried, iodine number and thiocyanate number are estimated. Representative samples are to be got 45 to 65 cm. from the fore end of the side. Shoulder fat is less saturated than back fat in general.—I. Leitch.

58

BEL'KEVICH, V. I. Novyi metod kolichestvennogo opredeleniya zhira v tkanayakh nasekomykh. [**A new method for the estimation of fat in insect tissues.**] *Zool. Zh.*, 1954, **33**, 709–713. [Moscow Stat. Plant Protection.]

59

ŠKODA, J. and ŠLECHTA, L. Acidobutyrometrické stanovení tuku v tukotvorných kvasinkách. [**Acidobutyrometric estimation of fat in fat-producing yeasts.**] *Chem. listy*, 1955, **49**, 1097. [Fac. Food Tech., Chem.-Tech. Univ., Prague.]

60

TROËNG, S. Oljehaltsbestämning i svenskt oljeväxtfrö. Ny gravimetrisk seriemetod utarbetad vid Cereallaboratoriet, Sveriges Utsädesförening, Svalöv. [**Estimation of oil in Swedish oilseeds. New gravimetric routine method from the Cereal Laboratory, Swedish Seed Association, Svalöv.**] *Kungl. Lantbruksakad. Tidskr.*, 1955, **94**, 125–140. English summary.

The ground sample was shaken mechanically in a centrifuge tube containing benzene and steel balls; it was then centrifuged and part of the benzene solution was removed by pipette, evaporated and weighed. The method was calibrated with known amounts of oil. Reproducibility was good and the difference from a continuous extraction method did not exceed 0·28 per cent. oil.

A. Hepburn.

61

CRUZ AUÑON, F. Estudio analitico del insaponificable de los aceites de algodon y de soja y su aplicacion a la investigacion de los mismos, solos y en sus mezclas. [**Analytical study of the unsaponifiable matter from cottonseed and soya bean oils and its application to the investigation of these oils, alone and in mixtures.**] *Bol. Inst. Nac. Invest. Agron., Madrid*, 1955, **15**, 187–239. [Inst. Fom. Prod. Fibras Textiles, Serv. Algodon, Seville.]

A method is described for analysing soya and cottonseed oils by chromatography on a silica column. The unsaponifiable fractions were isolated. They were characteristic of the oils, and could be used to estimate the proportion of each oil in a mixture.—T. D. Bell.

62

PERILÄ, O. **Separation of saturated straight chain-fatty acids. Qualitative paper chromatography.** *Acta chem. scand.*, 1955, **9**, 864–865. [Inst. Technol., Helsinki.]

The application of techniques due to a number of authors is described. R_F values are given for fatty acids from formic to cerotic acid.

H. G. Bray.

63

VAN DE KAMER, J. H., GERRITSMA, K. W. and WANSINK, E. J. **Gas-liquid partition chromatography: the separation and micro-estimation of volatile fatty acids from formic acid to dodecanoic acid.** *Biochem. J.*, 1955, **61**, 174–176. [Central Inst. Nutrit. Res. T.N.O., Utrecht.]

The gas-liquid chromatographic method of James and Martin (Abst. 77, Vol. 22) was modified to effect separation of acids from C_1 to C_{12} in one process. This is achieved by gradually raising the column temperature from 100° to 150° C. in such a way that 137° is reached when heptanoic acid has been titrated and 150° is reached after octanoic acid has left the column.—G. A. Garton.

64

INOUYE, Y., NODA, M. and HIRAYAMA, O. **Paper chromatography of unsaturated fatty acid esters as their mercuric acetate addition compounds.** *J. Amer. Oil Chem. Soc.*, 1955, **32**, 132–135. [Biochem. Lab., Coll. Agric., Kyoto Univ., Japan.]

Mercuric acetate addition compounds of the methyl esters of unsaturated fatty acids were separated and identified by reversed-phase paper,

chromatography; diphenylcarbazone (phenylazoformic acid phenylhydrazide) was used to detect the compounds on chromatograms.

The qualitative application of the method to the analysis of the component unsaturated acids of natural fats showed the presence of hitherto undetected tetradecenoic acid in olive oil and hexadecenoic acid in linseed oil.—G. A. Garton.

65

VAN DER VIES, J. **Determination of free non-volatile fatty acids.** *Biochem. J.*, 1955, **60,** 671. [Dept. Pharmacol. Res., N.V. Organon, Oss, The Netherlands.]

Plasma, 2 ml., is run into 6 ml. of phosphoric acid solution (metaphosphoric acid 50 g., NaCl 250 g. and water to 1 litre) contained in a 100-ml. flask. After a few minutes 16 ml. ethanol containing 0·4 per cent. amyl alcohol is delivered into the flask, followed by 20 ml. light petroleum. After shaking for 1 min. and allowing to stand, the light petroleum extract is filtered. Ten ml. of the extract is evaporated on a water bath, dried *in vacuo* and dissolved in 5 ml. neutral ethanol containing 0·6 mg. thymol blue per 100 ml. The fatty acids are then titrated with 0·01 *N* NaOH under a stream of N_2.—G. A. Garton.

66

JARRIER, M. and POLONOVSKI, J. Méthode de dosage des acides gras estérifiés et son application au sérum sanguin. [**Method for estimating esterified fatty acids and its application to blood serum.**] *Bull. Soc. Chim. biol.*, 1955, **37,** 495–499. [Lab. Chim. Biol., Fac. Méd., Paris.]

Esters are extracted from serum with alcohol-ether, the solvent being then removed by evaporation. The residue is treated with an ethanolic solution of hydroxylamine hydrochloride and the hydroxamate formed is estimated from the colour given with ferric perchlorate.—H. G. Bray.

67

FRANKEL, E. N. and TARASSUK, N. P. **An extraction-titration method for the determination of free fatty acids in rancid milk and cream.** *J. Dairy Sci.*, 1955, **38,** 751–763. [Dept. Dairy Indust., Univ. California, Davis.]

Fatty acids are extracted with ethanol, ether and light petroleum. Aliquots of the extract are titrated with alcoholic KOH using phenolphthalein as indicator. The method gives 95 to 100 per cent. recovery of added higher (C_{16}–C_{18}) fatty acids but only 52 to 58 per cent. of lower (C_4–C_8) acids. The effect of this error on the results obtained is considered. The distribution of the hydrolysis products of fat is discussed.—H. G. Bray.

68

GLOPPE, K. E. and HVIDSTEN, H. **Determination of volatile fatty acids in silage by distillation and by chromatographic methods.** *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 129–134. [Inst. Animal Nutrit., Royal Agric. Coll., Norway.]

Values are given for the formic, acetic, propionic and butyric acid content of 30 samples of silage estimated by the chromatographic method of Nijkamp (*Chem. Weekblad*, 1949, **45,** 480; 1950, **46,** 37) and for the acetic and butyric acid content of 17 of the samples estimated by a distillation method (Behrens, *Ztschr. angew. Chem.*, 1926, **39,** 1350). The agreement is good. The loss of volatile acids on drying potato silage is discussed.

H. G. Bray.

69

BAER, E. **Chemistry of the phosphatides.** *Annu. Rev. Biochem.*, 1955, **24,** 135–156. [Banting and Best Dept. Med. Res., Univ. Toronto.]

70

LEA, C. H., RHODES, D. N. and STOLL, R. D. **Phospholipids. 3. On the chromatographic separation of glycerophospholipids.** *Biochem. J.*, 1955, **60,** 353–363. [Low Temp. Res. Stat., Univ. Cambridge.]

For previous parts see Abst. 3884, Vol. 23; Title 4090, Vol. 24.

Good separations of natural and synthetic glycerophosphatides were obtained by using silica-impregnated paper with 20 per cent. (v/v) methanol in chloroform as developing solvent. Ninhydrin, phosphomolybdic acid/stannous chloride, fuchsin/sulphur dioxide and iodine vapour were used as detecting reagents. The preparation of pure phosphatidylethanolamine, lecithin, lysophosphatidylethanolamine and lysolecithin from normal and venom-treated eggs was achieved by using methanol-chloroform chromatography on a silicic acid column.—H. G. Bray.

71

SPERRY, W. M. and BRAND, F. C. **The determination of total lipides in blood serum.** *J. Biol. Chem.*, 1955, **213,** 69–76. [Dept. Biochem., New York State Psychiat. Inst.]

Serum or plasma, 1 ml., is pipetted into a 25-ml. volumetric flask containing 8·3 ml. methanol, and about the same volume of chloroform is added. The mixture is boiled, cooled to room temperature and made up to the mark with chloroform. The filtered extract, 20 ml., is then purified by the removal of non-lipid contaminants using one or other of 2 diffusion techniques. The purified lipid extract is dried and transferred to a tared 5-ml. volumetric flask. Weight of lipids × 125 = concentration in mg. per 100 ml. For further

analytical work on the extracted lipids it is necessary to store the weighed lipids in a desiccator containing pure nitrogen, to prevent oxidative degradation of cholesterol.—G. A. Garton.

72

HANEL, H. K. and DAM, H. **Determination of small amounts of total cholesterol by the Tschugaeff reaction with a note on the determination of lathosterol.** *Acta chem. scand.*, 1955, **9**, 677–682. [Dept. Biochem. Nutrit., Polytech. Inst., Copenhagen.]

The method is applicable to as little as 0·004 mg. per ml. cholesterol, the accuracy being about 3 per cent. Coprosterol gives a faint reaction under the conditions described, but dihydrocholesterol and epicholestanol do not react. Lathosterol (Δ-7-cholestenol) gives a yellow colour with maximum absorption at 395 mμ. and negligibly little at 528 mμ., the absorption maximum for the red colour given by cholesterol, so that the two may be estimated simultaneously.—H. G. Bray.

Other Organic Constituents

73

CARROLL, K. K. **Ion-exchange chromatography in alcohol.** *Nature*, 1955, **176**, 398–400. [Collip Med. Res. Lab., Univ. W. Ontario, London.]

Absolute alcohol could be used as an eluting agent in the separation of organic acids by ion-exchange chromatography. Acids with a high R_F value were eluted more readily when alcohol replaced water; those with a low R_F were retarded. The extension of this technique to include acids and bases with limited solubility in water seems promising.—A. Hepburn.

74

MCARDLE, B. **A modified method for the microdetermination of citric acid.** *Biochem. J.*, 1955, **60**, 647–649. [Clin. Res. Unit, Guy's Hosp., London, S.E.1.]

An improvement of the colorimetric method of Taylor (Abst. 3896, Vol. 23) applicable to 10 to 80 μg. citrate in biological fluids.—A. Hepburn.

75

HESS, W. C. and WHITE, A. A. **A simplified method for the determination of citric acid in dentin and bone.** *J. Dent. Res.*, 1955, **34**, 462–465. [Dept. Biol. Chem., Sch. Med., Georgetown Univ., Washington, D.C.]

76

TÄUFEL, K. and POHLOUDEK-FABINI, R. Zur Bestimmung der Citronensäure im Wein. [**Estimation of citric acid in wine.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102**, 28–32. [Inst. Ernährungsforsch., Potsdam-Rehbrücke.]

77

BONTING, S. L. **The colorimetric determination of lactic acid in submicrogram quantities.** *Arch. Biochem. Biophys.*, 1955, **56**, 307–317. [Dept. Physiol., Coll. Med., State Univ. Iowa, Iowa City.]

This is an ultramicro adaptation of the method of Barker and Summerson (Abst. 831, Vol. 11). From 0·025 to 0·25 μg. lactic acid can be estimated in 25-μl. samples with a standard deviation of 0·0051 μg. The optimum conditions for a number of experimental variables have been established.

A. Hepburn.

78

KIELHÖFER, E., AUMANN, H. and SPECHT, M. Die colorimetrische Bestimmung der Äpfelsäure in Wein, Obstwein, Traubensaft und Obstsaft. [**Colorimetric estimation of malic acid in wine, fruit wine, grape juice and fruit juice.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **100**, 449–458. [Weinforschungsinst., Trier.]

The method depends on the reaction between malic acid and α-naphthol in concentrated H_2SO_4. The reagent is not specific for malic acid and the reaction with other substances was studied. In certain materials direct estimation of malic acid is possible, but in others it is necessary first to separate the acid by means of an ion-exchange resin (Permutit E 3). In both procedures malic acid is isolated as its barium salt, which is then treated with the reagent. After development of the red colour the mixture is centrifuged and the optical density of the supernatant fluid is measured.

H. G. Bray.

79

WERK, E. E. (JR.), MCPHERSON, H. T., HAMRICK, L. W. (JR.), MYERS, J. D. and ENGEL, F. L. **Studies on ketone metabolism in man. 1. A method for the quantitative estimation of splanchnic ketone production.** *J. Clin. Invest.*, 1955, **34**, 1256–1267. [Dept. Med., Duke Univ., Durham, N.C.]

A method is described for the estimation of blood ketone bodies in which they are decarboxylated and oxidised with dichromate to yield acetone; this is estimated spectrophotometrically as its 2 : 4-dinitrophenylhydrazone, which is extracted with carbon tetrachloride before being read at 420 mμ.—H. G. Bray.

80

TAYLOR, K. W. and SMITH, M. J. H. **1: 2-Diamino-4-nitrobenzene as a reagent for the detection and determination of alpha-keto acids in blood and urine.** *Analyst*, 1955, **80**,

607–613. [Dept. Chem. Pathol., King's Coll. Hosp. Med. Sch., Denmark Hill, London, S.E.5.]

α-Keto-acids were detected in blood and urine samples by paper chromatography of their stable nitroquinoxalinol derivatives produced by reaction with 1 : 2-diamino-4-nitrobenzene. Pyruvic and α-ketoglutaric acids were the main components and the mean amounts in the blood of 7 normal subjects, estimated by elution of the spots on the chromatogram and spectrophotometric analysis of the eluates, were 0·35 and 0·10 mg. per 100 ml.

A. Hepburn.

81

ARRHENIUS, S. **A new method for peroxide determination.** *Acta chem. scand.*, 1955, **9,** 715–717. [Kungl. Veterinärhögsk., Stockholm.]

The use of vanillin and H_2SO_4 for the estimation of *tert.*-butyl peroxides and hydroperoxides is discussed.—H. G. Bray.

82

GERLACH, E., WEBER, E. and DÖRING, H. J. Einige neue Lösungsmittel für die Papierchromatographie von Phosphorsäure-Estern. **[New solvents for chromatography on paper of phosphoric acid esters.]** *Arch. exp. Pathol. Pharmakol.*, 1955, **226,** 9–17. [Pharmakol. Inst., Univ. Heidelberg.]

Six solvent mixtures are described and the R_F values of 32 organic phosphates in 4 of them are recorded. Improved localisation of the spots is obtained by treating the paper with versene and 8-hydroxyquinoline.—H. G. Bray.

83

HEFTMANN, E. **Partition chromatography of steroids.** *Chem. Rev.*, 1955, **55,** 679–711. [Lab. Chem., Nat. Inst. Arthritis Metabol. Dis., Bethesda, Md.]

84

SMIT, C. J. B., JOSLYN, M. A. and LUKTON, A. **Determination of tannins and related polyphenols in foods. Comparison of Loewenthal and Pro methods.** *Anal. Chem.*, 1955, **27,** 1159–1162. [Dept. Food Technol., Univ. California, Berkeley.]

A comparison was made between methods depending on permanganate titration and colorimetric phosphomolybdic-tungstate reduction. It is concluded that both are highly empirical.

H. G. Bray.

See also Abst. 216.

Inorganic Constituents

85

GORDON, H. T. and HEWEL, C. A. **Paper chromatography of alkali and alkaline earth cations.** *Anal. Chem.*, 1955, **27,** 1471–1474. [Dept. Entomol., Univ. California, Berkeley.]

A simple apparatus for ascending one-dimensional chromatography is described. The developing solvent is a mixture of *iso*propanol, pyridine, water and acetic acid (8 : 8 : 4 : 1) and detection is by means of 8-hydroxyquinoline and uranyl zinc acetate. R_F values are given for a number of cations and organic compounds. Procedures are described for the concentration of dilute solutions before application to paper and for the precipitation of interfering anions by lead acetate directly on the paper strip.—H. G. Bray.

86

FRIEDMAN, H. S. and RUBIN, M. A. **Clinical significance of the magnesium : calcium ratio : technic for the determination of magnesium and calcium in biologic fluids.** *Clin. Chem.*, 1955, **1,** 125–133. [Chemo-Med. Inst., Georgetown Univ., Washington, D.C.]

An adaptation of the Schwartzenbach versene method (*Helv. chim. Acta*, 1946, **29,** 811), for the simultaneous estimation of Mg and Ca in serum and cerebrospinal fluid. The method may be applicable also to other body fluids.

A survey of 100 patients showed that the Mg : Ca molar ratio may be of clinical significance.

H. G. Bray.

87

QUENTIN, K. E. Calcium- und Magnesiumbestimmungen mit Natrium-äthylendiamintetraessigsäure unter besonderer Berücksichtigung der Mineralwässer. **[Estimation of calcium and magnesium with sodium ethylenediaminotetra-acetate with special application to mineral waters.]** *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102,** 106–117. [Balneol. Inst., Univ. Munich.]

88

GORSUCH, T. T. and POSNER, A. M. **Colorimetric determination of micro quantities of calcium.** *Nature*, 1955, **176,** 268–269. [County Laboratories, Ltd., Stanmore, Middx.]

The murexide method of Ostertag and Rinck (*Chim. Anal.*, 1952, **34,** 108) is used at *p*H 6·2, but if the *p*H is increased to 11·0 the sensitivity of the reaction is increased at least fiftyfold, so that from 0 to 8 μg. Ca per 10 ml. can be estimated. Reference is made to the effect of other ions on the method.—H. G. Bray.

89

GEHRKE, C. W., AFFSPRUNG, H. E. and LEE, Y. C. **Direct ethylenediaminetetraacetate titration procedure for calcium in biological substances. Anion exchange separation of phosphate.**

Univ. Missouri Agric. Exp. Stat. Res. Bull. No. 570, October 1954, pp. 10.

Forage and feed samples were dry-ashed, dissolved in HCl and passed through an anion-exchange resin column to remove phosphate. Ca was then estimated directly by titration with disodium dihydrogen ethylenediaminetetra-acetate, with murexide as indicator. Recovery of added Ca was satisfactory. A significant error occurred only when the quantity of Ca in the solution to be titrated exceeded 20 mg. The method was more accurate than the accepted oxalate method and it has been applied to milk, urine, serum, rations, grains and other substances in which phosphate might interfere with the titration.—A. Hepburn.

90

BERGER, E. Y. **Calcium determination in biologic material.** *Clin. Chem.*, 1955, **1,** 249–252. [Res. Serv., Third (New York Univ.) Med. Div., Goldwater Mem. Hosp., Welfare Island, New York.]

Calcium is precipitated as its oxalate, which is oxidised with ammonium hexanitratocerate. The excess cerate is titrated with ferrous iron, with *o*-phenanthroline as indicator. The method is applicable to serum, heparinised plasma, urine, dried tissues and faeces.—H. G. Bray.

91

HORNER, W. H. (with LAWSON, N. L. and TRACHTENBERG, N. S.). **The determination of calcium in biologic material.** *J. Lab. Clin. Med.*, 1955, **45,** 951–957. [Dept. Metabol., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

A rapid photometric method with versene and murexide is described.—H. G. Bray.

92

MITCHELL, L. C. **Separation and identification of acids by paper chromatography. 1. The halides.** *J. Assoc. Off. Agric. Chem.*, 1955, **38,** 832–835. [Food and Drug Admin., Dept. Health, Washington 25, D.C.]

F, Cl, Br, I, Na and K ions are separated by a solution of ammonia in 2-methoxyethanol (methyl cellosolve) as developing solvent. The detecting reagent is ethanolic ammoniacal $AgNO_3$.

H. G. Bray.

93

WOOD, T. **A reagent for the detection of chloride and of certain purines and pyrimidines on paper chromatograms.** *Nature*, 1955, **176,** 175–176. [Res. Dept., Bovril, Ltd., 148–166 Old St., London, W.C.1.]

In chromatograms stained with a reagent containing bromophenol blue, acetone and $AgNO_3$, halogen ions and certain purine and pyrimidine compounds could be identified. It is suggested that the reagent may be generally applied to compounds forming an insoluble complex with silver.—A. Hepburn.

94

DOLE, V. P. and THORN, N. A. **Precise determination of chloride in plasma by differential potentiometric titration.** *Anal. Chem.*, 1955, **27,** 1184–1186. [Hosp. Rockefeller Inst. Med. Res., New York 21.]

The procedure described is applicable to 1-ml. samples and has a precision of 0·1 per cent. Two electrodes are used, one of which can be isolated by means of a sleeve between successive additions of silver nitrate.—H. G. Bray.

95

LUHMAN, C. A. **A rapid potentiometric method for the determination of soluble chlorine in feeds.** *J. Assoc. Off. Agric. Chem.*, 1955, **38,** 764–766. [California Dept. Agric., Sacramento.]

96

PETERSON, R. E. and BOLLIER, M. E. **Spectrophotometric determination of serum copper with biscyclohexanoneoxalyldihydrazone.** *Anal. Chem.*, 1955, **27,** 1195–1197. [Nat. Inst. Arthritis Metabol. Dis., Nat. Insts. Health, Bethesda, Md.]

Deproteinised serum is treated with the reagent at *p*H 7·5 to 7·9 and the optical density of the blue complex formed is measured at 600 mμ. The reagent is more sensitive than others commonly used and gives no colour with other ions occurring in biological material.—H. G. Bray.

97

ANDRUS, S. **Determination of copper in plant materials by means of zinc dibenzyldithiocarbamate.** *Analyst*, 1955, **80,** 514–516. [Dept. Chem., Nat. Agric. Advisory Serv., Trawscoed, Aberystwyth.]

The material is wet-ashed and the copper in the diluted digest is extracted with a solution of zinc dibenzyl dithiocarbamate in carbon tetrachloride; the optical density of the extract is measured at 440 mμ. Other metals occurring in plant material do not interfere.—H. G. Bray.

98

TANNER, H. and RENTSCHLER, H. Der Polarograph als Hilfsmittel für Getränkeanalysen. 2. Die quantitative polarographische Bestimmung von Kupfer in süssen und vergorenen Getränken. [**The polarograph as a means of analysing beverages. 2. Qualitative polarographic estimation of copper in sweet and fermented beverages.**] *Mitt. Geb. Lebensmittel.*

Hyg., 1955, **46**, 209–219. [Eidg. Versuchsanst., Wädenswil.] French and English summaries.

For part 1 see *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **96**, 161.

99

SCHALL, E. D. and WILLIAMSON, H. G. **Spectrophotometric determination of fluoride.** *J. Assoc. Off. Agric. Chem.*, 1955, **38**, 454–459. [Dept. Biochem., Purdue Univ., Lafayette, Ind.]

The sample is ignited in the presence of magnesium acetate and the ash is dissolved in 60 per cent. perchloric acid. Chloride is precipitated with silver carbonate and fluoride is removed by distillation. The absorbance of the distillate is measured at 360 mμ. in a solution containing potassium titanium oxalate, ascorbic acid and a biphthalate buffer (pH 4·2).—H. G. Bray.

100

BARTLET, J. C., KAVANAGH, D. and CHAPMAN, R. A. **The determination of the fluoride content of edible bone meal.** *Canad. J. Technol.*, 1955, **33**, 348–355. [Food and Drug Labs., Dept. Nat. Health Welfare, Ottawa, Ont.]

A sample of bonemeal was ignited, dissolved in perchloric acid and distilled as fluosilicic acid into NaOH. Fluoride was estimated colorimetrically by its ability to bleach a solution of ferric salicylate. The standard error was 2·3 per cent. Although not so sensitive as other colorimetric methods, this procedure is rapid and the reagents are easily obtainable.—A. Hepburn.

101

DEUTSCH, S. **Overcoming the effect of manganese dioxide in fluoride determinations.** *Anal. Chem.*, 1955, **27**, 1154–1155. [Air Control Res. Dept., Kaiser Steel Corp., Fontana, Calif.]

Manganese dioxide and chloride in plant materials interfere with the modified method of Willard and Winter (*Anal. Chem.*, 1953, **25**, 450) for fluoride by liberating chlorine which may bleach the alizarin red indicator. Interference can be eliminated by the incorporation of 3 per cent. hydrogen peroxide in the distillation mixture.—H. G. Bray.

102

MARIANI-MARELLI, O. and MARIANI, A. La determinazione fotometrica dello jodio nelle sostanze organiche. [**Photometric estimation of iodine in organic substances.**] *Rend. Ist. Super. Sanità, Rome*, 1955, **18**, 225–231. [Lab. Chim.] French, English and German summaries.

The method depends on colorimetric estimation of iodine dissolved in carbon disulphide, and is especially suitable for estimating quantities of less than 1 mg.—D. Duncan.

103

SAMSON, M., BROWN, H. and EICHEN, S. **Cross-contaminator exclusion test for dry-ashing determination of protein-bound iodine.** *Clin. Chem.*, 1955, **1**, 269–272. [Dept. Res., Samson Labs., Philadelphia, Pa.]

In this method, with 1 drop of serum a concentration of over 400 μg. I per ml., which might interfere with the estimation of I by the dry-ashing technique (see Abst. 3912, Vol. 23), is detected qualitatively.—A. Hepburn.

104

MENDOZA SCELZA, A. Determinación cuantitativa de sideremia con la técnica de Davies Levin y Oberholzer. [**Quantitative estimation of serum iron by the technique of Davies, Levin and Oberholzer.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 256–267.

105

MCCORD, W. M. and ZEMP, J. W. **Determination of lead in urine.** *Anal. Chem.*, 1955, **27**, 1171–1172. [Dept. Chem., Med. Coll. S. Carolina, Charleston.]

106

SMITH, A. J. **A colorimetric method for the estimation of serum magnesium.** *Biochem. J.*, 1955, **60**, 522–527. [Dept. Chem. Pathol., King's Coll. (Univ. Durham), Newcastle upon Tyne.]

Calcium is precipitated as oxalate and the supernatant fluid is deproteinised with trichloroacetic acid. The filtrate has its pH adjusted to 10·1 and is treated with Eriochrome Black T and the optical density of the solution is measured at 520 mμ. In 12 control experiments 95 to 102 per cent. of added magnesium was recovered from serum. The values obtained for normal serum Mg, mean 2·1 mg. per 100 ml., fell within the ranges of normal values found by other workers with other methods.

H. G. Bray.

107

POLLEY, D. and MILLER, V. L. **Rapid microprocedure for determination of mercury in biological and mineral materials.** *Anal. Chem.*, 1955, **27**, 1162–1164. [State Coll. Washington, W. Washington Exp. Stat., Puyallup.]

108

RHODES, D. N. **Micro-determination of phosphorus.** *Nature*, 1955, **176**, 215–216. [Low Temp. Res. Stat., Univ. Cambridge.]

The method of Allen (*Biochem. J.*, 1940, **34,** 858) was modified, the molybdenum blue colour being developed in the digestion flask and extracted by means of methyl*iso*butylketone. The sensitivity of the method is increased tenfold.—H. G. Bray.

109

CAVELL, A. J. **The colorimetric determination of phosphorus in plant materials.** *J. Sci. Food Agric.*, **6,** 479–480. [Nat. Agric. Advisory Serv., West Midland Province, Wolverhampton.]

The ashed material is dissolved in HCl, the solution is treated with a mixture of ammonium molybdate and ammonium vanadate and the transmittancy of the mixture is measured at 400 mμ.—H. G. Bray.

110

DESIKACHAR, H. S. R. **A shortened procedure for routine assay of phosphorus in foodstuffs.** *J. Sci. Indust. Res. India*, 1955, **14**C, No. 1, 32–33. [Central Food Technol. Res. Inst., Mysore.]

In foodstuffs and a few biological materials P was estimated colorimetrically after digestion with H_2SO_4 for 5 min. and also after complete oxidation with H_2SO_4, HNO_3 and perchloric acid by the method of Gerritz (see Abst. 44, Vol. 5). The shortened procedure measured 95 per cent. of the total P and is suggested as a routine method for large numbers of samples when only comparative values are required. Added sucrose or partly oxidised egg albumin did not interfere with the colour development.—A. Hepburn.

111

GERRITSMA, K. W. and FREDERIKS, J. C. Scheiding en quantitatieve bepaling van gecondenseerde phosphaten met behulp van de papierchromatografie. [**Separation and quantitative estimation of condensed phosphates by chromatography on paper.**] *Chem. Weekblad*, 1955, **51,** 197–201. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.]

Increasing use of inorganic phosphates in the food industry create a need for analytical methods to distinguish different P compounds. An alkaline and an acid developing fluid are used: 30 ml. propanol, 30 ml. ethanol, 39 ml. water and 1 ml. 25 per cent. ammonia; and 75 ml. *iso*propanol, 25 ml. water, 5 g. trichloroacetic acid and 0·3 ml. 25 per cent. ammonia. The spots are made visible by spraying with a phosphomolybdate complex and exposing to ultraviolet light.—I. Leitch.

112

ČERVENKA, R. and KOZLOVÁ, M. Polarografické stanovení selenu ve vodách. [**Polarographic estimation of selenium in water.**] *Chem. listy*, 1955, **49,** 1158–1161. [Hyg. Inst., Prague.]

A method for polarographic estimation of small amounts of selenium in water and in air is described. In dilute hydrobromic acid Se gives well defined polarographic waves.

A. Jančařík (Czechoslovakia).

113

BROEKHUYSEN, J. and BÉCHET, J. Microdosage du soufre dans les matériaux biologiques. [**Micro-estimation of sulphur in biological materials.**] *Anal. chim. Acta*, 1955, **13,** 277–280. [Serv. Recherche C.E.R.I.A., Inst. Émile Gryson, Brussels.] English and German summaries.

The material is oxidised in an oxygen bomb, yielding sulphate, which is precipitated as its barium salt. Excess Ba is precipitated as chromate at *p*H 9 and the excess chromate, which under the conditions described is equivalent to the sulphate originally present, is estimated colorimetrically at 370 mμ. By this method 0·1 mg. S can be estimated to within 2 to 3 per cent.—H. G. Bray.

114

KALINOWSKA, R. and SIEDLECKA, J. Oznaczanie małych ilości cynku. [**Estimation of small amounts of zinc.**] *Rocz. Państwowego Zakł. Hig.*, 1955, **6,** 93–107. [Zakł. Badania Żywności i Przedmiotów Użytku PZH.] Russian and English summaries.

Zinc was estimated colorimetrically after reacting with dithizone in an alkaline medium. Cu and Sn^{2+}, which interfere, were removed. Less than 1 μg. Zn could be estimated. The accuracy was within 10 per cent. with an average error of 5 per cent. (From English summary.)—A. Hepburn.

115

SZOT, Z. Oznaczanie cynku surowicy i krwinek czerwonych. [**Estimation of zinc in serum and red blood cells.**] *Acta biochim. polon.*, 1955, **2,** 129–134. [Inst. Haematol., Warsaw.] English and Russian summaries.

Enzyme Activity

116

PERALTA, O. and REINHOLD, J. G. **Rapid estimation of amylase activity of serum by turbidimetry.** *Clin. Chem.*, 1955, **1,** 157–164. [William Pepper Lab. Clin. Med., Med. Clin., Hosp. Univ. Pennsylvania, Philadelphia.]

A modification of the method of Waldron (Abst. 3093, Vol. 21).—H. G. Bray.

117

SZCZEPKOWSKI, T. W. Nowa metoda wyosabniania i oczyszczania cytochromu c. [**A new method for the isolation and purification of**

cytochrome *c*.] *Acta biochim. polon.*, 1955, **2,** 169–174. [Inst. Chem. Physiol. A.M., Cracow.] English and Russian summaries.

The method is based on the extraction of horse heart muscle with dilute H_2SO_4, and adsorption on Permutit and aluminium oxide, followed by elution with dilute NH_4OH. It yielded a concentrated solution of enzymically active cytochrome *c* containing 0·43 per cent. Fe. (From summary.)

E. M. Hume.

118

FORSTER, T. L., JENSEN, C. and PLATH, E. **A photometric method for estimating the lipase content of milk.** *J. Dairy Sci.*, 1955, **38,** 764–774. [N. Dakota Agric. Exp. Stat., Fargo.]

The substrates used are esters of 2-naphthol-6-sulphonic acid. The acid liberated by the enzyme is estimated colorimetrically with the reagent of Folin and Ciocalteu.—H. G. Bray.

Miscellaneous

119

PRZYBYLSKI, E. and PARYS, J. Potencjometryczne oznaczanie kwasowości niektórych artykułów żywności. [**The potentiometric measurement of the acidity of some food products.**] *Rocz. Państwowego Zakł. Hig.*, 1955, **6,** 119–140. [Zakł. Badania Żywności i Przedmiotów Użytku PZH.] Russian and English summaries.

120

MOTTIER, M. and POTTERAT, M. De l'extraction des colorants pour denrées alimentaires avec la quinoléine et de leur identification par chromatographie sur plaque d'alumine. [**Extraction of colouring matter from food products with quinoline and its identification by chromatography on alumina " plates ".**] *Anal. chim. Acta*, 1955, **13,** 46–56. [Serv. Féd. Hyg. Pub., Lab. Contrôle Denrées Aliment., Berne.] English and German summaries.

Water-soluble dyes are extracted from a solution or suspension of the food material with quinoline and fat-soluble dyes directly with pentane. The dyes are then separated by chromatography on " plates " of alumina, by means of mixtures of ethanol, *n*-butanol and water.—H. G. Bray.

121

BAGNALL, D. J. T. and SMITH, A. **Abnormally small freezing-point depressions of genuine milk.** *Analyst*, 1955, **80,** 623–625. [City Labs., 184 High St., Hull.]

Milk samples from 32 cows in the morning and evening had average freezing-point depressions of 0·518° and 0·522° C.; the minimum value for genuine milk from a herd is generally regarded as 0·530° C. The small depressions were attributed to a lactose deficiency caused by the recent change from winter feeding to grazing on spring grass.

A. Hepburn.

122

RAMACHANDRA, B. V., DASTUR, N. N. and GIRI, K. V. **Application of circular paper chromatography method for the detection of adulteration of milk.** *Indian J. Dairy Sci.*, 1955, **8,** 83–88. [Indian Dairy Res. Inst., Bangalore.]

123

NEAL, C. E. and CALBERT, H. E. **The use of 2, 3, 5-triphenyltetrazolium chloride as a test for antibiotic substances in milk.** *J. Dairy Sci.*, 1955, **38,** 629–633. [Dept. Dairy Indust., Univ. Wisconsin.]

In presence of growing bacterial cells in milk 2 : 3 : 5-triphenyltetrazolium chloride is converted to formazane with the appearance of a pink colour. Antibiotics inhibit this conversion. This reaction was used to detect antibiotics in raw milk; with *Streptococcus thermophilus* as test organism 0·04, 0·2, 0·25 and 4·0 μg. penicillin, aureomycin, terramycin and streptomycin, respectively, per ml. could be detected.—A. Hepburn.

124

MAHON, J. H., ANGLIN, C. and CHAPMAN, R. A. **A modified Cornell phosphatase test for the analysis of blue mold and aged cheeses.** *J. Assoc. Off. Agric. Chem.*, 1955, **38,** 482–493. [Food and Drug Directorate, Dept. Nat. Health and Welfare, Ottawa.]

125

DANNACHER, S. and STAUB, M. Über die Bestimmung des Fleischgehaltes in Suppenpräparaten. [**Estimation of the meat content of soup preparations.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1955, **46,** 163–167. [Kanton. Lab., Zürich.] French and English summaries.

A method is described, based on estimation of the N content of the insoluble protein of the meat in the soup preparation, *i.e.*, the dried residue after extraction of fat with ether, and of salt with alcohol and water. If the meat used is also available, a simple calculation gives the meat content of the preparation. The residue should be examined under the microscope to test that it consists of meat fibres. Ingredients containing starch, *e.g.* potato flour, or protein, *e.g.* peasemeal, can be corrected for. Tests with chicken meat and chicken soup of known composition showed an accuracy of 1 per cent.

The insoluble protein content of " chicken meat" from different countries ranged from 45 to 70 per cent. of the dry matter, the difference being due chiefly to fat. The N content of the insoluble

protein of the meat had only the narrow range from 15·2 to 15·7 per cent., mean 15·5 per cent. The N content of the insoluble protein of single samples of oxtail and ham was almost the same. Hence it is suggested that not the meat content but a minimum amount of insoluble protein of meat of the particular kind should be legally prescribed.—W. M. Deans.

126

GARDINER, S. D. and FARMILOE, F. J. **Design and operating technique of a vacuum drying oven. 3. Solids in (a) mixtures of cane and beet molasses and (b) beet molasses.** *Analyst*, 1955, **80,** 557–561. [Tate and Lyle Res. Lab., Westerham Rd., Keston, Kent.]

For part 2 see Title 163, Vol. 25.

127

THURMAN, R. L. and WEHUNT, E. J. **A laboratory method for determining digestible nutrients.** *Agronom. J.*, 1955, **47,** 302–303. [Univ. Arkansas, Fayetteville.]

The dried ground material is autoclaved with 1 : 19 (by volume) HCl at 15 lb. pressure for 1 hr. and the residue is dried and weighed. Values obtained by this method are compared with those obtained in digestibility trials with rabbits.

H. G. Bray.

MICROBIOLOGICAL

128

LEES, K. A. and TOOTILL, J. P. R. **Microbiological assay on large plates. 1. General considerations with particular reference to routine assay. 2. Precise assay. 3. High throughput, low precision assays.** *Analyst*, 1955, **80,** 95–110; 110–123; 531–535. [Glaxo Labs., Ltd., Sefton Park, Stoke Poges, Bucks.]

These papers describe in detail, with statistical analysis, methods for microbiological assay on large seeded agar plates ranging in size from 12 to 18 in. square and accommodating from 64 to 144 tests on each, so that many samples with few replicates, or few samples with many replicates, can be dealt with simultaneously. Constancy of the volume of test solution applied is achieved by the use of insulating beads of unglazed porcelain. The first paper gives experimental designs suitable for routine assay of several samples simultaneously with a standard error of about $\pm$ 5 per cent., the second for more accurate assay, *e.g.*, of relatively pure preparations of antibiotics or growth substances, up to 3 samples simultaneously with a standard error of about 1 per cent., and the third for large-scale preliminary work, *e.g.*, on crude fermentation products, where over 10 samples may have to be assayed simultaneously but a standard error of $\pm$ 10 per cent. is immaterial.—W. M. Deans.

129

MERTZ, E. T., RENNERT, S. S. and COLE, E. W. **A bacterial method for determining protein digestibility.** *J. Nutrition*, 1955, **56,** 437–446. [Dept. Biochem., Purdue Univ., Lafayette, Ind.]

A method for the estimation of the digestibility of protein in which the proteolytic action of pepsin is combined with that of *Pseudomonas aeruginosa*. Some ether-soluble substances and dialysable sugars inhibit the action of *Pseudomonas* and must be removed from the feed before digestibility of protein is estimated. The particle size of the feed may also be of importance, and this is being investigated. Results obtained by the method described agreed within 10 per cent. with those obtained from trials with rats.—T. D. Bell.

See also Abst. 203.

CLINICAL AND EXPERIMENTAL

130

INKLEY, S. R., BROOKS, L. and KRIEGER, H. **A study of methods for the prediction of plasma volume.** *J. Lab. Clin. Med.*, 1955, **45,** 841–850. [Dept. Med., Univ. Hosps., Cleveland, Ohio.]

Close agreement was found between results obtained with Evans Blue and with iodinated serum albumin. The results obtained from an extensive study are discussed in detail.—H. G. Bray.

131

FRANK, H. A. and CARR, M. H. (with HUFFMAN, B. J. and BROSNAHAN, M. L.) **A simplified dye method for estimating plasma volume.** *J. Lab. Clin. Med.*, 1955, **45,** 977–980. [Res. Labs., Veterans Admin. Hosp., Kansas City, Mo.]

A simplified method is described in which estimation of the absolute amount of dye is unnecessary.—H. G. Bray.

132

FRANK, H. A. and CARR, M. H. (with HUFFMAN, B. J. and BROSNAHAN, M. L.) **A simplified method for estimation of the extracellular fluid space.** *J. Lab. Clin. Med.*, 1955, **45**, 973–976. [Res. Labs., Veterans Admin. Hosp., Kansas City, Mo.]

A thiosulphate method is described.

H. G. Bray.

133

KLEMENT, A. W. (Jr.), AYER, D. E. and ROGERS, E. B. **Simultaneous use of Cr^{51} and T-1824 dye in blood volume studies in the goat.** *Amer. J. Physiol.*, 1955, **181**, 15–18. [Biophys. Div., Med. Lab., Army Chem. Centre, Md.]

In experiments on 20 goats the mean blood volume given by the ^{51}Cr method was 6·10 per cent. of the bodyweight and by the T 1824 dye method 7·35 per cent. The mean total blood volume (^{51}Cr cell volume plus dye plasma volume) was 7·05 per cent. of bodyweight.—H. G. Bray.

134

RYCHTER, Z., KOPECKÝ, M. and LEMEŽ, L. **A micromethod for determination of the circulating blood volume in chick embryos.** *Nature*, 1955, **175**, 1126–1127. [Dept. Anat., Charles Univ., Prague.]

135

MCGOVERN, J. J., JONES, A. R. and STEINBERG, A. G. **The haematocrit of capillary blood.** *New Engl. J. Med.*, 1955, **253**, 308–312. [Dept. Paediat., Harvard Univ. Med. Sch., Boston, Mass.]

A micro-method based on that of Guest and Siler (*J. Lab. Clin. Med.*, 1934, **19**, 757) is described. The centrifuge equipment is available commercially and a reading device for the tubes, which are 75 mm. long and 2 mm. in diameter, is to be described elsewhere. The method, which is shown to give results comparable with those of the Wintrobe procedure, is particularly useful for samples of blood, either arterial or venous, from infants and young children.—D. Harvey.

136

BERNSTEIN, R. E. **The correction of mean cell volume and mean cell haemoglobin concentration.** *J. Clin. Pathol.*, 1955, **8**, 225–226. [Dept. Physiol., Univ. Witwatersrand, S. Africa.]

137

CANNAN, R. K. **Proposal for the distribution of a certified standard for use in hemoglobinometry, prepared by the Division of Medical Sciences, National Academy of Sciences—National Research Council.** *Clin. Chem.*, 1955, **1**, 151–156; *J. Lab. Clin. Med.*, 1955, **46**, 135–140; *Science*, 1955, **122**, 59–60. [Washington, D.C.]

A report of a panel of the Division of Medical Science, National Academy of Sciences–National Research Council recommending a crystalline human haemoglobin standard containing 0·335 per cent. Fe, a cyanmethaemoglobin solution as a standard for distribution and a cyanmethaemoblobin method for Hb estimation.—H. G. Bray.

138

HUISMAN, T. H. J. and PRINS, H. K. **Chromatographic estimation of four different human hemoglobins.** *J. Lab. Clin. Med.*, 1955, **46**, 255–262. [Dept. Paediat., Univ. Groningen.]

Two methods are described for the estimation of haemoglobins A, B, C and F. In the first a column of Amberlite IRC 50 (XE 64) is used for the separation of the carboxyhaemoglobins, eluting successively with 3 citrate buffers of increasing sodium ion concentration. In the second method the pigments are made visible and estimated on the column, which is contained in flat cuvettes, without the collection of effluent fractions.

H. G. Bray.

139

DAHLSTRÖM, H. **A critical study of Sjöstrand's method for determination of carboxy hemoglobin, and the total hemoglobin content of the human body.** *Acta physiol. scand.*, 1955, **33**, 296–308. [Dept. Surg., Sch. Med., Washington Univ., St. Louis, Mo.]

140

FURLONG, N. B. and SCHWARZ, M. J. **A method for obtaining *in vivo* spectra of blood pigments.** *J. Lab. Clin. Med.*, 1955, **46**, 285–297. [Aero Med. Lab., Wright-Patterson Air Force Base, Ohio.]

The Beckman spectrophotometer is modified to allow its use in the same way as the Wood ear oximeter. A continuous spectrum of rabbit blood was recorded under normal conditions and after treatment with carbon monoxide.—H. G. Bray.

141

KAHN, A. **An efficient clinical method for determining the CO_2 content of serum.** *J. Lab. Clin. Med.*, 1955, **46**, 312–317. [Dept. Med., Univ. Chicago, Ill.]

The *p*H of serum is measured before and after equilibrium with a mixture of nitrogen and carbon dioxide of known composition. By means of a nomogram the CO_2 content of the sample can be estimated from the *p*H change.—H. G. Bray.

142

STANLEY, R. G. and TRACEWELL, T. **Manometer flask for measuring respiratory quotients.**

Science, 1955, **122**, 76–77. [Forest Physiol. Lab., Univ. California, Berkeley.]

A flask is described which permits the measurement of CO_2 production and O_2 uptake during immediately consecutive intervals, so that duplicate samples in separate flasks are not required.

H. G. Bray.

143

THUNEBERG, P. **Quantitative collection of urinary output in full-term newborn and premature male infants.** *Ann. Paediat. Fenn.*, 1955, **1**, 192–197. [Child Hosp., Univ. Helsinki.]

144

PAYNE, M. A., LAZZARINI, A. A., BROT, N. and BEAL, J. M. **Preparation of colloidal fat suspensions for intravenous use.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 122–123. [Labs. Surg. Res., New York Hosp.-Cornell Med. Centre.]

One part of fat is dissolved in 10 parts absolute alcohol at 80° C. Pyrogen-free water, maintained at 80° C., is then added very slowly with constant agitation until the total concentration of alcohol is about 50 per cent. The alcohol is then evaporated on a water-bath, leaving the fat suspended in water. Dextrose or any salt in isotonic concentration may be added and the colloidal suspension may be sterilised by autoclaving in the container from which it is to be administered. The suspension has a particle size of 250 mμ.

Preliminary observations on a group of patients given 15 per cent. colloidal animal fat intravenously in amounts up to 500 ml. showed no reaction of any kind.—F. C. Aitken.

145

GEYER, R. P., OLSEN, F. R., ANDRUS, S. B., WADDELL, W. R. and STARE, F. J. **Preparation of fat emulsions for intravenous alimentation.** *J. Amer. Oil Chem. Soc.*, 1955, **32**, 365–370. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Descriptions are given of the homogeniser and auxiliary equipment used, the method of preparation of the emulsions and the routine animal tests made with each batch of emulsion.—F. C. Aitken.

146

CLARKE, P. M. **Nomograms for multiple slope-ratio assays arranged in blocks, and improved nomograms for assays without blocks.** *Brit. J. Pharmacol. Chemotherap.*, 1955, **10**, 296–304. [Nat. Inst. Res. Dairying, Univ. Reading.]

This paper presents approximate graphical methods for use in analysing the results of simple and multiple slope-ratio assays. The multiple assays are considered to be made in blocks, with a complete replication in each block. Each replication consists in single trials of each of the $(\nu - 1)$ test preparations at 2 non-zero levels, along with trials of a standard preparation at 2 non-zero levels, and a common zero dose. The last 3 treatments are repeated approximately $\sqrt{\nu - 1}$ times within each replicate. The simple assays consist in only 5 treatments, 2 levels of the test and of the standard preparation and a common zero dose, and no blocking is considered necessary.

Examples are given of the analytical lay-out. Estimates of error variance are obtained from ranges instead of by mean square analysis. The potencies of the test preparations relative to the standard are obtained by using nomograms, which also supply 95 per cent. fiducial limits, and these are shown to be very close to the results from exact analyses of the same data.

Data are supplied for the construction of nomograms for simple assays with any number of replications and for multiple assays of up to 15 different test preparations, arranged in 2 complete replicate blocks. Validity tests are given for all cases.—I. McDonald.

147

CANAWAY, R. J., RAYMOND, W. F. and TAYLOR, J. C. **The automatic recording of animal behaviour in the field.** *Electronic Eng.*, March 1955, pp. 4. [Grassland Res. Inst., Hurley, Berks.]

Electric switches at different points on the animal's body activate pins in contact with "Teledeltos" paper, making a continuous record of behaviour electrically. The switches and also the recording box, which includes clockwork-driven paper spools, batteries and relays, are mounted on leather harness worn by the animal. The box, size $6 \times 6 \times 4$ in., weighs 5 lb. A mercury switch on one leg counts each double movement, which is one complete walking cycle. A second switch, operated by the pressure of the animal's body, records lying and standing and a third switch operated by a cam mechanism from a loop arm resting on the neck records movements of the head up or down. Jaw movements with the head up represent rumination and with the head down, grazing. The problem of recording jaw movements has not yet been solved satisfactorily. The behaviour of a harnessed bullock was not adversely affected in comparison with that of its monozygous twin mate, and the records were in good agreement with detailed observations.

J. L. Corbett.

148

GONZÁLEZ, Q. J., ALVAREZ-BUYLLA, R. and AZPE, T. Nueva cámara metabolimétrica para pequeños animales de laboratorio. [**A new metabolism chamber for small laboratory animals.**] *An. Esc. nac. Ciencias biol.*, 1954,

8, 5–16. [Lab. Metabol., Esc. Nac. Ciencias Biol., I.P.N., Mexico.] English summary.

A description with photographs and diagrams is given of a glass respiration chamber suitable for use with small animals for measuring the rate and volume of respiration, CO_2 production and the respiratory quotient. Temperature records and electrocardiograms could be obtained at the same time.—A. M. Copping.

149

BRUNE, H. and SEIKA, E. Differenzierung von Qualitätsmerkmalen der Muskulatur des Schweines durch Quellungsversuche. [**Evaluation of quality of pork muscle by means of swelling tests.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 67–73. [Inst. Tierphysiol., Univ. Göttingen.]

Samples taken just after slaughter from the superficial gluteus muscle of 140 Improved Landschwein pigs of both sexes were classified as dark and firm or bright and soft and their behaviour in distilled water or hypertonic salt solutions was studied over a period of 10 hr. The 2 types of muscle differed in composition, the dark type having less fat and more water than the bright, but the differences could not fully explain their different behaviour on soaking. This was most clear in distilled water, in which the dark type steadily increased in weight, mainly by taking up water, but the bright steadily lost weight. The dark type lost less N to the water. The results are discussed and it is considered that a swelling test in distilled water would be useful in addition to practical judgement. The difference was not due to sex but there was nothing to show whether feeding or fatigue had anything to do with it.

W. M. Deans.

150

LLOYD, L. E., RUTHERFORD, B. E. and CRAMPTON, E. W. **A comparison of titanic oxide and chromic oxide as index materials for determining apparent digestibility.** *J. Nutrition*, 1955, **56,** 265–271. [Dept. Nutrit., Macdonald Coll., McGill Univ., Que.]

Sixty rats, initially 60 days old, received a diet of 90 parts ground wheat and 10 parts of a protein and mineral supplement. For half the rats it contained 0·25 per cent. TiO_2 and for the rest 0·25 per cent. Cr_2O_3. Markers were estimated in the faeces.

Constant maximum excretion of TiO_2 was not attained in 6 days, though that of Cr_2O_3 was attained within 4 days. The coefficient of apparent digestion was always lower by the TiO_2 method than that found by the conventional time collection method, but with Cr_2O_3 the two values were identical. Total recovery of TiO_2 for 30 rats from the 7th to the 13th day was 92·0 per cent., that of Cr_2O_3 99·8.

It is concluded that Cr_2O_3 is better than TiO_2 as a marker in digestibility studies.—D. Duncan.

See also Absts. 1117, 1156.

151

DOUGHERTY, R. W. **Permanent stomach and intestinal fistulas in ruminants: some modifications and simplifications.** *Cornell Vet.*, 1955, **45,** 331–357. [Dept. Physiol., New York State Vet. Coll., Ithaca, N.Y.]

This is an extremely useful paper describing the surgical techniques employed for cannulation of different parts of the alimentary tract of ruminants, and for exteriorising the flow of digesta. A full description of the method of making the cannulas or other forms of obturator used in ruminants is given, including the author's design for a large rubber stopper for large rumen fistulas in cattle. The article is unique in that it gathers together in one paper a lot of scattered information.

A. T. Phillipson.

152

NICHOLS, R. E. **A sampling tube for rumen fluid.** *Amer. J. Vet. Res.*, 1955, **16,** 410. [Dept. Vet. Sci., Wisconsin Agric. Exp. Stat., Madison.]

This tube consists of an inner and a closely fitting outer cylinder. Each has a large hole near the closed end. This end is inserted into the rumen with the outer tube turned so as to close the holes. When in place the inner tube is rotated through 180° and allowed to fill with fluid. The fluid is then trapped by rotating the inner tube through a further 180° and the sample is withdrawn in the tube.—A. T. Phillipson.

153

THÉRET, M. Méthode graphique pour la détermination des besoins alimentaires du porc. [**Graphic method of estimating the nutritional needs of pigs.**] *Rec. Méd. vét., Toulouse*, 1955, **131,** 420–425.

Two basic diagrams are presented, one relating energy requirements to growth for fattening pigs and for stock rearing, and the other showing feed consumption according to weight gain in pigs of each type. The calculation of starch equivalent, total digestible nutrients and digestible protein is explained. The use of the graphs for controlling the growth of pigs and evaluating feeding methods is shown.—A. M. Copping.

COOKING, STERILISATION AND PRESERVATION OF FOOD

154
YUDKIN, J. **The culinary aspects of nutrition.** *Practitioner*, 1955, **175,** 51–55. [Dept. Nutrit., Queen Elizabeth Coll., Univ. London.]

155
KLIMENTOVÁ, M. Význam rostlinných a pokrmových tuků v technologii vaření. [**The importance of plant fats in cooking technology.**] *Výživa lidu*, 1955, **10** (5), 76–77.

156
DESCHREIDER, A. R. Emploi des rayons ultraviolets dans les industries alimentaires. [**Use of ultraviolet rays in food industries.**] *Vita*, 1955, No. 12, pp. 7.

157
BERNFUS, E. Probleme der Lagerung. [**Storage problems.**] *Lebensmittel u. Ernährung*, 1955, **8,** No. 7, 9–10.

158
BRANDSTETTER, B. Modern Produktionsverfahren in den USA. [**Modern production processes in the U.S.A.**] *Lebensmittel u. Ernährung*, 1955, **8,** No. 8, 15–16.

A brief article touching on conservation of vitamins by the formation of chemical complexes, improved methods of sugar extraction and purification, sterilisation of meat by means of γ-rays (at an estimated cost of 0·1 cent. per $\frac{1}{2}$ kg.), automatic quick-freezing, production of concentrated fruit juices of good keeping quality, and manufacture of snacks from thinly sliced vegetables fried in coconut or groundnut oil.

W. M. Deans.

159
TRUHAUT, R. Le problème de l'introduction volontaire de substances chimiques étrangères dans les aliments. Les faits. Le point de vue du chimiste et du toxicologue. [**Problem of the voluntary introduction of foreign chemical substances into foods. The facts. Point of view of the chemist and the toxicologist.**]
SIMONNET, H. Le point de vue du physiologiste, du médecin. [**Point of view of the physiologist and doctor.**] *Bull. Soc. sci. Hyg. aliment.*, 1955, **43,** 79–113; 114–126.

160
SOUVERAIN, R. L'adjonction de substances chimiques aux aliments examinée au point de vue de la législation française. [**The addition of chemical substances to foods, examined from the point of view of legislation in France.**] *Bull. Soc. sci. Hyg. aliment.*, 1955, **43,** 127–154.

161
DEUEL, H. J. (Jr.) **Toxicological determination of suitability of food additives.** *Food Res.*, 1955, **20,** 215–220. [Dept. Biochem., Sch. Med., Univ. S. California, Los Angeles.]

162
BRÜCKE, F. Uber den psychologischen Einfluss von Zusatzstoffen (Farben), welche das Aussehen von Nahrungsmitteln beeinflussen. [**Psychological effect of additives (dyes) that affect the appearance of foods.**] *Lebensmittel u. Ernährung*, 1955, **8,** No. 8, 11–14.

163
PILGRIM, F. J., SCHUTZ, H. G. and PERYAM, D. R. **Influence of monosodium glutamate on taste perception.** *Food Res.*, 1955, **20,** 310–314. [Quartermaster Food and Container Inst. Armed Forces, Chicago 9, Ill.]

164
HEINTZE, K. Untersuchungen über den Einfluss von Temperatur, Druck und Erhitzungsdauer auf die saure Hydrolyse von eiweisshaltigen Produkten. 2. Das Verhalten einzelner Aminosäuren in saurer Lösung in Abhängigkeit von Druck und Temperatur. [**Effect of temperature, pressure and duration of heating on the acid hydrolysis of protein-containing substances. 2. Behaviour of some amino-acids in acid solution as affected by pressure and temperature.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **100,** 463–470. [Bundesanst. Lebensmittelfrischhaltung, Karlsruhe.]

For part 1 see *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **100,** 253.

Heating in 15 per cent. HCl at 112° to 179° C. under pressures up to 10 atm. causes 0·5 to 1 per cent. deamination of glycine, glutamic acid, valine, leucine, *iso*leucine, lysine, histidine and methionine. Addition of sucrose, 25 mg. per 100 ml., increases the extent of decomposition to about 2 per cent. Up to 47 per cent. of cystine, cysteine, serine and arginine is decomposed. Only with arginine and cysteine does sucrose increase this. Glycylglycine is more stable than glycine under the conditions studied.—H. G. Bray.

165
TATARENKO, E. S., SOBOL', A. E. and NOVIKOVA, Z. N. Izyskaniya antiokislitelei biologicheskogo proiskhozhdeniya dlya predokhraneniya

zhirov ot progorkaniya. [**Anti-oxidants of biological origin for the preservation of fats from rancidity.**] *Mikrobiologiya*, 1955, **24,** 217–222. [Ukraine Sci. Res. Inst. Food Indust., Kharkov.]

The object of this investigation was (1) to find moulds capable of accumulating fat in their mycelia, (2) to discover the optimum conditions for the formation of unsaponifiable matter, (3) to test the anti-oxidant qualities of unsaponifiable matter.

The mould *Naumoviella oleaginosa Tatarenko* sp. nov. was chosen for the test. Other moulds investigated were *N. humicola* and *Mortierella* sp. 2. All were shown to have a great capacity for fat accumulation. The last 2 were not tested for anti-oxidant properties. The optimum temperature for the development of *N. oleaginosa* was from 25° to 26° C. A lower temperature slowed down the growth of the culture but did not affect the accumulation of fat. The optimum *p*H of the nutrient medium (potato-glucose) for fat accumulation was from 4·8 to 5. The addition of from 0·2 to 1 per cent. KH_2PO_4 increased the capacity of the mould for fat accumulation, which was high, between 45 and 52 per cent. of the dry weight of the mould film. With beer wort as a medium the amount was from 20 to 52 per cent. The accumulation of unsaponifiable matter when the moulds were grown under identical conditions varied considerably, 1 per cent. unsaponifiable matter being obtained in one experiment, 16·2 per cent. in another. The unsaponifiable part of the lipids of *N. oleaginosa* contains substances with anti-oxidant properties, which at a concentration of 0·01 per cent. increase the stability of food fats 3·5 times. The unsaponifiable matter amounts to from 1 to 18 per cent. of the weight of the lipids.

A sample of butter used as a control became rancid within 28 days ; a sample with unsaponifiable matter from *N. oleaginosa* began to be rancid only after 86 days.—H. Scherbatoff.

166

Šupová, J., Pokorný, J. and Trnka, M. Použití antioxydantů k ochraně tuků před žluknutím. [**Anti-oxidants for preventing rancidity in fats.**] *Výživa lidu*, 1955, **10,** (6), 92–93.

167

Heimann, W., Matz, M., Grünewald, B. and Holland, H. Über die synergistische Wirkung von α-Alanin bei der Hemmung der Fettautoxydation durch phenolische Antioxydantien. [**Synergistic action of α-alanine in the inhibition of auto-oxidation of fats by phenolic anti-oxidants.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102,** 1–6. [Inst. Lebensmittelchem., Tech. Hochsch., Karlsruhe.]

Experiments in a Warburg manometer on ethyl linoleate with quercetin or *p*-benzoquinone as anti-oxidant indicated that the synergistic effect of α-alanine is due to reduction of the oxidised anti-oxidant, with breakdown of the α-alanine to pyruvic acid and ammonia. β-Alanine had no such effect.—W. M. Deans.

168

Köttgen, U., Braun, E. and Friedberg, V. Gefriertrocknung zur Konservierung von Frauenmilch. [**Freeze-drying for preservation of human milk.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 923–925. [Kinderklin., Univ. Mainz.]

Tests were made with human milk freeze-dried by the process of Catel *et al.* (Abst. 167, Vol. 24), which produces from 100 g. fresh milk 12·5 g. powder with a residual moisture content of 2 to 3 per cent. Paper electrophoresis of reconstituted freeze-dried milk gave results similar to those with fresh human milk ; boiled or pasteurised milk showed changes. Bacteriological tests showed no increase in harmful organisms during freeze-drying storage. Of 6 premature infants who were thriving on fresh human milk without supplement, 4 showed better average daily weight gains during 2 weeks when they had the dried milk instead ; their general condition and the appearance and bacterial flora of their stools were unaffected. Remaining obstacles to the wider use of the process are the high cost and the absence of a satisfactory method of reducing the number of bacteria in the raw milk, since the process does not kill them but merely prevents their multiplication.

W. M. Deans.

169

Harland, H. A., Coulter, S. T. and Jenness, R. **Natural variation of milk serum proteins as a limitation of their use in evaluating the heat treatment of milk.** *J. Dairy Sci.*, 1955, **38,** 858–869. [Dept. Dairy Husb., Univ. Minnesota, St. Paul.]

170

Pavel, J. Studie o tvorbě těkavých mastných kyselin při kysání mléka. [**Study of the formation of volatile fatty acids in souring milk.**] *Acta Univ. Agric. et Silvicult. Brno*, 1955, [A], 49–56. [Inst. Dairy Sci., Agric. Univ., Brno.]

171

Schormüller, J. and Leichter, L. Beiträge zur Biochemie der Käsereifung. [**Biochemistry of cheese ripening.**] 13. Glutaminsäuredecarboxylase in reifendem Sauermilchkäse. [**13. Glutamic acid decarboxylase in ripening sour milk cheese.**] 14. Das Vorkommen von Lysindecarboxylase in reifendem Sauermilchkäse. [**14. The presence of lysine decarboxyl-**

ase in ripening sour milk cheese.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102,** 13–27; 97–106. [Inst. Lebensmittelchem., Tech. Univ., Berlin Charlottenburg.]

For previous parts see Absts. 4263, Vol. 24; 220, 1774, 3259, Vol. 25.

13. The following are some of the findings of this detailed study of glutamic acid decarboxylase in ripening Harz cheese. The activity of the enzyme in a suspension of cheese 6 to 7 days old was much greater at 37° than at 30° C. The optimum *p*H lay between 4·8 and 5·2. Since addition of pyridoxal-5′-phosphate, the coenzyme, only slightly increased the activity, it was concluded that little surplus apoenzyme was present. During normal ripening, glutamic acid decarboxylase increased up to 10 days and then showed a decline, which was prevented by addition of the coenzyme. Activity was greater in the crust of the cheese than inside. γ-Aminobutyric acid, a frequent breakdown product from decarboxylation of glutamic acid, was detected in the cheese by paper chromatography.

In the discussion it is pointed out that vitamin B_6 in its phosphorylated form plays a double part in cheese ripening, as growth substance for bacteria and as coenzyme of the enzymes which the bacteria produce, and it is considered probable that the same is true of other vitamins.

14. Lysine decarboxylase was studied in the same materials as above. Its optimum *p*H lay between 5·1 and 5·8. Its activity was greatly increased by addition of pyridoxal-5′-phosphate. During normal ripening, lysine decarboxylase rose from the third to the sixth day and fell slowly after the tenth day; if pyridoxal phosphate was added, the rise was initially steeper and continued to the twentieth day, reaching a value over 7 times that without addition. Cadaverin, the product resulting from decarboxylation of lysine, was identified by paper chromatography in very ripe Harz cheese. Although milk is relatively low in vitamin B_6, so that curd is unlikely to contain much pyridoxal phosphate, any destruction of lysine implies irreparable damage to protein, and experiments on the fate of this amino-acid in ripening cheese are in progress.—W. M. Deans.

172

ZEILINGER, A. Haltbarkeitsfragen bei Butter und Käse. [**Keeping quality of butter and cheese.**] *Lebensmittel u. Ernährung*, 1955, **8,** No. 7, 7–8.

173

DATE, W. B. and BHATIA, D. S. **Preservation of Indian milk sweets. Some preliminary studies on *Shrikhand Wadi* and *Milk Burfee*.** *Indian J. Dairy Sci.*, 1955, **8,** 61–66. [Div. Food Processing, Central Food Technol. Res. Inst., Mysore.]

174

HUSAINI, S. A. and ALM, F. **Denaturation of proteins of egg white and of fish and its relation to the liberation of sulfhydryl groups on frozen storage.** *Food Res.*, 1955, **20,** 264 – 272. [Swedish Inst. Food Preservation Res., Gothenburg.]

175

FUNFÁLEK, A. Změny masa při vaření a pečení. [**Changes in meat during boiling and roasting.**] *Výživa lidu*, 1955, **10,** (5), 80–81.

176

KURKO, V. I. Gistologicheskie izmeneniya kollagenovykh volokoi v myase pri teplovoi obrabotke. [**Histological changes in the collagen fibres of heat-treated meat.**] *Vop. Pitan.*, 1955, **14,** No. 3, 32–36. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

177

GERRITSMA, K. W. and FREDERIKS, J. C. Über die Hydrolyse kondensierter Phosphate während der Bereitung und Lagerung gekochter Wurst. [**Hydrolysis of condensed phosphates in the preparation and storage of cooked sausage.**] *Centraal Inst. Voedingsonderzoek T.N.O. Utrecht, Publ.* No. 196. Repr. from *Deutsche Lebensmittel-Rundschau*, 1955, **51,** 130–132.

Addition of condensed phosphates to sausages to improve appearance and consistency has been legal in the Netherlands since 1952. As Gosselin *et al.* (*J. Pharmacol. Exp. Therap.*, 1952, **106,** 180; 1953, **108,** 117) have since raised doubts about their safety, it was desired to find out how far these compounds are hydrolysed to the harmless orthophosphate during the preparation and storage of cooked sausage. Orthophosphate was estimated by the method of Weil-Malherbe and Green (*Biochem. J.*, 1951, **49,** 286) in sausage meat containing 0·5 per cent. of a 4 : 1 mixture of sodium phosphate and Kurrol's salt (octametaphosphate, a long-chain polyphosphate) and either smoked in skins and cooked for 1 hr. at 80° C., or canned and cooked for 3 hr. at 100° C. or 2 hr. at 112° C. The percentage of condensed phosphate hydrolysed was 31, 25 and 69, respectively, and in cooked smoked sausage hydrolysis continued during storage for up to 3 months. Another experiment showed that pyrophosphate is more readily hydrolysed than Kurrol's salt when heated with meat for 3 hr. at 100° C.—W. M. Deans.

178

GOERTZ, G. E., VAIL, G. E., HARRISON, D. L. and SANFORD, P. E. **Organoleptic and histological characteristics of fresh and frozen stored turkey fed high-density and low-density rations.** *Poultry Sci.*, 1955, **34**, 640–648. [Dept. Foods Nutrit., Kansas State Coll., Manhattan.]

179

BELLACCI M., M. Obtención industrial de gelatina a partir de residuos de pescados. [**Industrial preparation of gelatine from fish residues.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 391–394.

180

SORGER-DOMENIGG, H., CUENDET, L. S., CHRISTENSEN, C. M. and GEDDES, W. F. **Grain storage studies. 17. Effect of mold growth during temporary exposure of wheat to high moisture contents upon the development of germ damage and other indices of deterioration during subsequent storage.** *Cereal Chem.*, 1955, **32**, 270–285. [Dept. Agric. Biochem., Inst. Agric., Univ. Minnesota, St. Paul.]

Half of a 40 kg. sample of sound hard red spring wheat of low mould count was inoculated with moulds (*Aspergillus* and *Penicillium* spp.) and the other half was treated with sodium hypochlorite before samples were kept for 5, 10 or 15 days at moisture contents of 15, 18 or 21 per cent. and subsequently stored in sealed jars at 14 per cent. moisture for 2 to 12 months before examination and small-scale milling and baking tests. Wheat with 21 per cent. moisture was also stored at 13 per cent. moisture.

Mouldiness greatly increased the germ damage, loss of viability and increase in fat acidity which resulted from temporary storage at a high moisture content, and although mould counts fell during subsequent storage at 14 or 13 per cent. moisture, germ damage and fat acidity went on increasing. Mouldy wheat held at 21 per cent. moisture had poor milling and baking qualities and the baking quality continued to deteriorate during storage at 14 per cent. moisture.

It is suggested that evaluation of wheat quality and prediction of its storage behaviour may require a combination of criteria, namely, moisture content, mould count, viability and fat acidity.

W. M. Deans.

181

KIERMEIER, F. and CODURO, E. Über den diastatischen Stärkeabbau in lufttrockenen Substanzen. [**Diastatic breakdown of starch in air-dried substances.**] *Biochem. Ztschr.*, 1954, **325**, 280–287. [Deutsch. Forschungsanst. Lebensmittelchem., Munich.]

The rate of breakdown of soluble starch by diastase at 37° C. increased with the water content when this was between 14 and 42 per cent.; above that it was constant. In presence of plant fibres (filter paper, supporting fibres of beech leaves) the enzyme was active down to 5·5 per cent. moisture, corresponding to a relative humidity of 46 per cent. in the air.—W. M. Deans.

182

KIERMEIER, F. and CODURO, E. Der Einfluss des Wassergehaltes auf Enzymreaktionen in wasserarmen Lebensmitteln. 3. Über Enzymreaktionen in Mehl, Teig und Brot. [**Effect of water content on enzyme reaction in foods of low water content. 3. Enzyme reactions in flour, dough and bread.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102**, 7–12. [Deutsch. Forschungsanst. Lebensmittelchem., Munich.]

For previous parts see Title 3149, Vol. 24 and preceding Abst.

3. This is part of a thesis by Coduro (Univ. Munich, 1953). At 30° C. the natural amylases, and also the proteases, of rye flour behaved like diastase (see preceding Abst.) except that there was no sharp change at a definite moisture content. Breads already shown (Abst. 283, Vol. 24) to retain amylase activity after baking were stored at 30° C. In "Knäckebrot" breakdown of starch was demonstrated even when the moisture content was as low as 5·14 per cent., corresponding to a relative humidity of 36 per cent.; this is ascribed to its porous structure. Breakdown of starch also occurred in wheat rolls and "Schlüter" (fine wholemeal) bread and rolls. It is thought likely that proteolytic breakdown may occur also during storage of bread and other dry foods.

W. M. Deans.

183

HISZPAŃSKA, C., PŁOŃSKA, H., RUTCZYŃSKA-SKONIECZNA, E., SZACHOWSKA, M. and ZALĘSKI, J. Wpływ dodatków innych arykułów żywności na wartość higieniczną chleba. [**The effect of some supplementary food products on the nutritive and organoleptic value of bread.**] *Rocz. Państwowego Zakł. Hig.*, 1955, **6**, 141–148. [Zakł. Badania Żywności i Przedmiotów Użytku PZH.] Russian and English summaries.

The addition of potato flakes or potato flake powder did not improve the nutritive value or taste of bread. Flakes of poor quality, containing large quantities of peel, increased the fibre content. The addition of whey, while improving the baking quality and the Ca content of the bread, greatly increased the acidity. Defatted soya bean flour increased the mineral content of sweet baked products but not the protein content, and introduced an undesirable flavour.—J. S. Thomson.

184

KIK, M. C. **Influence of processing on nutritive value of milled rice.** *J. Agric. Food Chem.*, 1955, **3**, 600–603. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

The systems of processing to which the rice had been subjected were the rice conversion process in which it is soaked and dried *in vacuo* and the Malek process in which rice is steamed under pressure. Analytical data are presented for proximate constituents and for contents of vitamin B complex components, Ca, P and Fe and 17 amino-acids ; biological value and digestibility for the rat are given. The general improvement in nutritive value produced by such treatments is confirmed.

D. Harvey.

185

SUBBA RAO, G. N., BAINS, G. S., BHATIA, D. S. and SUBRAHMANYAN, V. **Processing of millets and cereals (other than rice) into rice substitutes.** *Trans. Amer. Assoc. Cereal Chem.*, 1953, **11**, 167–171. [Central Food Technol. Res. Inst., Mysore.]

Owing to the scarcity of rice in India in recent years experiments were made to find a simple technique by which other grains, such as wheat, millet and maize, could be made palatable and easy to cook by way of substitutes. Attention was directed towards changing the composition of the cooking medium, pre-cooking of wheat, removal of seed coat by chemical and physical means and using a mixture of millet and cereal flours with tapioca flour.—J. S. Thomson.

186

EMILSSON, B., NILSSON, R. and WRAGHE, H. O. Användning av groningshämmande medel vid lagring av matpotatis. **3.** Försök under lagringssäsongerna 1952–53 och 1953–54. [**Use of sprout-inhibiting substances in storing ware potatoes. 3. Experiments in the storage seasons 1952-53 and 1953-54.**] *Kungl. Lantbruksakad. Tidskr.*, 1955, **94**, 141–158. English summary.

For previous parts see Absts. 4542, Vol. 19 ; 190, Vol. 22.

Sprouting of potatoes was satisfactorily inhibited by spraying the crop with maleic hydrazide, 2500 g. per hectare, from 4 to 6 weeks before lifting. Treated potatoes did not blacken so readily on boiling. Nevertheless, the practice is not generally recommended, since weight loss on storage was increased and, with some varieties, loss due to disease was also increased.

Additional studies with other chemicals showed that a preparation of dinitrotoluene was slightly and one of *iso*propylphenylcarbamate ten times more powerful than Fusarex (tetrachloronitrobenzene).—W. M. Deans.

187

HEINZE, P. H., KIRKPATRICK, M. E. and DOCHTERMAN, E. F. **Cooking quality and compositional factors of potatoes of different varieties from several commercial locations.** *U.S. Dept. Agric., Tech. Bull.* No. 1106, March 1955, pp. 69.

188

KIERMEIER, F. and RICKERL, E. Über die Ursachen der Verfärbung gedämpfter Kartoffeln. 1. Der Einfluss phenolischer Körper. [**Causes of discolouration of steamed potatoes. 1. Effect of phenolic substances.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **100**, 441–449. [Deutsch. Forschungsanst. Lebensmittelchem., Munich.]

The literature is reviewed with special reference to phenolic substances as a possible cause of discolouration of cooked potatoes.

Paper chromatography of alcoholic extracts with a 4 : 1 : 5 mixture of butanol, acetic acid and water as solvent and ferrous sulphate or phosphomolybdic acid as developer revealed the presence in steamed peeled old potatoes of a single variety, per 100 g. fresh substance, of from 24 to 37 mg. chlorogenic acid (simultaneously discovered as a constituent of potatoes by Johnson and Schaal (*Science*, 1952, **115**, 627)). New potatoes had about half and old raw peeled potatoes about a tenth as much. Small amounts of caffeic acid were detected also. Chlorogenic acid gives a greyish green colour with salts of Fe and is considered a possible cause of discolouration of potatoes.—W. M. Deans.

189

SCHOUSTRA, A. and WILLEMS, J. J. L. Het koken van aardappelen voor het zoutlose dieet. [**Boiling potatoes for the salt-free diet.**] *Voeding*, 1955, **16**, 706–708. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.] English summary.

The question whether unpeeled potatoes boiled in salted water along with peeled potatoes remain sufficiently free of salt to be harmless to patients on a salt-free diet is discussed. Three experiments were made : (1) unpeeled potatoes were boiled along with peeled potatoes in water containing 1 g. salt per 100 g. peeled potatoes ; the water half-covered the potatoes and had to be poured off after boiling ; (2) the unpeeled potatoes were placed on a saucer on top of the peeled ones, otherwise the conditions were as above ; (3) as (2), but no salt was added to the water. Raw peeled potatoes were found to contain 20 mg. salt per 100 g. potato, peeled potatoes boiled in salted water 356 mg. and unpeeled 18 mg. If the unpeeled potatoes were put on a saucer they contained 13 mg. per 100 g. in the pan with salted water and 8 mg. in

the pan without salt. It is therefore permissible to boil potatoes in salted water for patients on a salt-free diet, provided the potato skins are unbroken.—M. Eddison.

190

LEE, F. A., WAGENKNECHT, A. C. and HENING, J. C. **A chemical study of the progressive development of off-flavor in frozen raw vegetables.** *Food Res.*, 1955, **20,** 289–297. [New York State Agric. Exp. Stat., Cornell Univ., Geneva.]

In continuation of previous work (Title 1483, Vol. 21 ; Abst. 1734, Vol. 25), unblanched peas, snap beans and sweet corn frozen and stored at 0° F. for up to 2 years were found to develop off-flavours after about 2 weeks ; some persons could not detect these even much later, which possibly accounts for statements that blanching is not essential. Crude lipids extracted from the vegetables began to increase in acidity after about 1 week. Peroxides did not appear till later, after 3, 4 and 8 weeks, respectively. As was found earlier, peroxides appeared in the lipids of blanched sweet corn after 18 months.—W. M. Deans.

191

MOORJANI, M. N. and BHATIA, D. S. **Storage effects on the proteins of groundnuts.** *J. Sci. Indust. Res.* [*B*], *India*, 1954, **13,** 113–114. [Central Food Technol. Res. Inst., Mysore.]

Groundnuts stored for 18 months at 20° to 30° C. showed a loss of true protein N of 11 per cent., of N soluble in NaCl of 10 per cent. and of N in the NaCl extract precipitable by trichloroacetic acid of 14·6 per cent. Digestibility estimated by pepsin and trypsin digestion was reduced by 7·9 per cent. The protein had become partly denatured.

J. S. Thomson.

192

NOWAK, E. Qualitätsprüfung von Sojakuchen und -Extraktionsschroten. [**Testing the quality of soya cakes and extracted meals.**] *Bodenkultur*, 1954, **8,** 54–56. [Landwirtsch. Chem. Bundesversuchsanst., Vienna.]

In 3 dark-coloured samples of soya meal 2 or 3 times as much of the crude protein was non-digestible as in a normal sample, which pointed to damage of the proteins by overheating. In only one of them did the proportion of free fatty acids, as oleic acid, in the oil exceed 50 per cent., the figure suggested as a normal limiting value. Soya cake should not have more than 15 per cent. of free fatty acids in the oil.—W. M. Deans.

193

SCHALLER, A. Probleme und Fortschritte der Süsswarenlagerung. Ursachen und Vermeidung von Qualitätsveränderungen. [**Problems and advances in storage of confectionery. Causes and prevention of changes in quality.**] *Lebensmittel u. Ernährung*, 1955, **8,** No. 8, 7–10.

A short review.

194

GRAU, C. R. and ZWEIGART, P. A. **The effects of various processing methods on the value of cottonseed meal as an amino acid source for chickens.** *Poultry Sci.*, 1955, **34,** 724–728. [Dept. Poultry Husb., Davis, Calif.]

Cottonseed meals, free from gossypol, produced in 24 different ways, were compared in trials with chicks from hatching to 2 weeks of age. The methods of production included screw and hydraulic press and solvent extraction at temperatures from 188° to 240° F. Some of the meals were commercial products about which information on the temperature was not available, and others were prepared in the laboratory. The percentage of protein in the meals ranged from 34 to 58, and in the trial each was included in a standard ration to give a total of 20 per cent. protein. As a control a similar ration with fishmeal was used. The results, based on comparison of growth rates, showed that some of the meals were satisfactory, but there was no guarantee that any one method would produce a satisfactory meal. There was some indication that the better meals were produced at the lower temperatures.—T. D. Bell.

195

JONASSEN, H. B. and DEMINT, R. J. **Interaction of gossypol with the ferrous ion.** *J. Amer. Oil Chem. Soc.*, 1955, **32,** 424–426. [Tulane Univ., New Orleans, La.]

196

DIJKSTRA, N. D. Proefnemingen over het bewaren van natte bostel. [**Experiments on the preservation of brewer's wet grains.**] *Versl. Landbouwk. Onderzoek.*, 1955, No. 61.4, pp. 11. English summary.

Two lots of brewer's grains each of roughly 10,000 kg. were ensiled, one in a waterproof concrete silo and one in a pit. Analyses before and after storage from April to December and the results of 10-day digestibility trials with wethers in which the grain was given with 300 g. dried clover are reported. Mean digestibility coefficients for silo and pit silage were : organic matter 64·9 and 55·0, crude protein 78·3 and 70·6, crude fat 91·8 and 90·2, N-free extract 57·9 and 44·3, crude fibre 51·0 and 38·3. The silo silage was of better quality, with less butyric acid, and percentage losses were less, 12·2 as against 29·8 for digestible crude protein and 13·7 as against 31·0 for starch equivalent.—I. Leitch.

197

DIJKSTRA, N. D. and SPRENGER, J. J. I. Proefnemingen over de achteruitgang van de verteerbaarheid bij het kunstmatig drogen van gras. [**The effect of artificial drying on the digestibility of grass.**] *Versl. Landbouwk. Onderzoek.*, 1955, No. 61.1, pp. 24. English summary.

Improvements have recently been made in the technique of drying grass. In high-temperature driers inlet and outlet temperatures are from 600° to 900° and from 140° to 180° C. In low-temperature band driers inlet and outlet temperatures are below 200° and from 120° to 140° C. Experiments with different samples of grass chopped, dried at high temperatures and sometimes ground and cubed, or dried at low temperatures, showed little difference in digestibility by wethers. Protein was most affected, but even so the reduction was only 2 to 3 per cent. or 5 to 6 per cent. after grinding and cubing. Carotene also was lost in grinding and pressing. In high-temperature drying the inlet temperature does not appear to matter. A low outlet temperature determines quality.

I. Leitch.

198

DIJKSTRA, N. D. and BRANDSMA, S. Proefnemingen over het ensileren van voorgedroogd gras. [**Experiments on silage making by the wilting method.**] *Versl. Landbouwk. Onderzoek.*, 1955, No. 61.3, pp. 45. English summary.

A detailed account is given of 3 years' silage making with wilted grass: 1951, spring and autumn silage, 1952, one spring and two autumn, 1953, three spring silages, and in 1952 and 1953 hay made on frames from the same grass. Butyric acid in silage varied inversely with the dry matter content. Losses of digestible crude protein ranged from 16·1 to 33·4, average 24·2 per cent., and of starch equivalent from 20·8 to 36·3, average 27·5 per cent. The losses in silage of digestible crude protein in the 2 years were about 71 and 58 per cent. and of starch equivalent 66 and 62 per cent. of the losses in hay from the same crop.

I. Leitch.

199

PARISH, D. H. **The losses on conservation with mineral acid silage produced in small silos.** *Res. and Exp. Rec. Minist. Agric. N. Ireland*, 1952–53 (1955), **3**, 160–165.

A small-scale experiment with Italian ryegrass ensiled with a 2 : 1 mixture of HCl and H_2SO_4 under pressure in 4 dustbins with holes in the base for drainage is reported, with tables of analytical findings. After 11 months the silage was of excellent quality, with *p*H from 3·93 to 4·03. Loss of organic matter was high, about 30 per cent.; this was not due to moulding but may have been due to the presence of yeasts. There was, however, no loss of crude protein, which shows the possibilities of the A.I.V. method for preserving herbage rich in protein.—W. M. Deans.

200

ALDERMAN, G., COWAN, R. L., BRATZLER, J. W. and SWIFT, R. W. **Some chemical characteristics of grass and legume silage made with sodium metabisulfite.** *J. Dairy Sci.*, 1955, **38**, 805–810. [Dept. Animal Nutrit., Pennsylvania State Univ., University Park.]

Forty-eight samples of silage made from grass and legumes, either mixed or separately, with the addition of 8 to 10 lb. sodium metabisulphite per ton of green matter were analysed. The average *p*H was 4·49, a value higher than is found in good silage made by other methods. Lactic acid values were low also, but the silage was nevertheless well preserved, little butyric acid was formed and protein breakdown was satisfactorily reduced. It is suggested that in silage made by this method it is the action of the bisulphite ion, not the hydrogen ion, that is important.—T. D. Bell.

201

BRATZLER, J. W., COWAN, R. L. and SWIFT, R. W. **Preservation of grass silage with sodium metabisulfite.** *Pennsylvania Agric. Exp. Stat. Bull.* No. 597–P, April 1955, pp. 6.

Grass silage can be preserved for long periods by the addition of 8 lb. bisulphite per ton of forage in a tower silo or 10 lb. per ton in a trench silo. (See Abst. 3322, Vol. 25.)—J. S. Thomson.

202

FOOT, A. F., MURDOCH, J. C. and ROWLAND, S. J. **Marrowstem kale silage.** *Empire J. Exp. Agric.*, 1955, **23**, 109–112. [Nat. Inst. Res. Dairying, Reading.]

Kale was ensiled in large and small silos. The dry matter of the kale before ensiling ranged from 14·6 to 15·4 per cent. and the crude protein from 11·3 to 14·8 per cent. of the dry matter; after ensiling, from 16·45 to 18·13 and from 12·0 to 14·4 per cent., respectively. Loss of dry matter was highest in the large silos, 32·5 to 37·8 per cent. as against from 23·9 to 25·1 in the small silos, but in the latter the loss of dry matter in the effluent was much higher. The addition of chopped hay before ensiling had no beneficial effect on the quality of the silage or on the amount of seepage.

J. S. Thomson.

See also Absts. 212, 217, 220, 231, 246, 253, 288, 289, 321, 339, 358, 904.

CULTURE OF MICRO-ORGANISMS FOR FOOD

See Abst. 165.

2. CHEMICAL COMPOSITION OF FOODSTUFFS

(Except Vitamins, for which see Section 3)

ENERGY VALUE, PROXIMATE PRINCIPLES AND INORGANIC CONSTITUENTS

GENERAL

203

WILLIAMS, H. H. **"Essential" amino acid content of animal feeds.** *Cornell Univ. Agric. Exp. Stat. Memoir* No. 337, January 1955, pp. 31.

Microbiological methods are discussed and the procedure is fully described for estimating arginine, *iso*leucine, threonine, tryptophan, tyrosine and valine with *Streptococcus faecalis*, and histidine, leucine, lysine, methionine and phenylalanine with *Leuconostoc mesenteroides*. Data for the content of N and of these 11 amino-acids are presented for 69 feedingstuffs commonly used as sources of protein for animals, and their applicability in the calculation of the amino-acid content of mixed feeds is demonstrated.—D. Harvey.

204

BONDI, A. and BIRK, Y. **The action of proteolytic enzymes on protein feeds. 1. Liberation of terminal groups from peptic and pancreatic digests.**

BIRK, Y. and BONDI, A. **2. Intermediary products precipitated by trichloroacetic acid and phosphotungstic acid from peptic and pancreatic digests.** *J. Sci. Food Agric.*, 1955, **6**, 543–548; 549–556. [Agric. Res. Stat., Rehovoth, Israel.]

1. The liberation of terminal groups (COOH, NH_2 and α-NH_2) and the COOH : NH_2 ratio in digests of typical animal and plant protein feeds *in vitro* by pepsin and pancreatin was characteristic of the enzyme and independent of the substrate. Plant proteins were more soluble than animal proteins. Digestion with pepsin released small amounts of α-NH_2 groups, pancreatin more and pancreatin digestion after incubation with pepsin still more.

2. The feeds of the previous experiment were enzymically digested and treated with trichloroacetic and phosphotungstic acids. The number of amino-acids in the peptides precipitated by trichloroacetic acid from a pancreatin digest of plant proteins ranged from about 20 to 30. This relatively stable protein fraction was not found in animal feeds. Its presence in plant feeds is suggested as a possible reason for the lower nutritive value of plant proteins.—A. Hepburn.

FOODSTUFFS OF ANIMAL ORIGIN

Milk and Milk Products

205

FORD, T. F., RAMSDELL, G. A. and LANDSMAN, S. G. **Composition of the casein-containing particles in milk.** *J. Dairy Sci.*, 1955, **38**, 843–857. [E. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Washington 25, D.C.]

Most casein in particles from fresh skimmed milk appeared to be a single phosphoprotein, which from the organic P : N ratio was probably a mixture of α-, β-, and γ-caseins or, alternatively, the latter existed separately in particles of comparable size. Calcium and $Ca_3(PO_4)_2$ were considered to be combined with phosphoprotein as a complex. Inorganic P varied between milks and decreased with particle size, but in milks of low Ca content and for the smallest particles removed there was a definite minimum proportion. The largest particles had a different composition and contained some non-protein material.

A. Hepburn.

206

BEAU, M. Études sur la caséine. **[Studies on casein.]** *Lait*, 1955, **35**, 1–13; 258–272.

207

GORDON, W. G. and ZIEGLER, J. **Amino acid composition of crystalline α-lactalbumin.** *Arch. Biochem. Biophys.*, 1955, **57**, 80–86. [E. Reg. Res. Lab., Philadelphia, Pa.]

208

ASCHAFFENBURG, R. and DREWRY, J. **Occurrence of different beta-lactoglobulins in cow's milk.** *Nature*, 1955, **176**, 218–219. [Chem. Dept., Nat. Inst. Res. Dairying, Univ. Reading.]

Milk from individual cows contained either a mixture of 2 electrophoretically distinct β-lactoglobulins or one of these. The type produced appears to be characteristic for a given cow. β_1-Lactoglobulin, β_2-lactoglobulin and a mixture of

the 2 was found in the milk of 7, 33 and 30 cows, respectively. The β_1- and β_2-lactoglobulins prepared from appropriate milk had distinctive crystals, and preliminary work indicates differences in isoelectric point and solubility.

A. Hepburn.

209

RIEL, R. R. **Variation in fat constants of genuine Canadian milk fat.** *J. Assoc. Off. Agric. Chem.*, 1955, **38,** 494–503. [Sci. Serv., Canada Dept. Agric., Ottawa.]

Reichert Meissl and Polenske values and refractive index are tabulated for monthly samples from June 1953 to May 1954 from 29 butter factories representative of dairying regions in the 8 provinces of Canada, with graphs of frequency distributions. The monthly averages for all factories represent about 5300 herds and 39,000 cows. The overall averages and 95 per cent. fiducial limits were: Reichert Meissl value 27·8, 25·1 to 30·5; Polenske value 2·0, 1·4 to 2·6; refractive index 1·45419, 1·45326 to 1·45512. The ranges are narrower than those reported in the literature. Differences between provinces and between months were significant. Reichert Meissl values decreased from June to November and rose from November to April. The decline in autumn may be due to poor feeding and bad weather or to end of lactation. Polenske values were highest in June and July and refractive index was high in summer and low in winter.—W. M. Deans.

210

SCHÄFER, K. H., BREYER, A. M. and KARTE, H. Das Spurenelement Eisen in Milch und Milchmischungen. **[The trace element iron in milk and milk mixtures.]** *Ztschr. Kinderheilk.*, 1955, **76,** 501–513. [Kinderklin., Univ. Göttingen.]

Since the published values for the Fe content of human and cow's milk, found by ashing, vary widely, an extensive study was made in which Fe soluble in 6*N* HCl was estimated colorimetrically by the phenanthroline method as used by Heilmeyer and Plötner (*Das Serumeisen und die Eisenmangelkrankheit*, Jena, 1937) in several hundred samples of human milk at different stages of lactation; and from 50 to 70 analyses were made of cow's, ewe's and goat's milk and of cereal gruels and other preparations for feeding infants. Some of the results have appeared already (Title 2355, Vol. 20; Abst. 191, Vol. 21; Schäfer, *Erg. inn. Med.*, 1953, **4,** 705).

Human milk is richer in Fe than the milks of the animals studied, but the amount declines from over 120 μg. per cent. in the first 10 days to about 90 after 6 months. These are 1947–48 values, but those of Klarczyk (*Thesis*, Univ. Hamburg, 1954), in 1953–54 when food supplies were normal, are similar. The decline seems to be less in summer than in winter. Contrary to the view of Albers (*Eisen bei Mutter und Kind*, Leipzig, 1941), giving Fe by mouth to the nursing mother does not raise the Fe content of her milk.

For the milk of cow, ewe and goat collected in aluminium or glass vessels in summer the respective values 67, 64 and 25 μg. per cent. were found. Of the cereal gruels, 5 per cent. oatmeal gruel had most, 294 μg. per cent.; gruel of barley 173, of dried barley 266 and of rice only 86 μg. The usual "half-milk" prepared with 5 per cent. oatmeal gruel and 5 per cent. sugar had 188 μg. It is suggested that the greater liability to anaemia of infants fed on mixtures of cow's milk and oatmeal than of breast-fed infants may be due to interference with Fe absorption by the phosphates of cow's milk and the phytic acid of oatmeal. Soya milk is remarkably rich in Fe (1000 μg. per cent.) and this Fe is available, as has been shown by Borngräber (*Thesis*, Univ. Göttingen, 1951) with anaemic infants, and by Krause (*Thesis*, Univ. Göttingen, 1951) with rats anaemic from feeding on cow's milk.

The Fe in milk is not dialysable. The percentage of the total Fe (found by ashing) soluble in 6*N* HCl was 72 for human milk, 79, 91 and 86 for the milk of cow, ewe and goat, respectively, and 97 for soya milk. That is, the acid-soluble Fe can be taken as representative of the total Fe.

Studies of the distribution of acid-soluble Fe in human and cow's milk showed that only about half is in the skimmed milk or whey and most of the other half is bound to fat. Electrophoretic studies of whey, both human and cow, to be more fully reported elsewhere, showed that most of the Fe is associated with the immune globulins, not with β-lactoglobulin. This has been confirmed with milk to which radio-active Fe was added (Title 1950, Vol. 24) and by preliminary experiments with the ultracentrifuge.—W. M. Deans.

211

RAI PURI, B. and LAL GUPTA, H. **Studies in physico-chemical properties of milk. 5. Viscosity of milk.** *Indian J. Dairy Sci.*, 1955, **8,** 78–82. [Dept. Chem., Punjab Univ., Hoshiarpur.]

212

MANI, G. S., LILY, G., BALASUBRAMANIAN, S. C. and BASU, K. P. **Composition and nutritive value of some indigenous milk products.** *Indian J. Med. Res.*, 1955, **43,** 237–242. [Dairy Chem. Sect., Indian Dairy Res. Inst., Bangalore.]

Samples of boiled milk, dahi (curd), khoa, kheer and channa, the forms in which milk is commonly consumed in India, were analysed for fat, protein,

lactose, minerals, total solids, Ca, P, vitamin A, vitamin B_1, riboflavin, nicotinic acid and ascorbic acid. The samples of milk and of the products were all from a mixed lot of fresh cow's milk.

Milk had a higher nutrient content than any of the products. Dahi had slightly lower vitamin A, vitamin B_1, riboflavin and nicotinic acid contents than milk; the lactose content of milk decreased by about 34 per cent. on curdling. Khoa had lower vitamin A and C contents; kheer had a composition similar to that of milk but had less vitamin A and C. Channa had the lowest content of nutrients, especially of vitamins of the B group, lactose, vitamin A and ascorbic acid; it had no nicotinic acid.—G. F. Garton.

(See also Absts. 881–3, Vol. 26).

213

VALENTI, G. Osservazioni sulla viscosità dinamica e cinematica del latte di capra durante la lattazione. [**Observations on the dynamic and kinematic viscosity of goat's milk throughout lactation.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 1143–1145. [Cat. Ispezione Alimenti Origine Animale, Univ. Messina.]

214

ŠEBELA, F., KÜHR, J. and PAVEL, J. Příspěvek k poznání složení kobylího mléka. [**On the composition of mare's milk.**] *Acta Univ. Agric. et Silvicult. Brno*, 1955, [A], 33–42. [Inst. Dairy Sci., Agric. Univ., Brno.]

For the milk of 9 mares from Southern Moravia the following percentage composition was found: water 89·44, total solids 10·63, fat 1·41, protein 1·78, sugar 6·66, ash 0·48, solids-not-fat 9·32 [as given].—M. Prokšová (Czechoslovakia).

215

NUÑEZ DE LOS RIOS, J. M. Análisis bromatológico y microbiológico de las cremas lácteas. [**Bromatological and microbiological analysis of cream.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 127–129.

Studies were made on 4 kinds of cream, 2 thin and 2 thick, obtainable commercially in Lima. The mean composition was water 56·13, fat 34·04, protein 2·24 and sugar 3·39 per cent. The mean vitamin A content was 146 I.U. [? per g.]. All the samples contained traces of gelatine. Bacterial counts were of the order of 41,000 per ml. or g.—D. Duncan.

216

BROGIONI, M. Recherche et dosage du diacétyle dans le beurre produit dans la province de Pérouse. [**Studies on and estimation of diacetyl in butter produced in the province of Perugia.**] *Lait*, 1955, **35**, 276–282. [Lab. Provinc. Igiene Profilassi, Reparto Chim., Perugia.]

Fifty g. butter was steam-distilled between 105° and 110° C. and the first 15 ml. of distillate was collected in 5 ml. distilled water. Diacetyl was estimated by the method of Pien (Title 4373, Vol. 19). Values found in different butters ranged from 0·46 to 0·80 mg. per kg.

A. Hepburn.

217

WEGELIN, E. **On the proteins of milk whey. The nitrogen distribution in whey, electrophoretic characterization of proteins, and feeding experiments.** *Versl. Landbouwk. Onderzoek.*, 1952, No. 58·3, pp. 147.

For preliminary reports on this work see Seekles and Wegelin (Abst. 1043, Vol. 23), Seekles (Vergadering van het Genootskap ter bevordering van Melkkunde, Utrecht, 1951, *Nederlands Melk Zuiveltijdschr.*, 1951, **5**, 259 and Wegelin, *ibid.*, 263.

In the Netherlands about 1 million tons of whey are produced annually. Of this about 2 per cent. is used as food, some for animal feed and the rest is wasted. A certain amount of lactalbumin for animal feeding is got as a by-product of the lactose industry, but it is injured by heat denaturation.

This report describes studies by electrophoresis of proteins in whey as delivered from cheesemaking, *i.e.*, from pasteurised milk, and after further heat treatment, salting out, electrodialysis and condensing. Dried whey also was analysed. There are 4 main components: (1) "Whey protein", which occurs in rennin whey but not in acid whey, (2) β-lactoglobulin, (3) a highly soluble albumin not yet identified, and (4) a heterogeneous globulin fraction (that precipitated by saturation with $MgSO_4$) with which the immune bodies of milk are associated.

Ultracentrifugal analysis gives 3 components of which the first, the α-fraction, includes (1) and (3) of the electrophoretic analysis.

In terms of decreasing resistance to heat, fraction $3 > 2 > 1 > 4$. Condensing at temperatures below 49° C. has little effect beyond that already produced by pasteurisation. Electrolytic desalting removes part of the N.P.N. of whey and causes further slight changes in the residue. Analysis of samples of dried whey showed that the electrolytic process removes riboflavin with lactose and vitamin B_{12} possibly directly.

To compare whey proteins from cow's milk with those from breast milk, the breast milk was centrifuged to remove fat and the casein was coagulated with $CaCl_2$, citric acid and rennet. The clear filtrate was dialysed against a citrate-phosphate-KCl buffer and concentrated by freezing to a protein concentration of 1·04 g. per 100 ml. Component (1) of cow's milk whey was absent; the first component of breast milk whey corresponded

to β-lactalbumin but was present in a concentration of only 10 per cent. as compared with 54 per cent. in cow's milk whey. The main components were two more slowly moving proteins for which the ascending and descending patterns were so different that, with the amount of milk available, further analysis was not possible. They were different from the bovine constituents.

A further study of pooled breast milk, from the Milk Bank, pasteurised and lyophilised, again showed no "whey protein", β-lactoglobulin, a component corresponding to (3) in cow's milk whey and a third corresponding to the third component in fresh breast milk but of different mobility.

In experiments in which rats, chicks, twin calves and pigs were given whey, dried or desalted and dried, the lactose was inefficiently used (as shown by reducing substances in faeces and urine). The proteins were considered to be of as high value as other animal proteins.—I. Leitch.

Eggs

218

TSUJI, F. I., BRIN, M. and WILLIAMS, H. H. **Lipide phosphorus and cholesterol changes in the hen's egg during incubation.** *Arch. Biochem. Biophys.*, 1955, **56,** 290–296. [Dept. Biochem., Cornell Univ., Ithaca, N.Y.]

Eggs from White Leghorn hens were incubated at 37·8° C. for from 6 to 21 days. The eggs were then dissected into embryo and residual yolk and each portion was analysed for lipids.

Lecithin P, cephalin P, total lipid choline and free cholesterol decreased, with incubation, in the residual yolk and showed a corresponding increase in the developing embryo; a progressive increase in esterified cholesterol occurred in both embryo and yolk. Although the unincubated egg contained almost no sphingomyelin, some was synthesised in the developing embryo. The total cholesterol content of the whole egg did not change appreciably during incubation.—G. A. Garton.

219

WORONICK, C. L. and GRAU, C. R. **Gossypol-cephalin compound from fresh eggs of hens fed cottonseed meal.** *J. Agric. Food Chem.*, 1955, **3,** 706–707. [Dept. Poultry Husb., Univ. California, Davis.]

Meat (All Kinds)

220

REITH, J. F., HOFSTEEDE, M. J. N. and LANGBROEK, W. **The nitrogen content of meat and the calculation of the meat content of meat products.** *J. Sci. Food Agric.*, 1955, **6,** 317–323. [Dept. Food Chem., Univ. Utrecht, Catharijnesingel 60.]

The formula of Stubbs and More for the calculation of "lean meat content" of meat products on the basis of their N content is discussed, in particular, the factors 3·4 for beef and 3·6 for pork. Published analyses of English, Dutch, American and German meat permitted calculation of the mean N content of fat-free beef and pork; for pork the factor 3·6 of the Stubbs and More formula was found to be higher than most of the values thus obtained. The relation between the Stubbs and More factors and the district where the animal was reared, the age of the animal and the fat content of the meat is discussed. N, fat and moisture were estimated in 19 samples of fresh Dutch pork and 19 samples of salted Dutch pork. The mean Stubbs and More factor for the fresh pork was found to be 3·4. The mean factor obtained for animals aged from 5½ to 6 months was the same as that for animals aged from 7 to 8 months. The data showed a slight negative correlation between the fat content and the Stubbs and More factor, but more significant was the influence of breed, as Yorkshire pigs generally showed a lower Stubbs and More factor than the "Veredeld Landvarken" stock. The losses of moisture and protein during the salting of the pork are calculated.—G. F. Garton.

221

REITSMA, K. Vlees en vleeswaren. **[Meat and meat products.]** *Voeding*, 1955, **16,** 726–736.

A chapter for a new textbook of nutrition (see Abst. 3588, Vol. 24).

222

HANSEN, R. P., SHORLAND, F. B. and COOKE, N. J. **The branched-chain fatty acids of ox fat. 2. The isolation of 15-methylhexadecanoic acid.** *Biochem. J.*, 1955, **61,** 141–143. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

By methods which included low-temperature crystallisation and ester fractionation, 15-methylhexadecanoic acid was isolated as 0·06 per cent. of the total fatty acids from 14·5 kg. of ox perinephric fat after hydrogenation.—G. A. Garton.

223

HAMILTON, P. B. and ANDERSON, R. A. **Hydroxylysine in proteins.** *J. Amer. Chem. Soc.*, 1955, **77,** 2892–2893. [Dept. Biochem., A.I. du Pont Inst., Nemours Found., Wilmington, Del.]

Of many proteins examined, only collagen contained hydroxylysine.—A. Hepburn.

See also Abst. 149.

Fish

224

CASTRO G., G. L. Análisis químico bromatológico de carnes y ovas ahumadas de la Serda

Chiliensis, " Bonito ". [**Bromatological chemical analysis of smoked flesh and roe of *Serda chiliensis*, bonito.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 66–74. [Lab. Tecnol., Pesquera, Callao.]

Salted and smoked flesh and roe of bonito contained, respectively, dry matter 45·3, 72·3, protein 35·9, 34·0 and ether extract 6·4, 10·9 per cent. The fat of the flesh contained 7420 I.U. vitamin A and 724 I.U. vitamin D per g. The flesh supplied 290·9 and the roe 233·5 Cal. per 100 g. The protein content was about 10 per cent. higher than that of fresh fish. When smoked at 80° to 85° F. for 25 hr. the preserved material kept well for 3 months.—T. D. Bell.

225

CISNEROS A., V. Preparación y estudio bromatológico de la carne ahumada del Mustelus Dorsalis o " tollo blanco ". [**Preparation and bromatological study of smoked flesh of *Mustelus dorsalis* (dogfish).**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 75–80.

The process of salting and smoking by the slow method of the flesh of the dogfish *Mustelus dorsalis* (" tollo blanco ") is described. The preserved flesh had dry matter 73·2, protein 52·2, ash 18·7 and ether extract 1·8 per cent. It supplied 225 Cal. per 100 g. and the fat contained 5500 I.U. vitamin A and 55 I.U. vitamin D per g.

T. D.Bell.

226

CÓRDOVA URTEAGA, A. Estudio bromatológico de la carne de Cheilodactylus Variegatus o " Pintadilla ". [**Bromatological study of the flesh of *Cheilodactylus variegatus* or " pintadilla " (the " painted fish ").**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 81–84.

Analysis of the flesh of the " painted fish " or " pintadilla " (*Cheilodactylus variegatus*) gave the following results : dry matter 24·5, protein 19·2 and ether extract 2·8 per cent. The fat had 8000 I.U. vitamin A per g., and 100 g. fresh material supplied 96·3 Cal. The fish had a pleasant taste and could be recommended for human consumption.

T. D. Bell.

227

GALLEGOS VILLA, A. Contribución al estudio bromatológico de la carne ahumada del Ethmidium Chilcae o " Machete ". [**Bromatological study of the smoked flesh of the spiny fish *Ethmidium chilcae* or " machete ".**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 103–108.

The spiny fish " machete " (*Ethmidium chilcae*) salted and smoked slowly for 4 days could be kept for 4 or 5 months. It had the following composition : dry matter 84·6, protein 52·9, ether extract 20·2 per cent. Vitamin A content was 11,332 I.U. per g. fat. It compared favourably with other fish of the Peruvian coast.—T. D. Bell.

228

MOCK MORALES, E. Contribución al estudio bromatológico de la Sciaena deliciosus (Lorna). [**Bromatological study of *Sciaena deliciosa* (a shore fish).**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 118–122.

The fresh and dried salted shore fish " lorna " (*Sciaena deliciosa*) contained, respectively, dry matter 25·5, 71·6 ; protein 16·0, 42·6 ; ether extract 2·0, 5·2 ; ash 1·5, 18·6 per cent. The energy values were 82 and 218 Cal. per 100 g. The fat of the fresh fish contained 6300 I.U. vitamin A. The salted product showed no sign of deterioration after 45 days.—T. D. Bell.

229

MORALES GALLEGOS, L. Estudio bromatológico de la carne ahumada del " Solea Vulgaris " o Lenguado. [**Bromatological study of the smoked flesh of *Solea vulgaris*, the sole.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 123–126.

Sole was preserved by salting and slow smoking. The smoked product, which could be kept for 4 or 5 months, had the following composition : dry matter 78·4, protein 51·8, ether extract 8·3, ash 17·4 per cent. The energy value was 282·5 Cal. per 100 g.—T. D. Bell.

230

PALOMINO G., J. A. Contribución al estudio bromatológico de la Sciaena Starksi—Robalo—. [**Bromatological study of *Sciaena starksi* (a shore fish).**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 148–155.

The flesh of the shore fish " robalo " (*Sciaena starksi*) contained, per cent. on fresh basis, protein 18·84, fat 2·82, carbohydrate 0·05 and ash 0·92. There was a high tyrosine content, 0·69 per cent., and a low tryptophan content, 0·20 per cent. The fat contained 12,008 I.U. vitamin A per g. The energy value was high. The fish can be successfully salted.—D. Duncan.

231

URCO NAJERA, A. Contribución al estudio bromatológico y ensayo de conservación de la Paralabrax Humeralis—cabrilla—. [**Bromatological study and attempt at preservation of *Paralabrax humeralis*, sea-bass.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 156–161.

The flesh of the sea-bass (*Paralabrax humeralis*) contained, per cent. on fresh basis, protein 16·77, fat 1·44, ash 1·10 and traces of carbohydrate. The percentages of tyrosine and tryptophan were 0·46 and 0·07. The fat contained 6930 I.U. vitamin A

per g. The energy value was 80 Cal. per cent., below the normal for fish.

The flesh was successfully salted and this could be done commercially. The salted fish contained, per cent., moisture 46·60, fat 2·77, ash 14·91, protein 34·91 and traces of carbohydrate. The energy value was again low for a dry product.

D. Duncan.

232

ZAMBRANO REYES, A. Análisis bromatológico de la carne de la "Merluccius Gayi" o Merluza seca (Peje Palo). [**Bromatological analysis of the flesh of *Merluccius gayi* (silver hake).**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 178–182.

Only small quantities of silver hake (*Merluccius gayi*) are caught off Peru. The analysis was made on the air-dried commercial product. The flesh contained 84 per cent. protein with 2·7 per cent. tyrosine and 1·25 per cent. tryptophan. The fat contained 9400 I.U. vitamin A per g.—D. Duncan.

233

CHEFTEL, R. I., MORETTI, J. and POLONOVSKI, J. Composition de l'huile de *Clupea pilchardus* Wal. en acides gras non saturés. [**Unsaturated fatty acid composition of the oil of *Clupea pilchardus*, Wal. (sardine).**] *Bull. Soc. Chim. biol.*, 1955, **37**, 709–714. [Lab. Biochem., Fac. Méd., Paris.]

Sardine (*Clupea pilchardus*) oil, 5 to 10 mg., was isomerised in a solution of ethylene glycol in KOH and diluted with methanol and the optical density was measured at 5 different wavelengths. From this the unsaturated fatty acid composition was calculated to within 5 per cent. error. The exact nature of each acid was not obtained, but it is suggested that hydrogenation followed by chromatographic analysis would give the proportion of acids as a function of their chain length. This information together with spectrometric data would allow a more precise estimation of the composition. The method was much better than other methods involving bromination and the use of lead and lithium salts.—A. Hepburn.

See also Abst. 884.

Other Types

234

CAIN, J. C. and MORTON, R. A. **Some minor constituents of liver oils.** *Biochem. J.*, 1955, **60**, 274–283. [Dept. Biochem., Univ. Liverpool.]

Liver lipids of Argentine shark, fin-whale, sheep, ox and horse were examined chromatographically, with particular reference to unsaponifiable matter. Ox liver fat unsaponifiable material yielded a compound $C_{19}H_{16}O$ [wrongly given as $C_{16}H_{19}O$ in summary], the absorption spectrum of which was indistinguishable from that of a compound isolated from butterfat by Morice (Abst. 1504, Vol. 21). Cholesta-3 : 5-dien-7-one, $\lambda_{max.}$ 270 mμ., was isolated from horse liver unsaponifiable material; another very similar substance, $\lambda_{max.}$ 272 mμ., probably containing 3 atoms of oxygen per molecule, was also obtained. In addition, horse liver lipids were found to contain a saturated higher aliphatic hydrocarbon and an unsaturated hydrocarbon, possibly hepene, $C_{45}H_{76}$. Carotenoids, mainly β-carotene, were found in horse, sheep and ox liver lipids. Horse kidney and spleen unsaponifiable matter contained, in addition to cholesterol, small amounts of 2 substances showing $\lambda_{max.}$ about 270 mμ. and 274 to 276 mμ., respectively, along with β-carotene and a waxy substance, probably a hydrocarbon.

G. A. Garton.

235

FERREYRA R., L. Estudio bromatológico de la carne del Lóligo Gahi "Jibia". [**Bromatological study of the flesh of *Loligo gahi* (a squid).**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 85–89.

The edible flesh of the squid "jibia" (*Loligo gahi*) had the following composition: dry matter 19·1, protein 15·7, ether extract 0·86. The energy value of 100 g. fresh material was 70·6 Cal. and the fat contained 6000 I.U. vitamin A per g.

T. D. Bell.

236

FLORES CASTAÑON, C. Valoración de los aminoácidos azufrados, metionina, cistina y cisteina en algunos moluscos. [**The sulphur amino-acids methionine, cystine and cysteine in some molluscs.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 90–98.

The methods are described in detail. The molluscs studied were species of squid (*Loligo*), mussel (*Mytilus*), "machas" (*Mesodesma*) and *Octopus*. The percentage of protein in dry matter was from 61 in *Mesodesma* to 88 in *Octopus*. On a dry matter basis, *Octopus* contained most methionine, 2 per cent., *Loligo* most cystine, 1·46 per cent., and *Mytilus* most cysteine, 0·54 per cent.

D. Duncan.

237

OKUYAMA B., V. Y. Contribución al estudio bromatologico [del] Thais Chocolata o "caracol negro". [**Bromatological study of *Thais chocolata* (an edible gastropod mollusc).**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 142–147.

The fresh flesh of the mollusc "caracol negro" (*Thais chocolata*) contained, per cent., protein 19·6, fat 0·6, carbohydrate 0·99 and ash 2·8. The ash contained, per 100 g., Ca 61·8 g., P 97, Fe 14 and Cu 2·2 mg. The vitamin A content was 6120 I.U. per g. fat. It is recommended that the mollusc be eaten fresh and not preserved.—D. Duncan.

238

VASQUEZ CASTILLO, A. Estudio bromatológico del Helix Aspersa " caracol común ". [**Bromatological study of *Helix aspersa*, the common snail.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 162–165.

The flesh of the snail, which is commonly eaten in Peru, contained on a dry basis protein 20, fat 1·76, total ash 2·41 g., Ca 22, Fe 17·2, P 72 and Cu 0·14 mg. per 100 g. The fat contained 2660 I.U. vitamin A per g. The snail is considered a valuable protein food.—D. Duncan.

See also Absts. 906, 914.

FOODSTUFFS OF VEGETABLE ORIGIN

General

239

OYENUGA, V. A. **Nigeria's feeding-stuffs. Their composition and nutritive value.** *Univ. Coll., Ibadan, Fac. Agric. Tech. Bull.* No. 1, July 1955, pp. 53.

Analytical data are presented for dry matter, crude and total protein, fat, fibre, total and silica-free ash and N-free extractives in 105 foods and feedingstuffs, almost all of vegetable origin. Digestible nutrients, except protein, which was estimated chemically, were calculated from the data by the use of coefficients obtained elsewhere. Over half of the bulletin is devoted to notes on the materials analysed and the plants from which they are obtained. Scientific names are given for all and dialect names for some.—D. Harvey.

240

OYENUGA, V. A. **The composition and nutritive value of certain feedingstuffs in Nigeria. 1. Roots, tubers and green leaves.** *Empire J. Exp. Agric.*, 1955, **23**, 81–95. [Div. Animal Nutrit., Fac. Agric., Univ. Coll., Ibadan.]

See preceding Abst.

241

SCHAMBYE, P. and JACOBSEN, I. **Cobalt content in some Danish soils, crops, fertilizers and concentrates.** *Roy. Vet. Agric. Coll., Copenhagen, Yearbook* 1955, 53–77.

Total Co was estimated in samples of surface soils and profiles from Jutland, in areas in which Co deficiency in cattle had been reported and in healthy areas. They represented the 3 main Danish soil types, clay, heath plain sand and diluvial sand. In 12 podsol profiles taken from deficient areas in 1949 the surface soil contained from 0 to 1·16 p.p.m. Co. The Co content of the leached layer increased downwards to the hardpan, which had the highest Co content. In samples from an experimental field in which plots had been manured with either farmyard manure or artificial fertilisers since 1894, the soil treated with farmyard manure contained 1·22 p.p.m. Co, that treated with artificial fertilisers 0·96 and unmanured soil 0·80 p.p.m.

In 1951 soil, pasture and field crop samples were taken from 20 areas, including those where soil profiles had been studied earlier. Co contents as low as 0·2 to 1·5 p.p.m. in heath sand and diluvial sand were not associated with signs of deficiency in cattle. There was little or no direct relation between soil Co and pasture Co, but crops grown on light and acid soil contained more Co than those from neutral soil. The Co content of grass ranged from 0·04 p.p.m. [given as 0·01 in summary] on a sandy loam to 0·21 p.p.m. on a heath sand area [the values are not given in relation to the occurrence of disease in cattle]. Oats, barley and rye contained even less Co than grass, from 0 to 0·07 p.p.m., with little difference between grain and straw. Beet pulp contained from 0·003 to 0·33 p.p.m. and beet leaves from 0·05 to 0·33 p.p.m.

Concentrates were also examined. The highest values for Co were found in coconut and groundnut meals ; soya bean meal and sunflower meal had low values. The concentrates were richer in Co than the grass, local cereals and beet pulp examined. Fertilisers contained little Co and did not contribute much to the Co content of the soil.

T. D. Bell.

242

SEMB, G. and TORSTEINSSON, I. Plantenes magnesium forsyning og magnesiuminnholdet i en del norske jordprøver. [**Supply of magnesium to the plant and the magnesium content of Norwegian soils.**] *Tidsskr. norske Landbruk*, 1955, **62**, 246–260. [Norges Landbrukshøgsk.]

Cereals

243

VAN SUMERE, C., MASSART, L. and VAN DER STRAETEN, A. **Polysaccharide fractions extracted from barley by concentrated urea solutions.** *Naturwissenschaften*, 1955, **42**, 463. [Lab. Biochem., Rijksuniv., Ghent.]

A polysaccharide fraction containing 85, 11 and 4 per cent., respectively, of glucose, arabinose and xylose was obtained by extraction of barley with 7·5 *M* urea.—A. Hepburn.

244

POOL, A. A. and SHOOTER, E. M. **The salt-soluble proteins of barley. 1. A review. 2. The detailed composition of saline extracts of barley-fractionation by precipitation with ammonium sulphate. 3. The detailed composition of saline extracts of barley-fractionation by precipitation with ethanol.** *J. Sci. Food Agric.*,

1955, **6**, 514–524; 524–534; 534–543. [Brewing Indust. Res. Found., Nutfield, Surrey.]

245

BENDOVÁ, K. O živinách v ryži. [**Nutrients in rice.**] *Výživa lidu*, 1955, **10**, (5), 72–73. [Res. Inst. Food Indust., Bratislava.] In Slovak.

The protein, fat, carbohydrate, ash, vitamin B_1, riboflavin and nicotinic acid contents of rice grown in Slovakia and the United States are compared.

M. Prokšová (Czechoslovakia).

246

DE LANGE, P. and HINTZER, H. M. R. **Studies on wheat proteins. 1. Polarographic determination of the apparent sulfhydryl content of wheat proteins. 2. Significance of sulfhydryl groups and disulfide bonds for baking strength.** *Cereal Chem.*, 1955, **32**, 307–313; 314–324. [Cereals Dept., Central Inst. Nutrit. Res. T.N.O., Wageningen, Netherlands.]

1. Solutions of gluten and water-soluble protein from wheat flour were dispersed in a medium containing gelatine, NH_4OH and $CoCl_2$ and examined polarographically. The apparent sulphydryl content was estimated by measuring the wave height and comparing it with that from a standard solution of cysteine. Expressed as cysteine, values for 13 varieties of Dutch wheat ranged from 0·28 to 0·61 and from 0·46 to 2·50 per cent. for gluten and water-soluble protein.

2. The cystine content was calculated from polarographs of the hydrolysed and unhydrolysed proteins. Baking tests and redox potential measurements of flour suspensions with and without cysteine and potassium persulphate indicated that the ratio of sulphydryl to disulphide in the flour protein may influence the improving action of potassium persulphate.—A. Hepburn.

247

MILLINGTON, A. J. **The protein content of some Australian wheat varieties.** *J. Austral. Inst. Agric. Sci.*, 1955, **21**, 59–68. [Inst. Agric., Univ. W. Australia.]

248

BLAIN, J. A. and TODD, J. P. **The lipoxidase activity of wheat.** *J. Sci. Food Agric.*, 1955, **6**, 471–479. [Food Sci. Sect., Royal Tech. Coll., Glasgow, C.1.]

See also Absts. 184, 888, 889.

Roots

249

BOSMAN, J. C., BAKERMANS, W. A. P. and SCHEYGROND, W. Enkele gegevens betreffende het eiwitgehalte van bieten. [**The protein content of beet.**] *Versl. Landbouwk. Onderzoek.*, 1951, No. 57.14, pp. 24. English summary.

According to the list of named varieties of fodder beets issued by the Central Bureau of Animal Feeding, protein content varies with dry matter (DM), but when beet crops are arranged in groups by dry matter content, protein and DM vary inversely. Since 1940 a total of 1630 samples of beet have been analysed: sugar beet 184, fodder-sugar beet 175, Groenkragen (high DM) 483, Groenkragen (low DM) 119, Barres beet 283 and unidentified 386. The records are analysed statistically with reference to the relation between DM and crude protein (inverse second degree relation for all data together); digestibility with pepsin and HCl of the crude protein (increase with percentage crude protein in DM to about 10 per cent. DM and 80 to 85 per cent. digestibility); relation between percentage dry matter and digestible crude protein in fresh substance (inverse, in general, big differences between groups). Regression equations and correlation coefficients are given. In the order of groups above, the following new percentage values are proposed: DM 23·0 for sugar beet, 20·0, 15·0 and finally 12·5 for low DM varieties; digestible crude protein in fresh substance 0·7 for the first three and 0·6 for the last; starch equivalent 16·0, 13·8, 10·3 and 7·9.

If for high DM varieties a yield of roots of 75,000 kg. per hectare and for low DM varieties one of 90,000 kg. is assumed the yields of digestible crude protein per hectare are 525 and 540 kg. and of starch equivalent 7725 and 7110 kg., so that there is little reason to prefer the high DM types on the ground of yield per hectare.—I. Leitch.

250

MURTHY, H. B. N. and SWAMINATHAN, M. **The nutritive value of different varieties of sweet potato.** *Current Sci.*, 1954, **23**, 14. [Central Food Tech. Res. Inst., Mysore.]

Energy value, proximate composition, and Ca, P and carotene contents are tabulated for 2 Indian varieties of sweet potato with white flesh and 3 American varieties with orange flesh. Since the former contained no carotene and the latter from 5·4 to 7·2 mg. per 100 g. fresh material, the introduction of American varieties seems desirable.

W. M. Deans.

Leafy Vegetables

251

ERRERA, G. Ricerche e considerazioni sull'erbaio di Brassica chinensis L. (cavolo cinese). [**Forage from *Brassica chinensis*, L. (Chinese cabbage).**] *Riv. Zootec.*, 1955, **28**, 208–214. [Ist. Zootec. Gen., Fac. Agrar., Piacenza.]

In 6 field trials Chinese cabbage gave yields ranging from 442 to 590 quintals per ha. [17·5 to 23·5 tons per acre]. A seed rate of from 2·5 to 1·5 kg. per ha. [2·2 to 1·3 lb. per acre] sown in rows

50 to 60 cm. [19·5 to 23·5 in.] apart gave the best results. Dry matter of the forage ranged from 7·03 to 8·50, average 7·77 per cent. and crude protein from 1·24 to 1·79, average 1·48 per cent. When sown on suitable soil it produced slightly more feed per ha. than rape, and in feeding trials with dairy cattle the two could be interchanged without affecting milk production. Chinese cabbage was less laxative than rape. It grew more quickly than rape; when sown at the beginning of August it could be cut at the end of October, and could then be grown between a summer harvest and an autumn or winter sowing. It responded well to organic or inorganic fertilisers, especially potash.—T. D. Bell.

Legumes

252

RADHAKRISHNAN, A. N., VAIDYANATHAN, C. S. and GIRI, K. V. **Nitrogenous constituents in plants. 1. Free amino acids in leaves and leguminous seeds.** *J. Indian Inst. Sci.* [*A*], 1955, **37,** 178–194. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

Free amino-acids were estimated by paper chromatography in ethanolic extracts of leaves. Leaves of the citrus group, *Citrus decumana*, *C. medica*, *C. acida* and *C. aurantium*, contained large quantities of proline. These species and *Atriplex hortensis*, *Trigonella foenum graecum*, *Murraya koenigii*, *Piper betel*, *Mentha piperita*, *Amaranthus gangeticus*, *Sesbania grandiflora* and *Coriandrum sativum* were comparatively rich in asparagine, glycine, aspartic acid, glutamic acid and alanine. The last 3 edible leaf species contained all the essential amino-acids, but the others lacked some of them. Diseased leaves of *C. aurantium* contained only traces of glutamic and aspartic acids.

Free amino-acids were estimated in the seeds of field bean (*Dolichos lablab*), horse gram (*D. biflorus*), green gram (*Phaseolus radiatus*) and Bengal gram (*Cicer arietinum*). Most amino-acids in green gram increased on germination. Asparagine did not appear until after 48 hr. and then most of the amino-acids expressed as a percentage of total N sharply decreased. Several unknown ninhydrin-positive compounds were present in both seeds and leaves.—A. Hepburn.

253

MOORJANI, M. N. and BHATIA, D. S. **Changes in the nitrogenous constituents of groundnut milk during souring.** *J. Sci. Indust. Res. India*, 1954, **13B,** 274–276. [Central Food Technol. Res. Inst., Mysore.]

During souring for 5 days of groundnut milk treated with takadiastase or with invert sugar added, N.P.N. and ammonia N increased, protein N decreased and total N remained unchanged.

A. Hepburn.

254

GRINDLEY, D. N. and AKOUR, A. A. **The seed oils of *Bombax sessile* and of *Lupinus termis*.** *J. Sci. Food Agric.*, 1955, **6,** 461–465. [Wellcome Chem. Labs., Med. Serv., Minist. Health, Khartoum, Sudan.]

Analytical data are given for the composition of the seeds and the properties of the oils. It is suggested that the oil from *Bombax sessile* might replace palm oil in all its uses; it has the advantage of containing no lipoclastic enzyme to cause deterioration. The non-fatty residue might serve as a cattle feed. The seeds of *Lupinus termis* are eaten by the people of the Sudan, providing a valuable source of protein (34·8 per cent. in the kernel). The oil content is only 9 per cent. Alkaloids are present, so that the seeds should be soaked in water before use.—J. S. Thomson.

255

JANSSON, S. L. and TORSTENSSON, G. Kvävegödslingens inverkan på ärtskördens storlek och sammansättning. [**Effect of nitrogen fertilisers on the yield and composition of peas.**] *Kungl. Lantbruksakad. Tidskr.*, 1955, **94,** 210–220. [Kungl. Lantbrukshögsk. Inst. All. Jordbrukslära.] German summary.

256

JOUBERT, F. J. **Lupin seed proteins. 2. A physico-chemical study of the proteins from yellow lupin seed (*Lupinus luteus*).** *Biochim. biophys. Acta*, 1955, **17,** 444–445. [Nat. Chem. Res. Lab., S. African Counc. Sci. Indust. Res., Pretoria.]

257

PETRI, E. M., STAVERMAN, A. J. and PALS, D. T. F. **The proteins of lupin seed (*Lupinus luteus*).** *Biochim. biophys. Acta*, 1955, **17,** 446. [Central Lab. T.N.O., Delft.]

See also Abst. 252.

Fruits

258

LEWIS, Y. S., DWARAKANATH, C. T. and JOHAR, D. S. **Acids and sugars in the 'kamrakh' fruit, *Averrhoa carambola*, Linn.** *Current Sci.*, 1954, **23,** 54–55. [Central Food Technol. Res. Inst., Mysore.]

259

LULLA, B. S. and JOHAR, D. S. **Chromatographic analysis of sugars in banana.** *Current Sci.*, 1955, **24,** 92–93. [Central Food Technol. Res. Inst., Mysore.]

260

LULLA, B. S. and JOHAR, D. S. **Organic acids in bananas.** *Current Sci.*, 1954, **23**, 362. [Central Food Technol. Res. Inst., Mysore.]

261

PIECHOCKA, J. and SZYMCZYK, F. Badania nad *Vaccinium uliginosum* L.—borówką bagienną. [**Assessment of food value of *Vaccinium uliginosum*, L.**] *Rocz. Państwowego Zakł. Hig.*, 1955, **6**, 109–117. [Zakł. Badania Żywności i Przédmiotów Użytku PZH.] Russian and English summaries.

Data are given for moisture, ash, sugar, nitrogen and ascorbic acid of the blueberry (*Vaccinium uliginosum*, L.). The ascorbic acid content was 43·7 mg. per cent. (From summary.)

J. S. Thomson.

262

HOLLEY, R. W., STOYLA, B. and HOLLEY, A. D. **The identification of some volatile constituents of Concord grape juice.** *Food Res.*, 1955, **20**, 326–331. [New York State Agric. Exp. Stat., Cornell Univ., Geneva, N.Y.]

263

ANGULO C., R. M. Estudio bromatológico de la "lima" (Citrus Limetta Risse) y de la "mandarina" (Citrus Novilis). [**Bromatological study of the lime (*Citrus limetta*, Risse) and the mandarin (*Citrus nobilis*, Lour.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 55–60.

Chemical analysis of lime and mandarin showed that they had high moisture contents of 90·7 and 89·2 per cent., respectively. As percentages of the fresh fruit they contained: protein 0·637, 0·457; ether extract 0·072, 0·109; carbohydrates 5·6, 6·2; ash 0·44, 0·37; Ca 49, 22; P 46, 19; Fe 1·6, 3·1; and vitamin C 40, 25 mg., vitamin B_1 96, 74 μg. per 100 g. The energy value was low, 25 Cal. per 100 g. for lime and 27 Cal. for mandarin.

T. D. Bell.

264

MCARTHUR-HESPE, G. W. F. M. Enige onderzoekingen over de activiteit van zetmeelsplitsende enzymen in peren gedurende de ontwikkeling en bij koelhuisbewaring. [**Studies of the activity of starch-splitting enzymes in pears during growth and in cold storage.**] *Thesis, Univ. Amsterdam*, 1955, pp. 70. English summary.

265

HURTADO CERVANTES, J. L. Análisis bromotológico del Solanum Licopersicum "tomate" y microbiológico de la salsa de tomate. [**Bromatological analysis of *Solanum lycopersicum*, the tomato, and microbiology of tomato sauce.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 109–117. [Lab. Invest. Agric.]

Two varieties of tomato commonly grown in Peru had the following average composition: moisture 92·99, protein 1·12, carbohydrate 2·95, ether extract 0·29 and ash 0·52 per cent. In 100 g. fresh material there was 23·5 mg. vitamin C and 0·3 mg. carotene. The dried seeds contained 37·5 per cent. oil.

Purées were made with the addition of 15 per cent. NaCl, 10 per cent. NaCl and 50 mg. Na benzoate per 100 g., or 5 per cent. NaCl and 100 mg. Na benzoate. Bacteriological examination of these and of 2 purées obtained from local markets showed that only in the sample prepared with 10 per cent. NaCl and 50 mg. Na benzoate was the bacterial count after incubation for 48 hr. below 50,000 per g., considered a safe level. There is no law in Peru controlling the levels of preservatives used, or the sale of unsuitable tomato purée. Regulations which should be enforced are suggested.—T. D. Bell.

Other Types

266

TAYEAU, F., FAURE, F. and SÉCHET, J. Recherches sur la valeur alimentaires des protéines du *Balanites aegyptiaca* (Simarubacées). [**Food value of the proteins of *Balanites aegpptiaca* (Simarubaceae).**] *Bull. Soc. Chim. biol.*, 1955, **37**, 629–633. [Lab. Chim. Biol., Fac. Méd., Bordeaux.]

Another version of a paper on Egyptian balsam (*Balanites aegyptica*) seed proteins published elsewhere (Abst. 4737, Vol. 25).

267

BELL, J. M. **The nutritional value of rapeseed oilmeal: a review.** *Canad. J. Agric. Sci.*, 1955, **35**, 242–251. [Dept. Animal Husb., Univ. Saskatchewan, Saskatoon.]

See also Abst. 254.

Pasture, Hay and Silage

268

ELY, R. E. and MOORE, L. A. **Holocellulose and the summative analysis of forages.** *J. Animal Sci.*, 1955, **14**, 718–724. [Dairy Husb. Res. Branch, U.S. Dept. Agric., Beltsville, Md.]

Holocellulose and lignin were the major constituents in the crude fibre and N-free extract fractions of 10 forages. Ash, protein, lignin, holocellulose and matter extractable by hot water and alcohol-benzene together accounted for approximately all the dry matter. The estimation of holocellulose was considered useful in the evaluation of forages.—A. Hepburn.

269

COULSON, C. B. **New free amino-acids in plant materials.** *Nature*, 1955, **176**, 518–519. [6 Drury Rd., Colchester.]

Paper chromatographic examination of ethanolic extracts of alfalfa hay revealed, in addition to normal amino-acids, pipecolinic acid, baikiain, citrulline and other substances reacting with ninhydrin, which may include ϵ-aminohydroxycaproic acid and 3 : 4-dihydroxyphenylalanine.

A. Hepburn.

270

KOLOUŠEK, J. and COULSON, C. B. **Plant proteins. 3. Amino-acid content of isolated hay proteins.**

KOLOUŠEK, J. **Addendum : occurrence of citrulline in various plants.**

KOLOUŠEK, J. and COULSON, C. B. **4. Amino-acids present in alcoholic extracts of grass and legume hays and fenugreek seeds.** *J. Sci. Food Agric.*, 1955, **6**, 380–386 ; 386–387 ; 455–461. [Agrobiochem. Lab., Fac. Agric., Technicka 1903, Prague 19.]

For part 2 see Abst. 4733, Vol. 25.

3. The approximate amino-acid composition of proteins of hay made from alfalfa, red clover, timothy and orchard grass cut at maturity and alfalfa cut at different stages was quantitatively estimated by 2-dimensional paper chromatography. There was evidence that the haymaking process, stage of growth and species may affect the amounts of methionine, tyrosine, proline, phenylalanine and glycine, but there were only slight changes in most other amino-acids.

Seeds of *Trifolium pratense*, *Medicago sativa* and *Dactylis glomerata* and the seeds and thallus of *Galega officinalis* contained citrulline. This suggests that citrulline is relatively widespread in plants.

4. Amino-acids were estimated by paper chromatography in hydrolysed ethanolic extracts of alfalfa hay cut at different stages of growth on unmanured land and in unhydrolysed extracts of mature alfalfa, red clover, timothy and orchard grass hays grown on manured land. Hydrolysed extracts of fenugreek (*Trigonella foenum graecum*, L.) seeds and mature hays were examined semi-quantitatively for amino-acids.

The amino-acids in alfalfa decreased with increasing age. Aspartic acid, glutamic acid and leucine(s) were present in greatest quantity. Mature alfalfa contained most aspartic acid, glutamic acid, alanine and proline but as free amino-acid it contained most asparagine, serine, glycine, alanine and proline. The mature hays differed in amino-acid composition. Fenugreek seeds contained few free amino-acids. Others were liberated after hydrolysis.—A. Hepburn.

271

PARISH, D. H., COEY, W. E. and ROBINSON, K. L. **The chemical composition of cocksfoot S143 at successive stages of growth, as influenced by fertiliser treatment. 1. Effect of low and high levels of nitrogen fertiliser on the proximate composition.** *Res. and Exp. Rec. Minist. Agric. N. Ireland*, 1952–53 (1955), **3**, 46–54.

A stand of cocksfoot S143 sown the previous summer was divided into 3 replications of 12 plots of which half were dressed with 5 cwt. Nitro-chalk per acre on 24 April. The plots, one treated and one untreated, were cut a fortnight later and each subsequent week for 5 weeks. Yields and proximate compositions were estimated.

In the experimental plots the percentage dry matter was less and the yield of dry matter and the percentage and yield of crude protein were greater than in the untreated plots. The percentage of crude protein decreased with subsequent cuts and the yield of crude protein increased until the fourth cut and then declined slightly. The Nitro-chalk increased the yield of crude protein, but could not prevent this falling off as the grass matured. The yield of dry matter also increased with time. The percentage of crude fibre was similar in control and experimental plots, which suggested that they had the same proportion of leaf to stem. The percentage of crude fibre increased with time, and the application of nitrogen did not appear to delay maturation. The true protein was consistently 80 per cent. of the crude protein, indicating that the protein had not deteriorated because of the fertiliser.—T. D. Bell.

272

HENDERSON, J. L. and DAVIES, R. O. **The yield and composition of mixed cereal-legume crops at different stages of growth. 1.** *Empire J. Exp. Agric.*, 1955, **23**, 131–144. [Univ. Coll. Wales, Aberystwyth.]

In a trial repeated in 3 consecutive years, oats, field peas and spring beans were grown, separately or all together, in experimental plots. They were cut at 7 equal intervals, the first when the oats were 1 ft. high, the peas in full vegetative state and the beans 10 in. high, and the last when all were fully ripe. Yields of dry matter and crude protein were estimated. At the last stage yields of the whole crop as cut were compared with yields after harvesting and threshing.

The highest yield of dry matter was from the mixture, and of crude protein from the peas. The best stage of cutting for silage of any of the crops was stage 4, when the oat grains were milky and the straw was beginning to be predominantly yellow, when the earliest pods on the peas were beginning to develop and the foliage was dark green, and when the seeds had formed in the most

advanced pods of the beans and the foliage was still dark green. After this stage yield of dry matter increased but crude protein decreased. Threshing under experimental conditions caused losses of dry matter and protein, and the grain obtained supplied less starch equivalent and digestible crude protein per acre than the silage made from the crop when cut at stage 4. When harvested under field conditions the losses were even greater. The contribution of the beans to both dry matter and crude protein in the mixture was small, and since they did not fulfil the purpose for which they were intended, namely, acting as supports for the peas, the value of including them was doubtful.—T. D. Bell.

273

THOMAS, B., HOLMES, W. B. and CLAPPERTON, J. L. **A study of meadow hays from the Cockle Park plots. 1. Proximate constituents and digestibility. 2. Ash constituents.** *Empire J. Exp. Agric.*, 1955, **23,** 25–33 ; 101–108. [King's Coll., Univ. Durham, Newcastle upon Tyne.]

1. Hays from 13 plots which had been given different manurial treatments for over 50 years were analysed. The treatments ranged from annual application of farmyard manure and artificial fertilisers to no manure of any type. All plots were cut for analysis on the same day. Digestibility trials of the hay from 4 plots were made with sheep.

On the basis of crude protein, digestible crude protein and calculated starch equivalent, the quality of the hay from plots which had been treated worst from the manurial point of view was highest. Digestibility trials confirmed the analytical results. It was thought that the stage of growth and the botanical composition of the swards were the main reasons for the results obtained. Yield was inversely related to quality.

2. Analysis of the silica-free ash of the hays showed that the percentages of Ca, P, K and Zn were directly influenced by the amounts of these elements supplied by the manurial treatment. No relation was found between treatment and Mg, Fe, Mn or Co content, but Na was low when no basic slag had been applied and high when it had, and basic slag also increased the Ca content. The P content of the ash was positively and the Mn negatively correlated with the acidity of the soil. When the hay contained a high proportion of weeds and clovers the Ca, Co, Mg and Zn contents of the ash were high. The highest Cu content resulted from dressing with farmyard manure.

T. D. Bell.

274

BRANDSMA, S. Over de minerale bestanddelen en hun onderlinge betrekkingen in weidegras van normale bedrijven. [**Mineral components and their interrelations in pasture on normal farms.**] *Meded. Landbouwhogesch. Wageningen*, 1954, **54,** No. 6, 245–309. English summary.

Data are presented in detail for 14 farms, 8 on sand and 6 on clay, where 10 samples of pasture were taken between 1 May and 1 October, 1952. K, Na, Ca, Mg, Cl, S, P and Cu were estimated and tables give the values at the several dates, general averages and averages by soil type. Crude protein was also estimated. Graphs show the seasonal changes for farms on sand and clay separately. In general there was little or no difference, by soil type, in crude protein or P ; all other minerals except K and Ca were less in pasture from sandy soil. Sandy soil showed a higher excess of total base and a higher alkali alkalinity. For the total of 126 samples, the range and mean for Cu in mg. per kg. dry matter (DM) were 5·2 to 15·2 and 10·6. The mean for pasture on clay was 11·7 $\pm$ 1·8 and on sand 9·8 $\pm$ 1·9 mg. Cu per kg. DM.

Correlation coefficients and diagrams show the relation between the several constituents and for comparison earlier data for pasture on which grass tetany occurs, and some other samples, are shown. Tetany pastures have relatively high K and total alkalinity and relatively low Ca and earth alkalinity.

I. Leitch.

275

RØYSET, S. Forsøk med magnesium og aukande mengd kopar til eng. [**Experiment with magnesium and increasing amounts of copper on leys.**] *Forskning og Forsøk Landbruket*, 1955, **6,** 131–140. [Stat. Forsøksgard, Furenes.] English summary.

The ley studied was on peat reclaimed in 1941. Four alternative fertiliser treatments were given to 16 plots in 1947 and hay was cut twice a year in 1947, 1948 and 1949. All the plots received Nitro-chalk, superphosphate and ammonium sulphate, and, per decare, 3 kg. manganese sulphate and 1 kg. borax ; 4 received also 3 kg. and 4 received 6 kg. copper sulphate per decare, 4 had 6 kg. copper sulphate and 10 kg. magnesium sulphate per decare, and 4 only the common treatment.

The Cu content of the hay rose with the amount of Cu supplied, from 4·0 mg. per kg. when no Cu was given to 10·4 mg. per kg. on the plots given 6 kg. $CuSO_4$ per decare. The biggest increase in yield was from the plots given 3 kg. $CuSO_4$ per decare, and in the third year only from those given 6 kg. ; it is postulated that the larger application was excessive. The plot given Mg gave in 1947 an increase attributed to Mg, in 1948 a poor increase and in 1949 an increase attributed to Cu.

The ley consisted originally of clover and grasses, but by the third year there was no clover. (From summary.)—D. Duncan.

276

CURNOW, D. H. and ROSSITER, R. C. **The occurrence of genistein in subterranean clover (*T. subterraneum*, L.) and other trifolium species.** *Austral. J. Exp. Biol. Med. Sci.*, 1955, **33**, 243–248. [Dept. Agric., Perth, W. Australia.]

In every single one of 123 strains of subterranean clover (*Trifolium subterraneum*, L.), 74 from Australia and 49 from overseas, mainly from the Mediterranean region, genistein or some closely related compound was detected by paper chromatography, from its R_F value and the pink colour developed with $FeCl_3$ (Abst. 1638, Vol. 25). The chance of finding a genistein-free strain of this valuable clover seems small. Of 17 other clovers examined, *T. globosum* contained about as much as *T subterraneum*, *T. campestre* (hop clover) and *T. pratense* (red clover) rather less.—W. M. Deans.

277

LAKKE GOWDA, H. S. **Studies on jola or jowar (*Andropogon sorghum*) as cattle fodder. 3. Hydrocyanic acid and phytic acid phosphorus content of different varieties of jola fodders at different stages of growth.** *Indian J. Dairy Sci.*, 1955, **8**, 47–52. [Mysore Serum Inst., Bangalore.]

For previous parts see Absts. 4090, Vol. 23; 4285, Vol. 24.

The HCN content of 4 different varieties of jowar (Kati, White, Ibbani and Red) was highest at the third week of growth, the value in the whole plant ranging from 13 to 32 mg. per 100 g. dry matter. The leaves had a higher content than the stems. From the third to the seventh week there was an abrupt fall in HCN content and by the 15th week only traces were present.

Phytic acid P was present in relatively small amounts in the early stages of growth, 30 to 40 mg. per 100 g. dry matter, but increased steadily, reaching a value of 122 mg. per 100 g. by the 17th week. Total P decreased steadily during growth.—J. S. Thomson.

MISCELLANEOUS

278

MITCHELL, T. J., IRVINE, L. and SCOULAR, R. H. M. **An examination of Scottish heather honey. 2.** *Analyst*, 1955, **80**, 620–622. [Dept. Tech. Chem., Royal Tech. Coll., Glasgow.]

In continuation of previous work (Abst. 312, Vol. 25), 25 samples of heather (ling, *Calluna vulgaris*) honey and 1 of bell heather (*Erica cinerea*) honey of the year 1952 were examined.

For heather honey *p*H ranged from 4·20 to 5·36 and moisture, deduced from the refractive index, from 16·0 to 24·8 per cent., mean 20·2. Colloid formed from 1·35 to 3·90 per cent. of the dry matter and the N content of the colloid ranged from 9·08 to 11·85 per cent., mean 10·25, corresponding to a protein content of about 64 per cent. The thixotropic ratio ranged from 2 [1 on p. 621] to 100. In some samples, but not all, high colloid content went along with high thixotropic ratio.

The sample of bell heather honey had *p*H 4·14, moisture 16·1 per cent., colloid 0·80 per cent. of the dry matter, N 9·60 per cent. of the colloid; the thixotropic ratio was 2.—W. M. Deans.

See also Abst. 64.

3. VITAMINS

GENERAL

279

ALMQUIST, H. J. **Evaluation of fat-soluble vitamins.** *Federation Proc.*, 1955, **14**, 650–654. [Res. Lab., The Grange Company, Modesto, Calif.]

280

BOYER, P. D. **Fat-soluble vitamins.** *Annu. Rev. Biochem.*, 1955, **24**, 465–496. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

281

BRIGGS, G. M. and DAFT, F. S. **Water-soluble vitamins. 1. Vitamin B_{12}, folic acid, choline, and para-aminobenzoic acid.**

FRIED, R. and LARDY, H. **2. Vitamin B_6, niacin, biotin, ascorbic acid.**

JOHNSON, B. C. **3. Thiamine, lipoic acid, riboflavin, pantothenic acid, inositol, and miscellaneous factors.** *Annu. Rev. Biochem.*, 1955, **24**, 339–392; 393–418; 419–464. [Nat. Inst. Arthritis Metabol. Dis., Nat. Insts. Health, Bethesda, Md.]

282

CEDRANGOLO, F. La biosynthèse des vitamines chez les animaux supérieurs. [**Biosynthesis of vitamins in higher animals.**] *Bull. Soc. Chim. biol.*, 1955, **37**, 399–437. [Inst. Chim. Biol., Univ. Naples.]

A review.

283

YAKOVLEV, N. N. and ZHABOTINSKAYA, O. P. Vliyanie primeneniya kompleksa vitaminov (A, B_1, B_2, PP, C and D) na rabotosposobnost' i uglevodnyi obmen pri myshechnoi deyatel'nosti. [**Effect of giving a vitamin complex (A, B_1, B_2, PP, C and D) on work capacity and carbohydrate metabolism during muscular activity.**] *Vop. Pitan.*, 1955, **14,** No. 3, 9–15. [Inst. Fizichesk. Kul'tur., Leningrad.]

Prolonged administration of a preparation, Polyvitamin, increased the work capacity of white rats and the rate of restoration of glycogen reserves during the recovery period. The vitamin mixture improved the performance of athletes to the greatest extent when combined with ascorbic acid, 250 mg. daily.—D. W. Taylor.

284

TROITZKII, G. V. and TARASOVA, L. S. O prirode kompleksov belkov krovi s karotinom, vitaminom A, vitaminom D_2 i kholesterinom. [**The nature of the complexes of blood proteins with carotene, vitamin A, vitamin D and cholesterol.**] *Biokhimiya,* 1955, **20,** 19–30. [Krymsk. Med. Inst., Simferopol.]

The experiments demonstrate the adsorptive nature of the bond between carotene, vitamin A and vitamin D, and the plasma proteins, resulting in the formation of complexes stable under the conditions of electrolyte concentration obtaining in the blood. The differences between these complexes and that formed with cholesterol were studied, and the physiological and pathological significance of such modes of transport of lipids in the bloodstream are discussed.—D. W. Taylor.

285

MOURIQUAND, G., EDEL, V. and CHIGHIZOLA, R. Association glutamate de Ca, thiamine et acide ascorbique et indice chronologique vestibulaire. [**Association of calcium glutamate, vitamin B_1 and ascorbic acid and the vestibular chronologic index.**] *C.R. Soc. Biol.*, 1955, **149,** 728–729.

Pigeons received a dose of 0·5 g. calcium glutamate, 0·1 g. vitamin B_1 and 0·5 g. ascorbic acid, and vestibular chronaxie was measured every 5 min. for an hour. There was no fall in the value such as usually occurs with glutamate. It is suggested that the antagonism of vitamin B_1 and ascorbic acid to glutamate may affect the therapeutic value of glutamate. Experience in paediatric practice suggested, however, that the substances might have a synergistic value for the backward child.—D. Duncan.

286

PRUZANSKY, J. and AXELROD, A. E. **Antibody production to diphtheria toxoid in vitamin deficiency states.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 323–325. [Biochem. Dept., Sch. Med., Univ. Pittsburgh, Pa.]

Weanling rats were given purified diets lacking individual vitamins for from 2 to 4 weeks before immunisation with diphtheria toxoid. A marked reduction of antibody response occurred in rats deprived of pantothenic acid, vitamin B_6, folic acid, biotin, riboflavin or vitamin D. Little decrease in antibody formation occurred in rats deprived of vitamin A and none in rats deprived of vitamin B_1.—A. M. Copping.

287

YAMAGATA, S., ARAI, I., UNOURA, K., ARATANI, T., MIURA, K. and OTOMO, K. Experimentelle Studien über die Funktion des reticuloendothelialen Systems. 5. Einfluss verschiedener Hormone und Vitamine auf die Funktion des RES und der Leber. [**Experimental studies on the function of the reticulo-endothelial system. 5. Effect of different hormones and vitamins on the function of the reticuloendothelial system and of the liver.**] *Tohoku J. Exp. Med.*, 1955, **61,** 113–125. [Med. Klin., Tohoku Univ., Sendai.]

The effect of the substances tested was judged by the changes in the Congo red index and in the prothrombin time, as previously described (*Tohoku J. Exp. Med.*, 1954, **59,** 257). The Congo red index was taken as measuring the activity of the reticuloendothelial system and the prothrombin time as the measure of liver function. Each trial was on 2 rabbits. Pituitary, adrenal and sex hormones, thyroxine and insulin were tested. Except for the adrenal cortical hormone, large doses of Amolysin and a testicular hormone preparation, they all reduced the Congo red index, showing the activity of the reticuloendothelial system to be increased; the prothrombin time was not affected except that it was increased by adrenal cortical hormone and the sex hormones tested. Vitamins A, D, B complex, C and K all decreased the Congo red index, but their effect on the prothrombin time varied. Luminal given alone increased the Congo red index but decreased the prothrombin time; given with anterior pituitary extract it did not alter the effect of the hormone but, given with vitamins A and D, it cancelled their stimulating effect on the reticuloendothelial system. From the results it was concluded that the reticulo-endothelial system is stimulated directly by the anterior pituitary hormone but indirectly, through the vegetative nervous system, by the vitamins.—L. Wills.

288

The effect of variety, curing, storage, and time of planting and harvesting on the carotene, ascorbic acid, and moisture content of

sweet-potatoes grown in six Southern States. *N. Carolina Agric. Exp. Stat. S. Cooperative Ser. Bull.* No. 30, October 1953, pp. 48.

The study was made over 7 years in 15 locations. One variety of sweet potato was always grown to provide a common standard of performance. Vitamin C was estimated in the reduced form as ascorbic acid, and carotene by the method of Moore and Ely (Abst. 1954, Vol. 11).

Carotene ranged from 0·5 in the light-coloured varieties to 44·6 mg. per 100 g. dry weight in the more pigmented ones. There were wide differences from year to year within locations but greater differences between locations, some of which seemed consistently associated with high or low values for carotene. Ascorbic acid concentration showed similar variations and ranged from 66·8 to 110·3 mg. per 100 g. The dates of planting and harvesting had no effect on carotene content, but roots from a first harvest contained more ascorbic acid when the planting was late than when early. In general, ascorbic acid decreased after 156 days of growth. Curing the roots for from 7 to 15 days at 75° to 85° F. caused shrinkage and about 20 per cent. of the ascorbic acid was lost. Storage for 4 months at 52° F. and at relative humidity from 75 to 85 per cent. about doubled the loss. Carotene content was not affected by curing or storage.

Moisture content varied widely both within and between locations for a single variety and had a mean value of 71·7 per cent. It remained relatively constant during curing and storage. About 5 per cent. of the weight was lost during curing and a further 7 per cent. after storage.

The yield of marketable roots varied considerably and was greatly influenced by environmental conditions. Allgold and Bunch Porto Rico had the highest yields.—A. Hepburn.

289

PATTON, M. B. and GREEN, M. E. **Cabbage. Factors affecting vitamin values and palatability. 1. Compilation of National Cooperative research findings on cabbage.**

GREEN, M. E. **2. Review of literature on cabbage.** *Ohio Agric. Exp. Stat. Res. Bull.* No. 742, April 1954, 5–52 ; 53–96.

1. The results, mostly published already, of researches on raw and cooked cabbage under the auspices of the National Cooperative Project on conservation of the nutritive value of foods at 20 agricultural experiment stations and at the U.S. Regional Vegetable Breeding Laboratory, Charleston, S.C. are summarised. Most of the work was on ascorbic acid but some results for vitamin B_1, riboflavin and Ca are given. A few pages are devoted to dehydrated cabbage and sauerkraut. Among the effects studied were those of variety, season, maturity, storage, cutting and details of cooking method.

2. The literature published in English between 1935 and the middle of 1952 is similarly summarised. There are 102 references without those on dehydrated cabbage and sauerkraut.

W. M. Deans.

290

POROTNIKOFF, O. Statens vitamin-laboratoriums undersøgelser af vitaminindholdet i danske levnedsmidler (1947–1953). [**Studies of the State Vitamin Laboratory of the vitamin content of Danish foods (1947–53).**] *Statens Husholdningsråds Faglige Medd.*, January-February 1954, Nos. 1–2, 1–7.

The causes of variation in the vitamin content of foods are summarised. The investigation was planned so that allowance was made for the more important causes of variation, but differences due to different Danish soils were not allowed for, since only the Copenhagen market was tapped ; within it, sampling by area and shop was wide. Preparation for analysis took into account possible inequalities of distribution within a sample. The results are expressed in terms of the edible portion of foods as purchased in the open market. Values for vitamin C are set out in a table. Foods known not to contain vitamin C were not tested. Values entered as 0 represent samples that were analysed but in which none was found. Estimation was by the 2 : 6-dichlorophenolindophenol method checked against a spectrographic method (see Abst. 181, Vol. 23). Dehydroascorbic acid was present only in amounts that did not exceed the possible error of the method and so was not distinguished. A few biological tests were made for comparison.

Certain comments on the table are made. Milk contained more vitamin C between October and March than between April and October. Vegetables showed seasonal differences and losses over the winter ; some, such as spinach, showed wide variations not referable to season. Fruits varied greatly with variety. On the average, Danish did not differ from imported fruit. Of jams, strawberry and blackcurrant had most vitamin C.

I. Leitch.

291

LIECK, H. Statens vitaminlaboratoriums undersøgelser af nikotinsyreindholdet i danske naeringsmidler. [**Studies at the State Vitamin Laboratory of the nicotinic acid content of Danish foods.**] *Statens Husholdningsråds Faglige Medd.*, October-December 1954, Nos. 10–12 ; 41–46.

Methods of collection and sampling were described in the preceding report on vitamin C. Nicotinic acid was estimated with *Lactobacillus arabinosus* by a method closely similar to that

described in the U.S. Pharmacopoeia (1947, XIII, p. 669).

Comments on the table are that there was little seasonal variation in the nicotinic acid content of vegetables and little destruction in cooking (another publication to follow). Vegetables of greatest value were mushrooms, green cabbage, green peas, parsnip, cress and potato. Fruit contained little nicotinic acid ; elderberries had most. Meat was the main source and account must be taken of its fat content. Of fish, the best were eel, gar, salmon, mackerel and tunny.—I. Leitch.

292

HJARDE, W. Statens Vitamin-laboratoriums undersøgelser af B_1-vitaminindholdet i danske naeringsmidler. [**Studies at the State Vitamin Laboratory of the vitamin B_1 content of Danish foods.**] *Statens Husholdningsråds Faglige Medd.*, March-April 1955, Nos. 3–4, 9–16.

Methods of collection and sampling were as described for estimation of vitamin C and nicotinic acid. Total vitamin B_1 was estimated by a modification of the thiochrome method described elsewhere (Hjarde, *Thesis*, 1950).

The values given for cereal products refer to them as they were on the market up to the beginning of 1954, and differences reflect differences in milling practice. After April 1954, from which date 500 μg. vitamin B_1 per 100 g. was to be added to wheat flour and semolina, all the present values are subject to revision. Bread, cakes and biscuits are all affected. In the interval a correction based on the amount of flour in the several products should be made. The amounts are shown in the table.

Some vegetables showed wide variations ; green peas had most vitamin B_1. Fruits supplied little and those treated with sulphite none. The fat content of meat had to be taken into account. Pig meat was outstandingly high. Other specially valuable foods, in terms of vitamin B_1, were yeasts and nuts, except coconut.—I. Leitch.

See also Abst. 1225.

VITAMIN A

293

ROUSSEAU, J. E. (Jr.), EATON, H. D., BEALL, G. and LUCAS, H. L. (Jr.) **A multiple regression study of the Carr-Price reaction for vitamin A in the presence of carotene.** *J. Dairy Sci.*, 1955, **38,** 902–903. [Storrs Agric. Exp. Stat., Conn.]

Standard solutions of vitamin A alcohol, and of carotene containing 90 per cent. of the β-isomer, were prepared and mixed to give concentrations of vitamin A ranging from 0 to 9·6 μg. and of carotene from 0 to 32 μg. per 10 ml. solution. The transmittance of the solutions was measured and varied from about 10 to 100 per cent. at 440 mμ. and from 20 to 100 per cent. in the product of the $SbCl_3$ reaction at 620 mμ. The estimations were made on each of 4 consecutive days. A model equation was fitted to the data ; none of the coefficients of the terms involving products of vitamin A concentration and carotene concentration were significantly different from zero, thereby apparently justifying the validity of the assumption of additivity of the colour densities of the 2 substances in the correction of Dann and Evelyn. Beer's law was found to hold for solutions of carotene but not of vitamin A. The divergence from the theoretical of solutions of vitamin A accounted for only 0·1 per cent. of the variance due to the concentration of vitamin A. When it was assumed that Beer's law held for both vitamin A and carotene it was found that carotene produced about 1/17th of the colour density of vitamin A in the $SbCl_3$ reaction. It is suggested that multiple regression analysis may be used to estimate the magnitude of the interference caused by carotenoid pigments when the $SbCl_3$ reaction is used for biological material.—I. M. Sharman.

294

DUNCKLEY, G. G. and MACFARLANE, Y. J. **Partition chromatography of vitamin-A-alcohol and its application to the non-saponifiable matter from cod-liver oil.** *J. Sci. Food Agric.*, 1955, **6,** 559–564. [Dept. Nutrit. Res., Med. Sch., Dunedin, N.Z.]

Reversed-phase partition columns as prepared by Howard and Martin (Abst. 1353, Vol. 20) with kieselguhr which had been made unwettable by exposure to dimethyldichlorosilane vapour and with medicinal paraffin as the stationary phase were used. For a column 6 cm. high and 15 mm. in diameter, 6 g. of the silane-treated kieselguhr was used. Before use the columns were washed with 90 per cent. aqueous methanol. The unsaponifiable material of cod liver oil was applied to the column, and developed with aqueous methanol, ethanol or *iso*propanol. Separation of vitamin A from material with irrelevant absorption was achieved by development with 25 per cent. aqueous ethanol followed by 70 per cent. aqueous methanol.—R. J. Ward.

295

SMITH, H., BEAUCHENE, R. E., PARRISH, D. B. and MITCHELL, H. L. **Detection of**

N, N'-diphenyl-p-phenylenediamine (DPPD) in dehydrated alfalfa and in mixed feeds. *J. Agric. Food Chem.*, 1955, **3**, 788–789. [Kansas Agric. Exp. Stat., Manhattan.]

A test is described for the presence of the antioxidant DPPD, which interferes with the estimation of carotene.

To 2 g. alfalfa meal were added 30 ml. 1 : 1 hexane-acetone. The suspension was stirred, 2 g. activated magnesia were added with stirring and the supernatant solution was filtered. The filtrate was treated with 5 ml. of 1 : 3 HCl and a drop of 0·25 per cent. copper sulphate. A blue colour in the aqueous layer showed the presence of DPPD in the sample. For mixed feeds the test was much the same but a 10 g. sample was extracted and the supernatant solution was treated a second time with magnesia before filtering.

The test detected concentrations of DPPD as low as 6 p.p.m. in mixed feed. In a more sensitive, but less specific, test the filtered solution obtained as before was evaporated and the residue was treated with concentrated HNO_3. The solution turned blue, then red.—V. H. Booth.

296

ENGEL, C. Chemie en physiologie van vitamine A en carotenoiden met vitamine A-werking. **[Chemistry and physiology of vitamin A and carotenoids with vitamin A activity.]** *Voeding*, 1955, **16**, 817–832 (to be continued). [Centraal Inst. Voedingsonderzoek, T.N.O., Utrecht.]

A chapter for a new textbook of nutrition (Abst. 3588, Vol. 24 ; see also Absts. 342, 395, Vol. 26).

297

POWELL, L. T., KRAUSE, R. F. and SANDERS, P. L. **The purification of milligram quantities of vitamin A.** *Arch. Biochem. Biophys.*, 1955, **57**, 306–311. [Dept. Biochem., Sch. Med., W. Virginia Univ., Morgantown.]

The livers of normal rats and of rats which had been given different amounts of vitamin A by mouth were homogenised in 2 N alcoholic KOH and the mixture was refluxed for 30 min. The unsaponifiable fraction was extracted with light petroleum and vitamin A was estimated by the $SbCl_3$ method. The vitamin A content of the livers ranged from 489 to 14,900 μg. Sterols were removed by precipitating with digitonin, and vitamin A was estimated again in a portion of the sterol-free extract. The remainder of the extract was adsorbed on alumina, the unadsorbed impurities were removed by washing the column with light petroleum and the vitamin A was eluted with a 1 : 1 mixture of light petroleum and ethyl ether. The final estimation was made spectrophotometrically and the purity was measured by the ratios $E_{310\ m\mu}/E_{325\ m\mu}$ and $E_{350\ m\mu}/E_{325\ m\mu}$. With pure vitamin A the ratios were 0·87 and 0·41 ; the average ratios for the liver extract were $0{\cdot}87 \pm 0{\cdot}02$ and $0{\cdot}41 \pm 0{\cdot}01$ with $E\,^{1\ per\ cent.}_{1\ cm.}$ ranging from 1605 to 1795. Recoveries ranged from 68 to 89 per cent. of the amount found by the $SbCl_3$ method.—R. J. Ward.

298

WALD, G., BROWN, P. K., HUBBARD, R. and OROSHNIK, W. **Hindered *cis* isomers of vitamin A and retinene: the structure of the *neo*-β isomer.** *Proc. Nat. Acad. Sci., Washington*, 1955, **41**, 438–451. [Biol. Labs., Harvard Univ., Cambridge, Mass.]

299

LAMBERTSEN, G. and BRAEKKAN, O. R. **A possible new vitamin A_1 isomer in the eyes of crustaceans.** *Nature*, 1955, **176**, 553–554. [Govt. Vitamin Lab., Norwegian Fish. Res. Inst., Bergen.]

The content of vitamin A in the eyes of the deep-sea prawn *Pandalus borealis* was estimated by a chromatographic procedure to be 150 I.U. per g. No vitamin A_2 was present. The ultraviolet absorption curve departed to the left from the expected curve for vitamin A_1. The maleic anhydride reaction gave 70·6 per cent. recovery, with the *cis*-configuration predominating. Biological potency of the extracted compound was found by Fisher *et al.* (*J. Marine Biol. Assoc. U.K.*, 1952, **31**, 229) to be 50 per cent. compared with the results of the chemical estimations. It is claimed that the results obtained point to a new vitamin A_1 isomer in the eyes of crustaceans, possibly the Δ-3 : 5-di-*cis*-isomer.—I. M. Sharman.

300

AMES, S. R., SWANSON, W. J. and HARRIS, P. L. **Biochemical studies on vitamin A. 14. Biopotencies of geometric isomers of vitamin A acetate in the rat. 15. Biopotencies of geometric isomers of vitamin A aldehyde in the rat.** *J. Amer. Chem. Soc.*, 1955, **77**, 4134–4136 ; 4136–4138. [Distillation Products Indust., Eastman Kodak Co., Rochester, N.Y.]

14. Measurements of growth and storage in the liver of rats were used to estimate the activity of the 5 isomers of vitamin A acetate. The growth experiments compared 2 doses of the test material with 2 similar doses of the U.S.P. Reference Standard. The 3 new isomers, 6-mono-*cis*, 2 : 6-di-*cis* and 2 : 4-di-*cis*, were found to have potencies of 634,000, 688,000 and 679,000 I.U. per g., respectively. Each of them therefore possessed about 23 per cent. of the defined activity, 2,907,000 I.U., of all-*trans*-vitamin A acetate. The mean conversion factor found from 7 estimates of liver

storage and 6 of growth with *neo*vitamin A acetate (2-mono-*cis*) was 1523 and the potency 2,190,000 I.U. per g., or 75·3 per cent. of the activity of all-*trans*-vitamin A acetate. It is difficult to detect the presence of the 6-*cis*- and 2 : 4-di-*cis*-isomers in vitamin A preparations by physical or chemical methods, so it is suggested that biological tests by one of these methods may be used to ascertain the presence of appreciable amounts of these 2 isomers.

15. The biological activity of 5 geometric isomers of vitamin A aldehyde and of α-vitamin A aldehyde was estimated from measurements of rat growth and liver storage with the U.S.P. Reference Standard for comparison. All-*trans* and *neo*-(2-mono-*cis*)-vitamin A aldehyde were found to have the same potency of 3,070,000 I.U. per g. or, on a molar basis, about 91 per cent. of the activity of all-*trans*-vitamin A acetate. The 6-mono-*cis*- and 2 : 6-di-*cis*-vitamin A aldehydes had potencies of 637,000 and 581,000 I.U. per g., respectively, only about 18 per cent. on a molar basis of the activity of all-*trans*-vitamin A acetate. The 2 : 4-di-*cis*-vitamin A aldehyde had an intermediate potency of 1,610,000 I.U. per g. or about 48 per cent. on a molar basis of the activity of all-*trans*-vitamin A acetate. The α-ionone analogue of vitamin A aldehyde had a potency less than 50,000 I.U. per g., the lowest level at which it was tested; in metabolism it was converted into α-vitamin A alcohol and about 39 per cent. of the ingested dose was found in the liver. As about 65 per cent. of all-*trans*-vitamin A acetate when ingested is found in the liver, it follows that the relative efficiency of storage in the liver of α-vitamin A aldehyde was about 60 per cent. It appears, therefore, that although it is inactive as vitamin A, the α-ionone analogue of the aldehyde is reduced, transported and stored like the aldehyde itself.

I. M. Sharman.

301

GOODWIN, T. W. **Carotenoids.** *Annu. Rev. Biochem.*, 1955, **24,** 497–522. [Dept. Biochem., Univ. Liverpool.]

302

GOODWIN, T. W. and FOX, D. L. **Some unusual carotenoids from two nudibranch slugs and a lamprid fish.** *Nature*, 1955, **175,** 1086–1087. [Dept. Biochem., Univ. Liverpool.]

303

LENEL, R. Évolution des pigments caroténoïdes de l'hypoderme au cours de la formation des nouveaux téguments chez la crabe *Carcinus maenas*. [**Evolution of the carotenoid pigments of the hypodermis during the formation of new teguments in the crab *Carcinus maenas*.**] *C.R. Acad. Sci.*, 1955, **241,** 662–664.

304

CURL, A. L. and BAILEY, G. F. **The state of combination of the carotenoids of Valencia orange juice.** *Food Res.*, 1955, **20,** 371–376. [W. Utilisation Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 10, Calif.]

The present study is complementary to work reported earlier (Abst. 338, Vol. 25). Valencia orange juice was filtered, the filter cake was extracted with acetone, the acetone was evaporated and the residue was dissolved in light petroleum. This extract was fractionated in a 100-tube Craig apparatus with light petroleum and 90 per cent. methanol. The fractions were examined colorimetrically and pooled into groups containing carotenoids with no free hydroxyl group, with one, and with 2 or more. Another similar run was made and the grouped extracts were saponified. The 6 solutions were chromatographed on magnesia. The state of combination of the carotenes was studied by comparing the results with the saponified and the non-saponified extracts.

The greater part of the carotenol fraction, as it occurred in the juice, was in the fully esterified form. The carotenols which have no cyclic ether groups, namely, cryptoxanthol, the hydroxy-α-carotene-like fraction, luteol and zeaxanthol, occurred mainly as esters. Epoxides occurred principally as esters, and the isomeric furanoxides were found to a considerably greater extent as free alcohols.

Nineteen of the carotenoids are tabulated and labelled with their probable identity. Two new carotenoids not previously found in nature were discovered. The name trollein is proposed for one, a polyol. The other was probably an ester of a carotenoid acid.—V. H. Booth.

305

MORTON, R. A. **The modes of action of vitamin A.** *J. Sci. Food Agric.*, 1955, **6,** 349–356. [Dept. Biochem., Univ. Liverpool.]

The present knowledge of the chemical, biochemical and systemic actions of vitamin A, and of the chemistry and biochemistry of vision, is reviewed.—R. J. Ward.

306

NIESAR, K. H. Ein biochemische Wirkung von Vitamin A. [**A biochemical action of vitamin A.**] *Naturwissenschaften*, 1955, **42,** 392–393. [Inst. Physiol. Ernährung Tiere, Univ. Munich.]

In young rats which had been made deficient in vitamin A the amount of deoxyribonucleic acid and of ribonucleic acid was below normal in the skin, testes, intestines, adrenal glands, diaphragm, heart, brain and thyroid gland. There was little change in the kidneys, and the amount of both substances was greater than normal in the liver

and spleen. In normal rats subcutaneous injection of 1000 I.U. vitamin A as an aqueous emulsion increased the amount of both substances in all the organs mentioned except the thyroid gland, which was not examined.—T. Moore.

307

MARSH, H. and SWINGLE, K. F. **Blood phosphorus, calcium, and vitamin A in range sheep.** *Amer. J. Vet. Res.*, 1955, **16,** 418–424. [Agric. Exp. Stat., Montana State Coll., Bozeman.]

Blood specimens were obtained over 4 years from breeding ewes on the Chadbourne Sheep Range in south-central Montana in the eastern foothills of the Rocky Mountains. The averages and standard deviations for 517 estimations were, per 100 ml. plasma, P 4·3 ± 0·9 mg., Ca 9·2 ± 1·0 mg. and vitamin A 29 ± 7·3 μg. The specimens were collected from 12 groups of from 30 to 32 animals; 11 of the collections were made during the winter, from October to March. The group of 46 animals from which samples were taken during the summer showed a higher value for P, 5·4 mg. per 100 ml. Values from ewes given a protein concentrate during pregnancy were not significantly different from those for other ewes on the range, not given the concentrate. One group not wintered on the range and given hay and concentrate had a higher vitamin A value of 33 μg. per 100 ml. when estimations were made in March. The carotène content of the grasses on the range generally varied between 1 and 3 μg. per g. but for the species *Artemisia frigida* reached the high value of 24 μg.

I. M. Sharman.

308

ROKKOMES, T. **Experimental hydrocephalus in young rats.** *Internat. Ztschr. Vitaminforsch.*, 1955, **26,** 1–10. [Biochem. Inst., Vet. Coll. Norway, Oslo.] German and French summaries.

A disorder in young rats, characterised by spastic muscle contractions, bloody exudate from the eyes and disturbances in growth of the fur, is described. The disorder proved to be hydrocephalus, the initial sign being a rise in cerebrospinal fluid pressure. The condition occurred when the parent rat was given a diet poor in vitamin A before and during pregnancy and also when a vitamin A supplement, sufficient to prevent the disorder in the young, was reduced while the young rats were less than 18 days old. Experiments suggested that an increase in the intake of fat-soluble vitamins prevented the disorder. The usual supplements of vitamins A, D, E and K were barely sufficient to prevent it, and were not sufficient to prevent a considerable rise in cerebrospinal fluid pressure in the young rats. Additional vitamin A prevented all visible manifestations of the disorder, showing that it was caused by an absolute or relative deficiency of vitamin A.

G. F. Garton.

309

BLAIZOT, J. and BÉNAC, R. La dépense énergétique chez le rat au cours de l'avitaminose A expérimentale. [**Energy expenditure in the rat during experimental vitamin A deficiency.**] *C.R. Soc. Biol.*, 1955, **149,** 810–813. [Lab. Physiol. Gén., Fac. Sci., Toulouse.]

Numerous measurements of oxygen consumption were made on 22 rats deprived of vitamin A, and on 14 not deprived. Oxygen consumption increased with age and bodyweight, and varied between individuals. For the same age the average consumption of oxygen was from 10 to 25 per cent. greater in the deprived than in the non-deprived. The increase in oxygen consumption was an earlier sign of deficiency than cessation of growth or xerophthalmia.—T. Moore.

310

BERNHARD, K. and HEINZELMANN, F. Untersuchungen über die Resorption durch Gelatine oder Pektin stabilisierter Vitamin-A-Präparate zur Vitaminisierung von Futtermitteln. [**Studies on the absorption of preparations of vitamin A stabilised with gelatine or pectin for use in vitaminising feeds.**] *Internat. Ztschr. Vitaminforsch.*, 1955, **26,** 91–95. [Schweiz. Vitamin Inst., Basle.] French and English summaries.

Dry vitamin A as preparations of vitamin A palmitate protected with gelatine or pectin was given to rats. Lymph was collected through a thoracic duct fistula and vitamin A was estimated by the Carr Price method.

When the dry vitamin preparation was given suspended in oil or water, 26·2 and 30·4 per cent., respectively, of the amount given was found in the lymph; 36·2 per cent. was found in the lymph of similar rats given unstabilised vitamin A palmitate in solution in olive oil.

The importance is discussed of protecting vitamin A so that it is stable in feeds and yet easily absorbed from the alimentary tract. It is claimed that the dry vitamin suspended in water is absorbed to the same extent as the unstabilised vitamin, but that, suspended in oil, it is less well absorbed.—V. H. Booth.

311

KIMBEL, K. H., FISCHER, W. and BÜNTE, H. Untersuchungen über enterale Antibiose bei der Ratte. 7. Resorption von Vitamin A. [**Studies on intestinal antibiotics in the rat. 7. Absorption of vitamin A.**] *Ztschr. ges. exp. Med.*, 1955, **126,** 141–144. [Med. Klin., Univ. Erlangen.]

For previous parts see Absts. 4382, Vol. 24; 2215, Vol. 25.

Of 56 albino rats weighing about 200 g., 16 were given 25 mg. of a water suspension of aureomycin daily for 5 weeks; the rest were untreated. Both groups were given 4000 I.U. of a water-soluble preparation or an oily solution of vitamin A by injection into the stomach, and 4½ hr. later they were killed. The contents of the intestines were washed out with petrol and homogenised with the intestines. The homogenate was filtered through paper and the filtrate was concentrated by drying *in vacuo* at 45° C. The residue was dissolved in chloroform and vitamin A was estimated by the Carr Price reaction. The livers were treated in the same way. The average vitamin A content of the intestines and livers of the rats receiving the water-soluble vitamin A was, respectively, 102 and 267 I.U. for those not given aureomycin and 115 and 204 I.U. for those given aureomycin. For those receiving the oily solution of vitamin A considerable differences were found. The intestines of those not given aureomycin contained on the average 2479 I.U., and of those given aureomycin only 900 I.U. The vitamin A content of the liver of those not given aureomycin was not estimated, but that of the rats given aureomycin was on the average 67 I.U.—R. J. Ward.

312

Kon, S. K., McGillivray, W. A. and Thompson, S. Y. **Metabolism of carotene and vitamin A given by mouth or vein in oily solution or aqueous dispersion to calves, rabbits and rats.** *Brit. J. Nutrition*, 1955, **9**, 244–267. [Nat. Inst. Res. Dairying, Univ. Reading.]

Rats and calves deprived of vitamin A and normal rabbits were given, orally and intravenously, carotene and vitamin A in oily solution or aqueous dispersion. The dispersions were prepared with and without the surface-active agent Tween 40. When carotene in Tween dispersion was injected into rats and rabbits little or no carotene was found in the blood 24 hr. later. After 5 min. vitamin A alcohol was found in the blood of rats, and later the values rose in the blood of both rats and rabbits. Analysis of carcases of rabbits at intervals after injection showed that most of the carotene disappearing from the blood was destroyed. The results suggest that the intestinal wall was not the site of conversion of injected carotene to vitamin A. When dispersions of carotene without Tween were injected, carotene disappeared rapidly from the blood and was not converted into vitamin A. With calves, carotene dispersed with or without Tween was converted very little, if at all, into vitamin A. The value for carotene in the blood rose and carotene persisted for up to 10 days but the rise did not account for more than half the amount injected. When vitamin A was injected it always appeared in the blood as the alcohol, whatever the dispersion or the species, but never quantitatively. The amount of vitamin A alcohol in the liver rose to about half, but in calves to only about one-tenth, of the dose injected. Appreciable amounts of carotene and vitamin A were found in the lungs of rabbits and calves after injection, but rapidly disappeared.

I. M. Sharman.

313

Teichman, R., Helmboldt, C. F., Rousseau, J. E. (Jr.), Jungherr, E. L., Eaton, H. D., Beall, G. and Moore, L. A. **Estimation of vitamin A depletion time in dairy calves.** *Storrs Agric. Exp. Stat. Bull.* No. 301, July 1953, pp. 30.

A ration deficient in vitamin A and carotene was given to 23 Holstein and 15 Guernsey calves aged 105 days, to 14 Holstein calves aged 63 days, and to 14 Holstein calves aged 35 days, until the level of vitamin A in blood plasma was less than 4 μg. per 100 ml. for 2 consecutive weeks. The average depletion time for the 105-day-old Holstein calves was 8·56 weeks, for the 105-day-old Guernseys 7·25 weeks and for the 63- and 35-day-old Holsteins 9·44 and 8·58 weeks, respectively. The linear rate of depletion was characteristic for age and breed but not for depletion time, level of feeding, sex, season or year.

The depletion time taken to reach the 4 μg. level, estimated from the average rates of decrease over the total period of depletion for each group of calves and the average levels of vitamin A in plasma for each calf after periods of from 1 to 4 weeks on the ration, agreed well with the observed values. Estimations based on the rates of decrease of vitamin A in plasma in individual calves or in subgroups during the initial depletion period were not so good.—T. Moore.

314

Byers, J. H., Weswig, P. H., Bone, J. F. and Jones, I. R. **Carotene in the ration of dairy cattle. 1. The influence of long periods of suboptimal carotene intake on the carotene and vitamin A values of the blood, liver, and milk fat of dairy cows.** *J. Dairy Sci.*, 1955, **38**, 657–663. [Dept. Dairy Husb., Oregon State Coll., Corvallis.]

Holstein and Jersey cows which had been kept on a diet providing 50 μg. carotene per kg. bodyweight [daily] were maintained on the same diet or on one providing 130 or 390 μg. carotene per kg. bodyweight [daily]. Carotene and vitamin A were estimated in the blood plasma, liver and milk fat at regular intervals. When the carotene intake was at the 390 μg. rate the vitamin A and carotene content of the blood plasma and liver

did not increase. Repeated injections of 250,000 or 1,250,000 I.U. of vitamin A ester also failed to increase the vitamin A content in the liver of the cows on the lowest carotene intake.—R. J. Ward.

315

TEICHMAN, R., MORGAN, M. E., EATON, H. D. and MACLEOD, P. **Effect of feeding N, N′-diphenyl-para-phenylenediamine to lactating dairy cows on carotene utilization and incidence of oxidized milk flavor.** *J. Dairy Sci.*, 1955, **38,** 693–695. [Storrs Agric. Exp. Stat., Conn.]

In a first experiment, 4 calves were fed on a ration low in carotene for 13 weeks from the age of 6 weeks. Dehydrated alfalfa meal was then added to the ration so that the daily intake of carotene was about 25·8 mg. per 100 lb. liveweight. After a stabilising period of 2 weeks 0·01 per cent. N, N′-diphenyl-*p*-phenylenediamine (DPPD) was included in the ration for 2 periods of 3 weeks in a simple reversal trial. In a second experiment, 8 lactating cows were selected as producing milk which developed an oxidised flavour within 24 hr. of adding 0·5 p.p.m. of Cu^{++} ions. Each of the cows received 2 g. DPPD daily during 2 periods of 15 days also in a reversal trial. During both experiments milk samples were taken for estimation of sp. gr., fat, carotenoids and vitamin A, and blood specimens for estimation of carotenoids and vitamin A. Administration of DPPD was found to improve utilisation of carotene, and the values for carotenoids and vitamin A were higher in both blood and milk. Organoleptic tests at intervals during the experiments showed that none of the milk samples developed off-flavour attributable to the use of DPPD.—I. M. Sharman.

316

CHANDA, R., CLAPHAM, H. M. and OWEN, E. C. **The effects of deprivation of carotene and anterior pituitary hormone on the partition of vitamin A in the blood and milk of the cow.** *Biochem. J.*, 1955, **60,** 391–399. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Injection of a proprietary preparation containing the thyrotropic, luteinising and follicle-stimulating hormones of the anterior pituitary was made in Ayrshire cows with and without dietary carotene. Carotene, vitamin A alcohol and vitamin A ester were estimated in the blood and milk of the treated cows and of untreated cows receiving the same diet. The pituitary preparation increased the mean daily output in milk of vitamin A alcohol when carotene was either absent from or present in the diet; the change was greater when it was absent than when it was present. The output of vitamin A ester also in the milk of cows given no green feed was increased by the hormone preparation though no vitamin A ester was found in the blood. The hormone treatment evidently increased the rate of esterification of vitamin A by the mammary gland. It also increased the serum vitamin A alcohol whether or not greenstuff was present in the diet and appeared to accelerate the conversion of dietary carotene into vitamin A in the gut. It is suggested that the results support the hypothesis that the hormone preparation, like thyroxine, accelerated the mobilisation of the liver reserves of vitamin A alcohol into the blood and thence into the milk in both alcohol and ester form.—I. M. Sharman.

317

LE GALLIC, P. Influence du parasitisme sur les fonctions liées à la vitamine A, chez le rat et la souris. [**Effect of parasitic infestation on functions connected with vitamin A in the rat and mouse.**] *C.R. Soc. Biol.*, 1955, **149,** 349–351.

When rats deficient in vitamin A were given liver from normal mice which had been deprived of the vitamin for 15 days their condition improved for more than 20 days. Improvement lasted for less than 4 days, however, if the mice had been deprived of the vitamin for the same period but had been suffering from mange or helminthic infection. Parasitic infestation appeared to interfere with the synthesis of "hormonal vitamin A".—T. Moore.

318

GIROUD, A. and MARTINET, M. Hypervitaminose "A" et anomalies chez le foetus de rat. [**Vitamin A excess and malformations in the rat foetus.**] *Internat. Ztschr. Vitaminforsch.*, 1955, **26,** 10–18. [Lab. Embryol., Fac. Méd., Paris.] English and German summaries.

Daily doses of 35,000 I.U. vitamin A acetate or palmitate given to pregnant rats invariably caused the death and resorption of the embryos; with 20,000 I.U. daily for 12 days early in pregnancy litters were carried to term by about half the animals. Severe malformations, which included anencephaly, anophthalmia, microphthalmia and cleft palate, occurred in a high proportion of the surviving embryos taken from rats killed on the 21st day of gestation.—T. Moore.

319

LASNITZKI, I. **The effect of excess vitamin A on mitosis in chick heart fibroblasts *in vitro*.** *Exp. Cell. Res.*, 1955, **8,** 121–125. [Strangeways Res. Lab., Cambridge.]

Hanging drop cultures were made of fibroblasts from the hearts of chick embryos from 10 to 11 days old. The culture medium was one drop of fowl plasma and one of chick embryo extract. It contained from 200 to 300 I.U. vitamin A per 100 ml. Duplicate halves of the culture were maintained in the medium with and without reinforcement

up to 2000 I.U. per ml. The cultures were maintained for up to 7 days with transfer to fresh medium every 2 days. Preparations were fixed and stained after 2, 4, 5, 6 and 7 days. Cell counts were made of about 500 cells in comparable fields, and the number of mitoses was expressed as a percentage of resting cells.

For the first 4 days the cultures showed no difference. On the fifth day the cell density was greater in the cultures with added vitamin A, and the difference increased for the next 2 days. The progress of mitosis was comparable. In the cultures with added vitamin A, the total number of cell divisions was greater on the fifth day, and by the seventh day the mitotic rate had increased by 50 per cent. and the mitotic count was doubled. The increased cell density was thus due to increased cell division and not only to cell migration. It is recognised that the cultures without added vitamin A might have been inhibited by insufficiency of the vitamin.—E. M. Hume.

320

COHEN, J., MADDOCK, C. L. and WOLBACH, S. B. **The effect of parathyroidectomy on the evolution of hypervitaminosis A in rats: histological and chemical observations.** *Arch. Pathol.*, 1955, **59,** 723–726. [Labs. Nutrit. Res., Child. Med. Centre, Boston, Mass.]

The administration to parathyroidectomised rats of daily doses of 1000 I.U. vitamin A per g. bodyweight caused the same signs of vitamin A excess, including haemorrhage and bone abnormalities, as occurred in intact animals. The injuries caused by vitamin A excess cannot, therefore, be explained by stimulation of the parathyroid gland. In parathyroidectomised animals calcium in the blood was reduced and phosphorus raised, irrespective of the vitamin A intake. With excess of vitamin A proteins were reduced and mucoproteins much increased in both groups.

T. Moore.

321

PATEL, H. S. and PATEL, B. M. **Loss of vitamin A potency during the preparation of ghee from milk.** *Indian J. Dairy Sci.*, 1955, **8,** 53–60. [Inst. Agric., Anand.]

Carotene and vitamin A were estimated in milk from Kankrej cows and in ghee prepared from the same milk by the direct cream method. Fourteen samples showed an average value for carotene of 2·55 μg. per g. milk fat and 1·96 μg. per g. ghee fat, and for vitamin A of 29 and 20 I.U. per g. fat, respectively. Average percentage loss in the preparation of ghee was 22·4 $\pm$ 3·9 for carotene and 29·7 $\pm$ 4·8 for vitamin A. When colostrum, with higher initial concentrations of carotene and vitamin A, was used for the preparation of ghee the percentage loss was greater, amounting on the average to 25·1 for carotene and 35·9 for vitamin A. Other methods of preparation were shown to have no significant effect on the loss of carotene and vitamin A. When ghee was prepared from buffalo milk by the customary method 10 samples showed an average percentage loss of vitamin A of 19·7 $\pm$ 2·66.—I. M. Sharman.

322

REID, B. L., DAUGHERTY, H. K. and COUCH, J. R. **The stability of vitamin A in mixed feeds and premixes.** *Poultry Sci.*, 1955, **34,** 603–608. [Dept. Poultry Husb., Texas Agric. Exp. Stat., College Station.]

A stabilised concentrate of vitamin A or a fortified fish liver oil, each containing 10,000 I.U. vitamin A per g., was added to mixed rations otherwise free from vitamin A or provitamin. The diets included a chick starter, turkey starter, beef cattle supplement, supplement for pigs containing 15 per cent. protein, commercial milk replacer and a commercial brand of dog biscuit. The supplements were added to give 10,000 I.U. vitamin A per lb. feed. The fortified rations were then stored for 4 months in amounts ranging from 5 to 100 lb. in a warehouse with little ventilation where the temperature varied from 66° to 96° F. Small samples were stored also at 42° F. Vitamin A in each of the fortified diets was estimated after 1, 2, 3 and 4 months' storage. After 4 months' storage the amount of vitamin A, added as the stabilised concentrate, which remained in the feeds and premixes generally ranged from 87 to 98 per cent. of that originally added. There was an unexplained fall in the vitamin A content of the chick starter, which dropped to only 27 per cent. Loss of vitamin A from the diets fortified with the fish liver oil was much more rapid at all stages, and after 4 months the content was only from 2 to 51 per cent. of the initial value. Loss of vitamin A was retarded in the samples stored at 42° F., and in the diets fortified with fish liver oil the amount retained was about 1½ times that in the corresponding samples stored in the warehouse.

Biological tests with chicks gave results in good agreement with those of the chemical estimation. Three groups of chicks given the feed containing the stabilised concentrate stored for 1, 2 or 3 months remained healthy during a 10-week period; the average content of vitamin A in the liver of the chicks at the end of the period was 24·8, 22·3 and 26·3 I.U. per g., respectively.—I. M. Sharman.

323

OLSSON, N., ÅKERBERG, E. and BLIXT, B. **Investigations concerning formation, preservation and utilization of carotene.** *Acta Agric. scand.*, 1955, **5,** 113–184.

In 1941 several members of the Scandinavian Agricultural Research Workers' Association collaborated in 4 countries in the investigation of carotene problems. Their researches were published from time to time. This article in English summarises them ; many of the reports have already been abstracted.

The paper gives tables of carotene content for different parts of grasses, oats, clovers, lupins, vetches, peas and carrots (Absts. 1657, 1660, Vol. 17 ; 3296, Vol. 20), and describes studies on the effect of climate and the relation between stage of development and carotene content in leafy plants and carrots (Abst. 2846, Vol. 16) ; the effect of light on carotene formation in growing clover ; the correlation of carotene with protein and with fibre ; the correlation of carotene with other pigments ; polyploidy in clovers ; the stability of carotene in stored carrots, green silages and dried forage crops (Absts. 4025, 4078, Vol. 16) ; and the utilisation of carotene by man (Abst. 2466, Vol. 17), pigs (Absts. 2828, 3060, Vol. 16), cows (Absts. 2844, Vol. 16 ; 2933, Vol. 24) and laying hens (Abst. 2825, Vol. 23).—V. H. Booth.

324

BALASUNDARAM, S., CAMA, H. R., SUNDARESAN, P. R. and VARMA, T. N. R. **High-potency vitamin A_2 oils from Indian freshwater fish.** *Nature*, 1955, **176**, 554. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

The content of vitamin A_1 and A_2 in the liver oils of Indian freshwater fish was estimated spectroscopically and by the $SbCl_3$ colour reaction. In each of the species investigated, *Callichrous bimaculatus*, *Ophiocephalus straitus* and *Wallago attu*, vitamin A_2 exceeded by about 9 times the amount of vitamin A_1. The $E\,\frac{1\ \text{per cent.}}{1\ \text{cm.}}$ values at 351 mμ. for vitamin A_2, and at 325 mμ. for vitamin A_1, in the three species, were 211 and 26, 200 and 25, and 106 and 11, respectively. The oils were further investigated by a chromatographic technique with 5 per cent. weakened alumina, which showed that most of the vitamin A_2 in the oil was in the ester form. Vitamin A_1 ester was not present, only the alcohol form being found. A small quantity of vitamin A_2 alcohol was present in each of the oils.—I. M. Sharman.

See also Absts. 224–8, 230–2, 234, 235, 238, 250, 265.

VITAMIN D

325

TSCHAPKE, H. and PLESSING, H. Chemische Vitamin D-Bestimmung mit Zinn (II)-chlorid. [**Chemical estimation of vitamin D with stannous chloride.**] *Naturwissenschaften*, 1955, **42**, 417. [Anst. Vitaminforsch. Vitaminprüfung, Potsdam-Rehbrücke.]

Several metal halides were tested as reagents for vitamin D, and stannous chloride was found satisfactory. Dissolved in acetyl chloride it gave a yellow colour with pure solutions in chloroform of vitamin D_2 or D_3. With irradiated products it gave a red colour. Vitamin A gave a blue colour which interfered, and the vitamin had to be removed by chromatography. Cholesterol, 7-dehydrocholesterol and ergosterol did not interfere so that the costly and time-consuming precipitation with digitonin could be omitted. The method is described in detail. The results were read in a Pulfrich photometer with filter S50. A curve of reference was constructed with pure vitamin D_2. Examples are given showing the close correspondence of the results obtained by the method and biologically for an assortment of materials.

E. M. Hume.

326

MARIANI, A. and CAVINA, G. Determinazione di vitamina D_2 in presenza di vitamina A in prodotti farmaceutici ed in concentrati naturali. [**Estimation of vitamin D_2 in presence of vitamin A in pharmaceutical preparations and natural concentrates.**] *Rend. Ist. Super. Sanità, Rome*, 1955, **18**, 232–237. [Lab. Biol., Ist. Super. Sanità, Rome.] French, English and German summaries.

In the method previously described (*Rend. Ist. Super. Sanità, Rome*, 1953, **16**, 725), vitamin A was selectively destroyed by chromatography in benzene solution on bentonite, but a small amount of a destruction product passed through the column and interfered with the spectrophotometric estimation of vitamin D_2 after reaction with $SbCl_3$. It was found that the water content of the bentonite adsorbent greatly affected the amount of the destruction product passing through the column. Superfiltrol, washed with benzene and dried at 40° C. with exactly 4 per cent. of water added, was found satisfactory. Results of applying the method to mixtures of vitamin A and vitamin D in pure solution and in pharmaceutical products are tabulated.—E. M. Hume.

327

VALLE ZARATE, N. T. Obtención de la ergosterina o pro-vitamina D a partir de la levadura de cerveza y esteres del ergosterol. [**Preparation of ergosterol or provitamin D from brewer's yeast and preparation of ergosterol esters.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 410–413.

Ergosterol was prepared from brewer's yeast by saponification with alcoholic potash, followed by alcohol extraction and recrystallisation. With the pure ergosterol thus obtained, condensation with appropriate acid anhydrides produced acetate, succinate and phthalate esters of ergosterol. [The physical and chemical constants of the ergosterol and its esters were determined but are not reported.]

A. M. Copping.

328

SONDHEIMER, F. and WHEELER, O. H. **The stereochemistry of calciferol and precalciferol.** *Chem. and Indust.*, 1955, No. 25, 714–716. [Syntex S.A., Apartado Postal 2679, Mexico.]

A report is made on the conclusions which could be drawn as to the steric configuration of calciferol and precalciferol (Abst. 349, Vol. 19) from a study of their ultraviolet spectra. Structural formulae are suggested.—E. M. Hume.

329

KOEVOET, A. L., VERLOOP, A. and HAVINGA, E. **Studies on vitamin D and related compounds. 2. Preliminary communication on the interconversion and the possible cis/trans isomerism of previtamin D and tachysterol.** *Rec. Trav. chim. Pays-Bas*, 1955, **74**, 788–792. [Lab. Org. Chem., Univ. Leyden.]

330

FESTENSTEIN, G. N., HEATON, F. W., LOWE, J. S. and MORTON, R. A. **A constituent of the unsaponifiable portion of animal tissue lipids ($\lambda_{max.}$ 272 mμ.).** *Biochem. J.*, 1955, **59**, 558–566. [Dept. Biochem., Univ. Liverpool.]

The presence in the intestine of the horse and pig of an unsaponifiable substance with an ultraviolet absorption maximum at 272 mμ. was described by Festenstein and Morton (Abst. 4804, Vol. 25). In the present study the substance was found also in horse stomach and in the liver, kidney, intestine and submaxillary glands of normal rats and of rats deprived of vitamin A. It was not found in ox or sheep intestine or in the bladder, testis or vagina of rats deprived of vitamin A. From its polarity, infrared and ultraviolet absorption, and probable empirical formula of $C_{28}H_{42}O_2$, it was considered that the substance might be a steroid containing the chromophoric grouping 8(9)-ene-7 : 11-dione.—D. Duncan.

331

CAUSERET, J. Recherches sur l'utilisation physiologique du calcium au cours de la croissance chez le rat. Nouveaux aspects du rôle biologique de la vitamine D. [**The physiological utilisation of calcium during growth of the rat. New aspects of the biological role of vitamin D.**] *Ann. Zootech.*, 1954, **3**, 271–336 ; 1955, **4**, 5–68. [Lab. Physiol. Nutrit., Paris.]

The article is too lengthy to abstract ; it is partly a review, partly a report of experiments, and partly a theoretical discussion.—E. M. Hume.

332

TALMAGE, R. V. and DODDS, B. F. **Comparative study of some effects of administration of dihydrotachysterol and calciferol to rats.** *Endocrinology*, 1955, **57**, 236–242. [Dept. Biol., Rice Inst., Houston, Tex.]

Ca and P were estimated in the blood and urine of about 190 male rats weighing between 175 and 250 g., maintained on a standard Purina diet or on a Ca-free diet. Some were injected intraperitoneally with 5 μC. ^{32}P. Calciferol in propylene glycol and dihydrotachysterol in sesame oil were given orally.

In the 72 hr. during which 200 μg. dihydrotachysterol was given daily, urinary and serum Ca on the normal or Ca-free diet increased more with dihydrotachysterol than without it ; serum and urinary P increased at first, but not progressively.

In a similar experiment with parathyroidectomised rats, given 200 μg. dihydrotachysterol daily for 1 or 2 days before the operation, urinary excretion of ^{32}P increased within a few hours after operation to normal or over, though it was greatly reduced when dihydrotachysterol was not given or was given only at the same time as the operation. Serum inorganic P rose somewhat but not greatly in all the rats subjected to parathyroidectomy. Serum Ca was prevented from falling after the operation when dihydrotachysterol had been given beforehand. Urine Ca rose in all the animals after operation, most in those given dihydrotachysterol for 2 days beforehand. The experiment was repeated with rats given 400 μg. dihydrotachysterol or the same amount of vitamin D_2. The vitamin failed to duplicate the action of dihydrotachysterol, the results with it differing little from those for untreated parathyroidectomised animals.

E. M. Hume.

333

HANSSLER, H. Experimentelle Untersuchungen über den Einfluss des D-Vitamin auf die Funktion von Thymus und Milz. [**Experimental studies on the effect of vitamin D on the function of the thymus gland and spleen.**] *Ztschr. ges. exp. Med.*, 1955, **126**, 105–115. [Kinderklin., Univ. Tübingen.]

The possibility that vitamin D acts on the body through the spleen and thymus gland, by inhibiting their production of a substance which reduces serum Ca and P, as suggested by Nitschke (Abst. 226, Vol. 3), and not through the parathyroid

glands, was investigated. The size of the nuclei in the 2 organs was used to assess their activity, in the same way as was previously done for the parathyroid glands (Absts. 1729, 2954, Vol. 24). The nuclei were measured in the reticular cells of the thymus and in the nodular marginal zone of the spleen, small nuclei being taken as a sign of inactivity. Young rats weighing from 30 to 40 g. were given for from 20 to 40 days diets high or low in Ca, with or without daily amounts of vitamin D_2 or vitamin D_3 ranging from 1 to 40,000 I.U., or with A.T. 10. There was no difference in the size of the nuclei whether the diet was low or high in Ca unless vitamin D was given, although the serum Ca value might be very different. Even with the lowest doses of vitamin D the cell nuclei were significantly smaller than without. The effect of A.T. 10 was the same, but it was less active.

It is concluded that vitamin D acts on the spleen and thymus to lower their activity, and that its effect on those organs is unrelated to the serum Ca value. Further, apart from the spleen and thymus, vitamin D raises the serum Ca value and thereby inactivates the parathyroid glands.—E. M. Hume.

334

ENGFELDT, B. and ZETTERSTRÖM, R. **Biophysical studies of the bone tissue of dogs with experimental rickets.** *Arch. Pathol.*, 1955, **59,** 321–331. [Dept. Physical Cell Res., Karolinska Inst., Stockholm.]

Of 3 dogs 2½ months old, 2 were fed on a rachitogenic diet and kept in darkness until, after a month, they had developed rachitic changes, mild as seen radiographically. All 3 were then given an intravenous injection of 1 mC. $Na_2H^{32}PO_4$ and were killed 3 hr. later. Thin longitudinal sections were cut of the epiphyses and metaphyses of the long bones. Some bones were first decalcified. The distribution of mineral salts in the section was determined by microradiography and radio-autography. The exchangeability of the Ca ions in the bone minerals was investigated by incubating bone sections, in which the radio-activity had faded, in $^{45}CaCl_2$ solution and making radio-autograms. The ultrastructure of the bone tissue was investigated by X-ray diffraction. The appearance of the sections is illustrated and described.

In rickets, mineralisation of the newly formed organic matrix, though arrested, was not wholly lacking. There was a thin zone of higher X-ray absorption at the outer border of the osteoid tissue; apatite was present, and there was uptake of ^{45}Ca *in vitro* in the same zone. In polarised light the orientation of the collagen fibres was disturbed, so that it was clear that the development of the organic matrix was abnormal as well as its mineralisation.—E. M. Hume.

335

HERZFELD, E., KLUPP, H., LOUDON, M. and ZWEYMÜLLER, E. Beitrag zur experimentellen Vitamin D-Vergiftung beim Hund. 1. Die Wirkung von Vitamin D_2 auf die maximale tubuläre Rückresorption von Phosphat (*Tm* PO_4) bei osmotischer Diurese und normaler Glomerulusfiltrationsgrösse. [**Experimental vitamin D intoxication in the dog. 1. The effect of vitamin D_2 on maximum tubular reabsorption of phosphate (*Tm* PO_4) in osmotic diuresis and normal glomerular filtration.**] *Ztschr. ges. exp. Med.*, 1955, **126,** 33–39. [Inst. Pharmakol., Univ. Vienna.]

Seven healthy adult female dogs, weighing from 10 to 24 kg., were transfused with a mixture of primary and secondary Na phosphate. The solution was hypertonic to promote diuresis and contained inulin for estimation of the glomerular filtration rate. Inulin and inorganic P were estimated in the blood and urine, and the method of calculating the tubular re-absorption of P from the data is set out. Several tests were made without vitamin D, which was then given as a single oral dose of 1 mg. vitamin D_2 per kg. bodyweight in oil solution, and tests were made 1, 2, 5 and 12 days later; in all, 32 such clearance tests were made. In none of the tests after administration of vitamin D was there any change in the tubular re-absorption rate outside the normal range of variation. There was no change in the concentration of residual N in the blood, showing that there had been no toxic action of vitamin D.

E. M. Hume.

336

RÄIHÄ, C. E. and FORSANDER, O. **Vitamin D and phosphorylation of thiamin.** *Acta paediat.*, 1954, **43,** Suppl. 100, 541–544. [Child. Clin., Univ. Helsinki.]

Three groups of from 2 to 5 rats were maintained on a diet deficient in vitamin D, one group receiving in addition 1000 I.U. vitamin D every 7 days. After 19 days the last group and a second group received 1000 I.U. vitamin D and 10 mg. vitamin B_1. The third group received only 10 mg. vitamin B_1. The supplements were mixed in the food. Two days later the heart blood was taken and cocarboxylase was estimated in it by the method of Westenbrink *et al.* (Abst. 1288, Vol. 15). The mean value for cocarboxylase in the group given vitamin D throughout was 13·2, for the group given vitamin D only at the same time as vitamin B_1 11·0, and for the group given vitamin B_1 and not given vitamin D at all 9·4. [The values are stated as per 100 ml. blood but no unit is given; presumably it should be μg.] The second and third group had signs of rickets.

The experiment was repeated with somewhat different amounts of vitamin D and with vitamin

B_1 given by injection instead of in the food. The corresponding values were 13·2, 13·0 and 9·3.

E. M. Hume.

337

HORN, V. and EDER, H. Zur Frage der Beeinflussung der D_2-Wirkung bei Küken durch Antibiotika. [**Problem of modifying the effect of (vitamin) D_2 on chickens with antibiotics.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 65–67. [Vet. Physiol. Inst., Justus Liebig Hochsch., Giessen.]

One hundred day-old Leghorn cockerels were given a diet on which rickets had been found to develop in from 4 to 5 weeks. After one week on the diet alone, 7 groups received daily 0·025 μg. vitamin D_3, or 0·25 or 0·5 μg. vitamin D_2, or the same 2 doses of vitamin D_2 with penicillin, or no addition. Penicillin was added as 25 mg. Procain-penicillin Bayer per kg. food. At the age of 5 weeks the tarsal-metatarsal distance was measured in X-ray photographs of the foot. Only the chicks receiving vitamin D_3 were protected against rickets. Penicillin appeared to have no effect on the activity of vitamin D_2.—E. M. Hume.

338

MEINTZER, R. B. and STEENBOCK, H. **Vitamin D and magnesium absorption.** *J. Nutrition*, 1955, **56,** 285–294. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Rats weighing about 90 g. were maintained in metabolism cages, and Mg balance experiments were made lasting 3 days. The diet was low in P, Ca and Mg, the respective percentages being 0·016, 0·012 and 0·02; it contained, per cent., Cerelose 67, cooked egg white 18, roughage 3, cottonseed oil 10 and salts, not including Ca, P or Mg, 2. Vitamins were added except vitamin D, which, when given, was administered as 75 I.U. vitamin D_2 per 3-day period. Additions were made to the diet of Mg phosphate, Mg carbonate, and Mg phytate in an acidic and a basic form, and sometimes also of 1 per cent. of $CaCO_3$.

In 12 experiments with 170 rats, administration of vitamin D always increased the absorption of Mg by an amount never exceeding 19 per cent. but, through loss in the urine, the retention was actually diminished. Mg was absorbed readily even when given as phosphate or phytate or in presence of excess base with added $CaCO_3$ and $NaHCO_3$. Retention of Mg was highest when phosphate intake was high, 0·34 per cent. of the diet. In 4 out of 5 experiments there was an increase in P retention when vitamin D was given. Phytic acid given as Mg phytate was available as a source of P even when vitamin D was not given, and when the extent to which the phytate was hydrolysed was low owing to an increased intake of $CaCO_3$. When additional $CaCO_3$ was not given only a little more phytate was hydrolysed with vitamin D than without it.—E. M. Hume.

339

SCHEER, K. Tierexperimentelle Untersuchungen über antirachitische Wirksamkeit handelsüblicher uv-bestrahlter Milch. Stellungnahme zu dieser Arbeit von W. Theopold und I. Schulte-Nickell in Monatsschrift für Kinderheilkunde, **102,** H. 5, 262 ff., 1954. [**Animal experiments on the antirachitic value of commercial milk irradiated with ultraviolet light. Comment on the article with this title by W. Theopold and I. Schulte-Nickell, *Monatsschr. Kinderheilk.*, 1954, 102, 262.**] *Monatsschr. Kinderheilk.*, 1955, **103,** 200–203. [Frankfurt a.M.]

The X-ray pictures of 160 rats used by Theopold and Schulte-Nickell in their test (Abst. 370, Vol. 25), were examined and re-evaluated with the conclusion that the original assessment was too rough and returned too large a proportion of animals as rachitic.

The results are summarised of tests, both published and unpublished, in which good vitamin D potency was found in milk irradiated by the same process as that used in Frankfurt (Coates *et al.*, Abst. 1883, Vol. 25; Engel, Abst. 4813, Vol. 25; Wodsack; Holtz; Czerny Krankenhaus, Univ. Heidelberg).

X-ray photographs are reproduced of 2 babies with florid rickets, cured by administration of milk irradiated by the process used in Frankfurt.

E. M. Hume.

340

THEOPOLD, W. Schlusswort zu den Bemerkungen von Herrn. Professor Scheer. [**Final comment on the remarks of Professor Scheer.**] *Monatsschr. Kinderheilk.*, 1955, **103,** 203–205. [Kinderklin., Univ. Marburg a.d. Lahn.]

Photographs are reproduced of sections of the bones of rats used in the test criticised by Scheer (preceding Abst.), showing the presence of gross rickets. The cure of rickets in the 2 babies is criticised as having occurred in April and May.

E. M. Hume.

See also Absts. 224, 225.

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VITAMIN E

341

EGGITT, P. W. R. and WARD, L. D. **The chemical estimation of vitamin-E activity in cereal products. 2. Millers' offals and compound animal foods.** *J. Sci. Food Agric.*, 1955, **6**, 329–337. [Dept. Appl. Biochem., Univ. Birmingham.]

For Part 1 see Abst. 2965, Vol. 24. The tocopherol pattern was estimated by the method described in Part 1 in fine wheat feed, coarse bran, commercial and purified wheat germ meal and 2 poultry feeds. The method was modified for the poultry feeds by doubling the quantity of pyrogallol and alkali used in the saponification. Coarse bran contained 6·5 mg. tocopherols per 100 g. and, by elution of the spots on paper chromatograms, was shown to contain 9 per cent. in the "origin spot", 9 per cent. α-tocopherol, 15 per cent. β-tocopherol and 67 per cent. ε-tocopherol. The values for fine wheat feed were 8·1 mg. per 100 g. and 13, 23, 21 and 43 per cent. of the respective tocopherols. Commercial wheat germ meal contained 26 mg. total tocopherols per 100 g. and had 14 per cent. origin spot, 49 per cent. α-tocopherol, 28 per cent. β-tocopherol and 9 per cent. ε-tocopherol, compared with 27 mg. per 100 g. and 14, 54, 29 and 3 per cent. of the respective tocopherols for purified wheat germ in which the coarse bran fragments had been removed by hand picking. Of the balanced poultry feeds, chick mash contained 5·6 and breeder mash 5·0 mg. total tocopherols per 100 g. with 19 and 20·5 per cent. origin spot, 22 and 16 per cent. α-tocopherol, 35 and 33 per cent. β- plus γ-tocopherol and 24 and 30·5 per cent. ε-tocopherol, respectively. The 2 mashes had a calculated vitamin E potency of 1·8 and 1·3 mg. per 100 g.—R. J. Ward.

342

EMMERIE, A. Vitamine E. [**Vitamin E.**] *Voeding*, 1955, **16**, 699–706.

A chapter for a new textbook of nutrition (Abst. 3588, Vol. 24; see also Absts. 296, 395).

343

SCOTT, M. L., HILL, F. W., NORRIS, L. C., DOBSON, D. C. and NELSON, T. S. **Studies on vitamin E in poultry nutrition.** *J. Nutrition*, 1955, **56**, 387–402. [Dept. Poultry Husb., Cornell Univ., Ithaca, N.Y.]

Male chicks were given a basal diet deficient in vitamin E, composed of torula yeast, glucose, vitamin-E-free lard and ground cellophane with added amino-acids, minerals and vitamins. The basal diet was given alone or with supplements of α-tocopheryl acetate, γ-tocopherol, diphenyl-*p*-phenylenediamine, butylated hydroxyanisole, nordihydroguaiaretic acid, 2 : 5-di-*tert.*amylhydroquinone, 6-ethoxy-1-2 :-dihydro-2 : 2 : 4-trimethylquinone, crude lecithin or purified phosphatides. With all the supplements the incidence of exudative diathesis was 100 per cent. and all the birds died by the 5th week except those receiving γ-tocopherol, which delayed the onset of exudative diathesis and death, and α-tocopheryl acetate, which gave complete protection.

In a second experiment chicks were given the basal diet with and without supplements of α-tocopheryl acetate, dried brewer's yeast or diphenyl-*p*-phenylenediamine, or a combination of the first and second, or of the second and third, supplements. Complete protection was given by α-tocopheryl acetate and dried brewer's yeast.

A third experiment showed that the vitamin-E-like activity of the dried brewer's yeast was in the fraction insoluble in hexane, and was thus not fat-soluble. Chicks receiving the basal diet showed microcytic anaemia.

In a fourth experiment the basal diet was altered by reducing the content of protein. The chicks had poor growth, severe exudative diathesis, leg weakness and gizzard erosion. Addition of methionine improved growth and alleviated gizzard erosion but did not affect exudative diathesis or leg weakness. Addition of vitamin E as well as methionine greatly increased growth and prevented all disorders.

For a fifth experiment cod liver oil was used instead of lard in the basal diet. Dried brewer's yeast or vitamin E again prevented exudative diathesis and leg weakness, but cystine improved only gizzard erosion and growth.—R. J. Ward.

344

VELLING, G. Ernaeringslidelse hos aellinger og kyllinger, formentlig fremkaldt af mangel på vitamin E. [**Nutritional disease in ducklings and chicks probably produced by lack of vitamin E.**] *Nord. Vet.-Med.*, 1955, **7**, 573–588. [Lab. Fjerkraeundersøgelser.] French, English and German summaries.

Literature is reviewed. During the years 1953 and 1954, out of 337 ducks sent for examination to the Poultry Research Laboratory, 22 had muscular dystrophy. In some paralysis developed slowly; in others it was rapid and almost immediately fatal. Of those recorded as sick, from 25 to 30 per cent. died.

The pathological findings were of individual muscles or groups of muscles of light colour with a "boiled" look; gizzard muscle might be severely affected. Histologically there was hyaline

necrosis, fragmentation, and cellular infiltration in the connective tissue round necrotic fibres. Sometimes there were calcareous deposits.

In the autumn of 1954 there was an epidemic of "crazy chick" disease with the characteristic signs; 80 certain specimens and 50 doubtful were received in a total of 6062. Chicks, only from 3 to 5 weeks old, were chiefly attacked; percentage mortality in affected flocks was usually from 1 to 5 but in some was as high as 10. Pathological and histological findings were of the characteristic oedema, necrosis, haemorrhages and hyaline thrombi in the capillaries of the cerebellum.

Inquiries and interviews on affected holdings suggested that too much cod liver oil was given on many farms. It is difficult to mix cod liver oil uniformly in a ration and unequal dispersal might explain the uneven incidence of the disorder. Empirical treatment by reduction of the protein part of the ration with corresponding increase of grain and omission of cod liver oil caused the recovery of all but those most severely affected. After experimental administration of a vitamin E preparation to a small number of crazy chicks some recovered, but the recovery may have been due to a simultaneous change of diet.—I. Leitch.

345

IRVING, J. T. and BUDTZ-OLSEN, O. E. **The relation between the action of vitamin E and protein in the body, and the influence of various fish-liver oils in the diet upon vitamin E activity in vivo.** *Brit. J. Nutrition*, 1955, **9**, 301–309. [Joint Dent. Res. Unit, Counc. Sci. Indust. Res. and Univ. Witwatersrand, Johannesburg.]

Young rats of 50 g. weight were given a diet deficient in vitamin E and low in protein, composed of potato starch, dried brewer's yeast and fish liver oil. The percentage of fish liver oil, which was cod or hake, was 20, 10 or 2·5, with corresponding adjustments made in the potato starch content. α-Tocopheryl acetate, 3 mg. daily, was given to some rats.

On the diets with hake or cod liver oil the animals lost weight or made very small gains. Vitamin E improved the weight gain of the rats having cod liver oil but had hardly any effect on those given hake liver oil. When the protein content was raised from 9·3 to 18·8 per cent. by substitution of egg albumin for 12·5 per cent. of the potato starch, the rats having both oils gained weight, but those with hake liver oil gained more slowly.

The incisor teeth of the rats having the cod liver oil diet were all white after 30 days, and the enamel organ was consistently affected after 20 days. Tocopherol completely protected the enamel organ and the colour of the teeth. Extra protein gave protection to the enamel organ but the teeth turned white.

Similar results were obtained with the rats having hake liver oil, but tocopherol gave no protection, and the degree of protection by extra protein was not as good as with cod liver oil. Extra protein and tocopherol together gave complete protection.

The dialuric acid haemolysis test was positive in all the rats receiving no tocopherol except in those having hake liver oil with extra protein. No pathological change was found in the kidneys of the rats having hake liver oil or the smaller amounts of cod liver oil. Degeneration of the convoluted tubules was found in the kidneys of the rats with 20 per cent. cod liver oil in the diet.

R. J. Ward.

346

HOVE, E. L. **Symposium on the antimetabolites. Anti-vitamin E stress factors as related to lipid peroxides.** *Amer. J. Clin. Nutrit.*, 1955, **3**, 328–336. [Dept. Animal Husb. Nutrit., Alabama Polytech. Inst., Auburn.]

347

ROSENKRANTZ, H. **Studies in vitamin E deficiency. 1. The oxygen consumption of various tissues from the rabbit.** *J. Biol. Chem.*, 1955, **214**, 789–797. [Worcester Found. Exp. Biol., Shrewsbury, Mass.]

Young rabbits weighing from 600 to 1200 g. were given a diet deficient in vitamin E and were kept in glass metabolism cages. Creatine and creatinine were estimated daily in the urine. Loss of appetite, decline in weight and muscular paralysis occurred in about 3 weeks. In order to estimate oxygen consumption of the tissues before irreversible biochemical or physiological changes might have occurred, the animals were killed when the urinary creatine output was below 20 mg. in 24 hr. Oxygen uptake was measured in slices and strips of skeletal muscle, bisected adrenal glands and kidney, liver and heart slices with and without calcium in the medium. In the deprived animals compared with non-deprived the oxygen uptake by slices of skeletal muscle was increased by 48 per cent. and of muscle strips by 54 per cent. in presence of Ca but there was little or no change in the absence of Ca; the increase in the oxygen uptake of the adrenal glands was 71 per cent. and of the liver 65 per cent. in presence of Ca, and 104 and 91 per cent., respectively, in absence of Ca. No change was found in the kidneys and heart. The increase in oxygen uptake of the adrenal glands was in the cortex; a similar increase was found in rabbits on a diet deficient in vitamins A and D, in pregnant rabbits on a stock diet, and in a rabbit with a broken leg.—R. J. Ward.

348

HOVE, E. L. and SEIBOLD, H. R. **Liver necrosis and altered fat composition in vitamin**

E-deficient swine. *J. Nutrition*, 1955, **56**, 173–186. [Dept. Animal Husb., Agric. Exp. Stat., Auburn, Ala.]

Six pigs were fed from weaning on a diet deficient in vitamin E and containing 2 per cent. cod liver oil and only 6 per cent. protein. Three of them died suddenly and were found to have massive acute haemorrhagic necrosis of the liver. Histological examination of the liver of the 3 survivors showed post-necrotic cirrhosis in 2 of them. The percentage of fat in the liver was 1·56 compared with 2·31 in pigs given vitamin E. Estimation of linoleic, arachidonic and pentaenoic acids in the muscle fat showed an average percentage of 3·09, 1·36 and 0·72, respectively, for the deprived pigs and 5·37, 2·19 and 1·14 for those given vitamin E. Liver fat showed a higher value for arachidonic acid, 6·54 per cent., for the deprived pigs than that, 5·78 per cent., for the non-deprived, but the concentration of linoleic and pentaenoic acids was lower in the deficient animals. Maize contains only small amounts of vitamin E, about 6 mg. α-tocopherol per kg., so it is probable that pigs given a diet based on maize and including cod liver oil, and without access to pasture or other source of vitamin E, will develop the fatal liver necrosis described.—I. M. Sharman.

349

WEINSTOCK, I. M., SHOICHET, I., GOLDRICH, A. D. and MILHORAT, A. T. **The effect of vitamin E deficiency on the oxidation of tricarboxylic acid cycle intermediates.** *Arch. Biochem. Biophys.*, 1955, **57**, 496–505. [Dept. Psychiat., Cornell Univ. Med. Coll., New York.]

Young rabbits were kept on a diet deficient in vitamin E, with or without a supplement of *dl*-α-tocopherol. After from 4 to 5 weeks they were killed, and systems were set up containing washed liver homogenate, cytochrome *c*, adenosine triphosphate and an intermediate of the tricarboxylic acid cycle. With α-ketoglutarate, succinate, fumarate, L-malate and oxalacetate the rate of oxygen uptake was from 60 to 600 per cent. higher for the liver of deprived than of non-deprived animals. With citrate, the slight increase in activity was not statistically significant. The addition of fluoride to the systems only slightly reduced the excessive oxygen uptake of the deficient tissues. The replacement of adenosine triphosphate by the diphosphate or monophosphate eliminated the difference in oxygen uptake between the deprived and non-deprived livers by increasing the uptake of the latter.—T. Moore.

350

DI BELLA, S. Inibizione della glicolisi anossibiontica del midollo osseo determinata da α-tocoferolo. [**Inhibition of anaerobic glycolysis in the bone marrow by α-tocopherol.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 1035–1037. [Ist. Chim. Biol., Univ. Sassari.]

The extent of anaerobic glycolysis by homogenates of bone marrow, expressed as μg. lactic acid per g. fresh bone marrow, was on average 44·7 per cent. less for 6 rats maintained for a month on an adequate diet with addition of 3 mg. α-tocopherol [presumably daily] than for 6 rats having the same diet without added tocopherol. For the same 2 groups of rats the aldolase activity of the bone marrow was on the average 52·8 per cent. less in the rats given added tocopherol.

E. M. Hume.

351

NASON, A., and LEHMAN, I. R. **Tocopherol as an activator of cytochrome *c* reductase.** *Science*, 1955, **122**, 19–22. [McCollum-Pratt Inst., Johns Hopkins Univ., Baltimore, Md.]

Cytochrome *c* reductase was prepared from normal muscle by a procedure involving homogenisation, dialysis and fractional centrifuging. The addition of α-tocopherol in a suspension of ethanol-globulin or -albumin to a system containing cytochrome *c*, diphosphopyridine nucleotide and the enzyme matured by storage at — 15° C. caused an increase in activity of up to sixfold. With the fresh enzyme high activity was observed even without tocopherol, which suggested that a substance having the same activity as tocopherol must be loosely attached and lost during storage. In agreement with the view, the activity of the fresh enzyme preparation was reduced by extraction with *iso*octane. α-Tocopheroxide also activated the system, but no activity was shown by numerous other substances tested, including esters of tocopherol, vitamin K_1, vitamin D_2, cholesterol, cystine, lipoic acid, oleic acid and anti-oxidants.

T. Moore.

352

YOUNG, J. M. (Jr.), DINNING, J. S. and DAY, P. L. **Metabolic interrelationships of vitamins E and B_6.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 216–217. [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

Weanling rats were given a basal diet deficient in vitamins E and B_6 with or without a supplement of one or both vitamins. Bodyweight and food intake were recorded and urine was analysed for creatine, creatinine and allantoin. Xanthurenic acid was estimated in the urine before and after intraperitoneal injection of 50 mg. DL-tryptophan per kg. bodyweight. The inclusion of vitamin B_6 increased growth but vitamin E had no effect. Both vitamins decreased the daily excretion of creatine and allantoin. Vitamin B_6 decreased the excretion of xanthurenic acid after injection of tryptophan; vitamin E had no effect.

R. J. Ward.

VITAMIN K

353

MARTIUS, C. and NITZ-LITZOW, D. Zum Wirkungsmechanismus des Vitamin K. [**The mode of action of vitamin K.**] *Biochem. Ztschr.*, 1955, **327**, 1–5. [Physiol. Chem. Inst., Univ. Würzburg.] English summary.

The effect was studied *in vitro* of a number of anticoagulant substances on oxidative phosphorylation in mitochondria from the liver of rats and of chicks reared on a diet lacking vitamin K. Inhibition of phosphorylation was closely related to anticoagulant activity. In tests with vitamin K_1 and two naphthoquinone derivatives with side chains differing in length, the number of C atoms in the side chain seemed to determine the effect on phosphorylation. The experiments are considered as evidence for regarding 2-methyl-1 : 4-naphthoquinone as provitamin K.—A. M. Copping.

354

YACOWITZ, H., ROSS, E., SANGER, V. L., MOORE, E. N. and CARTER, R. D. **Hemorrhagic syndrome in chicks fed normal rations supplemented with sulfaquinoxaline.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 1–7. [Dept. Poultry Sci., Ohio Agric. Exp. Stat., Wooster.]

When chicks were given a starter ration containing 5 per cent. alfalfa and 5 mg. menadione per lb. and supplemented with 0·1 per cent. sulphaquinoxaline, a haemorrhagic state like one observed in the field appeared in about 25 per cent. of the birds. Procaine penicillin, 2 mg. per lb. feed, greatly increased the incidence of haemorrhages and reduced the haematocrit values. The toxic effect of sulphaquinoxaline was variable. When it was given at 3, 4 or 5 weeks of age, the haematocrit values, measured at 7 weeks of age, were reduced, but in chicks given the drug at 2 days old the haematocrit values were almost normal. Some chicks were more resistant than others. The incidence of haemorrhages was higher in chicks on a broiler ration than in those on the starter mash, which is ascribed to the more rapid growth on the broiler ration. When 0·5 g. iodinated casein was included per lb. ration to introduce a stress factor the incidence and severity of the haemorrhages were increased.—E. M. Cruickshank.

355

CIANCIMINO, C. Comportamento dei lipidi epatici in seguito a somministrazione di vitamina K nei ratti alimentati con dieta steatogena. [**Behaviour of liver lipids after administration of vitamin K in rats fed on a diet to produce fatty liver.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 912–913. [Ist. Fisiol., Univ. Palermo.]

Two groups of adult male rats were fed for 25 days on a diet containing, per cent., sucrose 50, beef fat 40, casein 5, agar 1 and salts 4, with added vitamins not including vitamin K. One group received 1 mg. vitamin K per head daily by mouth. In the liver, total lipids, fatty acids and unsaponifiable fraction were estimated. The means and ranges for all 3 values were considerably higher in the rats given vitamin K.—E. M. Hume.

VITAMIN B COMPLEX: GENERAL

356

GIRI, K. V. and BALAKRISHNAN, S. **Circular paper chromatographic method for estimation of thiamine and riboflavin in multivitamin preparations.** *Anal. Chem.*, 1955, **27**, 1178–1180. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

A chromatographic method based on that of Giri and Rao (Abst. 1500, Vol. 22) was evolved for simultaneous estimation of vitamin B_1 and riboflavin on filter paper of 18 or 24 cm. diameter. Vitamin B_1 was converted to thiochrome and both vitamins were measured with a fluorimeter. Standard chromatograms for known concentrations of vitamin B_1 and riboflavin were prepared and reference curves constructed so that the method could be applied to vitamin mixtures. Acetic acid extracts were used and the chromatograms were found to be stable for up to 14 days after preparation.—A. M. Copping.

357

BRUST, M. and FRAENKEL, G. **The nutritional requirements of the larvae of a blowfly, *Phormia regina* (Meig.).** *Physiol. Zoöl.*, 1955, **28**, 186–204. [Dept. Entomol., Univ. Illinois, Urbana.]

Growth of blowfly larvae was investigated with a purified medium. Satisfactory results were obtained with a mixture of casein, cholesterol, McCollum's salt mixture No. 185, all known vitamins of the B complex and agar. Addition of yeast slightly increased the growth rate. Vitamin B_1, riboflavin, nicotinic acid, pyridoxine and pantothenic acid were essential for any growth, and other substances for optimum growth. A caseinate or a

hydrolysate of casein could not replace casein. Cholesterol was more effective than other sterols. The constituents of the medium were similar to those required by other insects, and no specific requirement was found to account for the very rapid growth of blowfly larvae.—A. M. Copping.

358

WESTERMAN, B. D., OLIVER, B. and MACKINTOSH, D. L. **Influence of chilling rate and frozen storage on B-complex vitamin content of pork.** *J. Agric. Food Chem.*, 1955, **3,** 603–605. [Dept. Foods Nutrit., Kansas Agric. Exp. Stat., Kansas State Coll., Manhattan.]

Vitamin B_1 and riboflavin were estimated chemically and pantothenic and nicotinic acid microbiologically in pork loin kept for 1, 3 or 7 days at 30° F. or 7 days at 40° F. before being frozen for storage. Regardless of treatment, it seemed that muscle from animals killed in January contained more vitamin B_1 than from those killed in June. The reverse was true of nicotinic and pantothenic acid. No seasonal change was found in riboflavin content. Loss of vitamin B_1 and riboflavin was greater than of the other B vitamins during storage and was most marked in meat kept 3 days at 30° F. before freezing. The greatest loss of nicotinic and pantothenic acid occurred in pork kept for one day at 30° F. before freezing. Palatability tests showed undesirable flavours in meat stored for 48 weeks, regardless of the rate of chilling and nature of the preliminary handling. Storage beyond 24 weeks produced off-flavour in the fat except in pork loin kept only one day at 30° F. before freezing.—A. M. Copping.

See also Absts. 184, 245.

VITAMIN B_1 (ANEURIN, THIAMINE)

359

VILLANUEVA, J. R. **A new method for the microbiological assay of thiamin (vitamin B_1).** *Nature*, 1955, **176,** 465. [Inst. Edafalogia, Consejo Superior Invest. Cient., Madrid.]

The paper is a preliminary note on the use of the fungus *Tuberculina persicina* for estimating vitamin B_1, in the presence of which growth and pigment production were stimulated, and the depth of colour could be used as a measure of the vitamin.—A. M. Copping.

360

HOFF-JØRGENSEN, E. and HANSEN, B. **A microbiological assay of vitamin B_1.** *Acta chem. scand.*, 1955, **9,** 562–566. [Biochem. Inst., Univ. Copenhagen.]

The organism was the yeast *Kloeckera brevis* B768. The medium and the method are described. Vitamin B_1 was estimated by this method and by the thiochrome method in several materials and the results agreed closely. The method makes possible the estimation of 0·001 μg. vitamin B_1 per ml. extract with a standard deviation of less than 10 per cent.—D. Duncan.

361

RANGANATHAN, B. and BHAT, J. V. **Growth response of a marine yeast, *Cryptococcus laurentii*, to thiamine.** *J. Indian Inst. Sci.* [*A*], 1955, **37,** 154–159. [Fermentation Technol. Lab., Indian Inst. Sci., Bangalore 3.]

In an initial series of tests the yeast responded quantitatively to small graded doses of vitamin B_1 in a purified basal medium. In further tests, 5 months later, there was no grading in response to small doses, and repeated investigation showed that the organism had become able to synthesise vitamin B_1. The observation is discussed in relation to inconsistent results obtained with yeasts in microbiological tests.—A. M. Copping.

362

ROSSI-FANELLI, A. and MONDOVI, B. Separazione elettroforetica su carta degli esteri fosforici della tiamina. 2. [**Separation by electrophoresis on paper of the phosphoric esters of vitamin B_1. 2.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1008–1011. [Ist. Chim. Biol., Univ. Rome.]

For part 1 see Title 4856, Vol. 25.

The rate of electrophoretic migration on paper by vitamin B_1 and its 3 phosphate esters was studied at *p*H from 3·5 to 9. The results are tabulated.—E. M. Hume.

363

UTZINO, S. and YAMAMOTO, T. **On the stability of thiamin solution. 1. Influence of protein bodies and blood plasma on the stability of thiamin or cocarboxylase solution.**

UTZINO, S. and SHIMATANI, M. **2. Influence of amino acids and various salts on the stability of thiamin in neutral or alkaline solution.** *Acta Scholae med. Univ. Kioto*, 1955, **32,** 97–101; 102–111. [Dept. Med. Chem., Fac. Med., Univ. Kyoto.]

1. Solutions of vitamin B_1 kept at 20° C. for 5 hr. were stable at *p*H values of from 3·5 to 5·5, but at higher values and especially at 6·7 or above the stability declined rapidly. Rabbit blood cells or plasma improved the stability of both vitamin B_1 and cocarboxylase at *p*H 7; cells and plasma

were equally effective for 3 hr., but after 24 hr. only plasma remained effective. Casein, globulin, gelatine and peptone all stabilised vitamin B_1 solutions for 3 hr. at *p*H 8, but glucose, creatine or ascorbic acid did not. Cu, Fe and Mn ions appeared to accelerate decomposition of vitamin B_1.

2. Glycylleucine, leucylglycine, diglycine, triglycine, alanine, glycine, benzoyldiglycine, benzoylglycine, acetylglycine, tyrosine, tyramine, taurine, citrate, phosphate, borate, tartrate and carbonate all increased the stability of vitamin B_1. Sulphanilic acid, sulphanilamide, urea, creatine, glycine anhydride, sodium acetate, Na_2SO_3, $Na_2S_2O_3$, NaCl, Na_2SO_4 and KNO_3 had no value. When vitamin B_1 solution was partly decomposed after 40 min. at *p*H 7·0 or 8·0, addition of cysteine partly restored the thiochrome reaction.—D. Duncan.

364

TAMAKI, T. and NOSE, Y. **Determination of allithiamine.** *J. Vitaminol., Japan*, 1954, **1,** No. 2, 1–5. [Biochem. Inst., Kyoto Prefectural Univ., Nishijin, Kyoto.]

Allithiamine was estimated by adding a citrate and phosphate buffer and cysteine to extracts before application of the thiochrome method. In blood, allithiamine and vitamin B_1 propyl disulphide were rapidly converted into vitamin B_1. Vitamin B_1 disulphide appeared to be an intermediary product in the conversion.—A. M. Copping.

365

WORDEN, A. N., WATERHOUSE, C. E. and PARTINGTON, H. **The response of the dog to test doses of vitamin B_1 hydrochloride.** *Vet. Rec.*, 1955, **67,** 503–509. [Cromwell House, Huntingdon.]

For previous work see Abst. 4400, Vol. 24.

The same 3 dogs, differing in breed, sex and weight, were used and they had a standard diet of known vitamin B_1 and riboflavin content and a standard water intake. Excretion in the urine of vitamin B_1, riboflavin, inorganic P and urea was estimated daily for 3 periods of 13 days during which the dogs received on certain days test doses of vitamin B_1 ranging from 250 to 10,000 μg.

There was marked individual variation in the daily excretion of vitamin B_1 after a test dose and in only one instance was the extra amount excreted in the ensuing 24 hr. approximately equivalent to the amount of the test dose. With the higher test doses excretion remained high for up to 96 hr. The amount of vitamin B_1 excreted daily was related to the volume of urine, which varied greatly; the concentration in the urine was not so variable. The test doses had no marked effect on the excretion of riboflavin, inorganic P or urea. It is concluded that a test of the type described to determine the vitamin B_1 status of dogs is of doubtful clinical value.—J. S. Thomson.

366

MILLER, E. R., SCHMIDT, D. A., HOEFER, J. A. and LUECKE, R. W. **The thiamine requirement of the baby pig.** *J. Nutrition*, 1955, **56,** 423–430. [Dept. Animal Husb., Michigan State Coll., East Lansing.]

Baby pigs taken from the sow at 3 or 4 days of age were given a synthetic milk diet (Abst. 4422, Vol. 24) with no vitamin B_1 for 4 days and then with graded doses of vitamin B_1. An amount of 1·5 mg. vitamin B_1 per kg. dietary solids was required for optimum growth and efficiency of feed utilisation. With intakes below 1·0 mg. per kg. solids, signs of vitamin B_1 deficiency developed. When extra vitamin B_1 was given by injection to 3 deficient pigs, normal weight gain, appetite and heart rate were restored in 2 of them. Blood studies showed no clear change in white cell count or Hb value, but the vitamin B_1 content of the blood was related to that of the diet.

A. M. Copping.

367

CHIONG CH., R. Piruvicemia en polineuritis experimental de la paloma. [**Blood pyruvic acid in experimental polyneuritis in the pigeon.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4,** 215–223.

The pyruvic acid content of the blood was estimated in 10 male and 10 female pigeons before, during and after recovery from experimental polyneuritis produced by a diet deficient in vitamin B_1. The mean values in the 3 conditions, in mg. per 100 ml. blood, were for females 1·42, 5·36 and 1·39, and for males 1·72, 5·81 and 1·69.

D. Duncan.

368

DE BERNARD, B. and LORENZI, G. L. Concentrazione della cocarbossilasi nella cartilagine metafisaria di giovani conigli a dieta carente di vitamina B_1. [**Concentration of cocarboxylase in the metaphyseal cartilage of young rabbits on a diet deficient in vitamin B_1.**] *Arch. Sci. biol., Bologna*, 1955, **39,** 308–312. [Ist. Chim. Biol., Univ. Pavia.]

In further studies on the concentration of cocarboxylase in metaphyseal cartilage in relation to growth (see Absts. 3493, 4866, Vol. 25), 20 Flemish Giant rabbits, aged 25 days and weighing about 650 g., were maintained for from 25 to 30 days on a diet without vitamin B_1. Eight received daily a subcutaneous injection of 0·5 mg. vitamin B_1, and the other 12 had in their food 2 g. daily of streptoguanidine. Cocarboxylase was estimated in the cartilage by a manometric technique in a Warburg apparatus. The deprived rabbits did not grow, so the amount of metaphyseal cartilage available for analysis was much less than from the non-deprived. The mean value for cocarboxylase, in μg. per g. fresh tissue, was 5·2 (range 3·7 to 6·9)

for the non-deprived and 0 for all but 3 (0·15, 2·0, 2·9) of the deprived. For comparison, values are given for 7 rabbits 30 days old; the mean was 16·4 with range 10·2 to 31·2 (Abst. 3493, Vol. 25).

E. M. Hume.

369

D'Agostino Barbaro, A. Vitamina B_1 e cocarbossilasi nel trattamento della sintomatologia nervosa da beri-beri sperimentale. [**Vitamin B_1 and cocarboxylase in treatment of the nervous signs of experimental beriberi.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1322–1324. [Ist. Chim. Biol., Univ. Messina.]

370

Di Stefano, E. and Previtera, L. Cocarbossilasi ed eccitabilità dei centri nervosi. [**Cocarboxylase and excitability of the nerve centres.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1324–1326. [Ist. Fisiol., Univ. Messina.]

371

Siliprandi, N., Boffi, V. and Lucarelli, A. **Action of insulin on thiamine phosphorylation *in vitro*.** *Nature*, 1955, **176,** 219–220. [Inst. Biol. Chem., Univ. Rome.]

Formation of cocarboxylase was studied *in vitro* in homogenates of liver and in preparations of thiaminokinase from normal rats and rats made diabetic with alloxan, with and without addition of insulin. Insulin had no significant effect in increasing the amount of cocarboxylase found except when it was incubated with serum from normal or diabetic rats for 30 min. before being added to the enzyme system. Serum by itself did not affect phosphorylation and the action of insulin was concluded to be concerned directly with phosphorylation of vitamin B_1 and not with activation of the thiaminokinase.—A. M. Copping.

372

Bamann, E. and Schuegraf, A. Dephosphorylierung der Aneurinphosphate durch Cer und Lanthan. [**Deposphorylation of vitamin B_1 phosphates by cerium and lanthanum.**] *Biochem. Ztschr.*, 1955, **326,** 507–510. [Inst. Pharmazie, Univ. Munich.]

Both cerium and lanthanum catalysed the dephosphorylation of vitamin B_1 pyrophosphoric acid and vitamin B_1 monophosphoric acid in weakly alkaline media. The segregation of terminal phosphate residues was greater with Ce and the hydrolysis of vitamin B_1 monophosphoric acid was greater with La.—D. Duncan.

373

Castellani, A. and De Bernard, B. Contenuto di cocarbossilasi nel fegato di ratti albini trattati con adrenocromo. [**Cocarboxylase content of the liver of white rats treated with adrenochrome.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1135–1137. [Ist. Chim. Biol., Univ. Pavia.]

Cocarboxylase was estimated in the liver of 2 groups of 10 male rats weighing about 150 g., of which one received a subcutaneous injection of 700 μg. adrenochrome per 100 g. bodyweight daily for 3 days. The mean value, expressed as μg. vitamin B_1 diphosphate per g. fresh tissue, was for the rats given adrenochrome 9·03 with range 3·45 to 12·65, and for those not given it 12·52 with range 8·90 to 15·00. The decrease of 28 per cent. was statistically significant.—E. M. Hume.

374

Mouriquand, G., Edel, V. and Chighizola, [R.]. Nouvelles remarques sur le choc thiaminique. Action comparée du chlorhydrate et du monophosphate de thiamine. [**New notes on shock due to vitamin B_1. Comparison of the effects of vitamin B_1 hydrochloride and monophosphate.**] *Presse méd.*, 1955, **63,** 1193–1194. [Lyons.]

In a brief general article, experimental work with pigeons is quoted showing that the monophosphate of vitamin B_1, when given in the same doses, had the same antiberiberi action as the hydrochloride but was about 5 times less liable to produce fatal shock on parenteral administration. Neither salt alone would completely restore vestibular function to normal, for which a complete diet was necessary.—L. Wills.

375

Salem, H. M. **Determination of methylglyoxal in thiamine-deficient rats by paper chromatography.** *Arch. Biochem. Biophys.*, 1955, **57,** 20–22. [Dept. Biochem., Fac. Agric., Univ. Cairo, Egypt.]

Paper chromatograms of urine from rats deprived of vitamin B_1, developed with ammoniacal silver nitrate after butanol, ethanol and water, showed spots characteristic of methylglyoxal.

A. M. Copping.

376

Ciancimino, M. C. Sul decorso del beriberi sperimentale nei colombi sottoposti a somministrazione di acido pantotenico. [**The course of experimental beriberi in pigeons given pantothenic acid.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1065–1066. [Ist. Fisiol., Univ. Palermo.]

Eight pigeons were fed on polished rice till the first signs of beriberi appeared. They were weighed, the amount of rice eaten was recorded, and the beriberi quotient of Amantea (Abst. 4092, Vol. 3) was determined. They were then given 10 mg. vitamin B_1 and a diet of maize till cure was complete. The depletion was then repeated and the birds were given at the same time

10 mg. pantothenic acid daily by intramuscular injection, but there was no difference from their behaviour without it.—E. M. Hume.

377

KONDO, T. **Metabolism of thiamin during intestinal obstruction.** *Nagoya J. Med. Sci.*, 1954, **17**, 293–304. [2. Dept. Surg., Sch. Med., Nagoya Univ.]

378

CHEYMOL, J., BOURILLET, F. and KERP, L. Action antagoniste de la thiamine vis-à-vis des effets paralysants musculaires de curarisants acetylcholinomimétiques. [**Antagonistic action of vitamin B_1 against the paralysing effects on muscle of acetylcholinomimetic curarising drugs.**] *C.R. Acad. Sci.*, 1955, **241**, 530–532.

379

RINDI, G., PERRI, V. and FERRARI, P. Cortisone ed avitaminosi B_1 del ratto. [**Cortisone and vitamin B_1 deficiency in the rat.**] *Internat. Ztschr. Vitaminforsch.*, 1955, **26**, 66–78. [Ist. Fisiol. Umana, Univ. Pavia.] German, French, and English summaries.

Twelve groups of rats weighing from 95 to 105 g. were maintained on a diet containing, per cent., purified casein 18, wheat starch 65, olive oil 10, cod liver oil 2 and salts 5. Six groups had an addition of 7 per cent. dried yeast to the diet, and 6 groups a mixture of B vitamins without vitamin B_1. Of those deprived and not deprived of vitamin B_1, pairs of groups had a daily dose of 1 or 4 mg. deoxycorticosterone acetate or none. One of each pair of groups was killed after 10 days and the other after 20 days. Pyruvate was estimated in the blood and vitamin B_1 by the thiochrome method in the liver, leg muscles and brain.

Weight increase was adversely affected by deprivation of vitamin B_1 or by administration of either dose of cortisone. The combined effect was little greater than that of either factor singly. The mean value for blood pyruvate was increased by deprivation and by the larger dose of cortisone, particularly after 20 days. The highest value was obtained after deprivation with cortisone for 20 days. The mean vitamin B_1 content of the liver, muscle and brain was decreased by deprivation and by administration of the 4 mg. dose of cortisone. The decrease after 20 days' deprivation was greater than after 10, but after 20 days' administration of cortisone was not significantly greater than after 10. There was no summation of effects when both treatments were given, the effect of deprivation being actually somewhat less when cortisone was given. The results are analysed statistically.—E. M. Hume.

380

DE CARO, L., RINDI, G., FERRARI, G. and PERRI, V. Andamento dell'avitaminosi B_1 in ratti ipofisectomizzati e in ratti surrenectomizzati. [**The course of vitamin B_1 deficiency in hypophysectomised and in adrenalectomised rats.**] *Arch.. Sci. biol., Bologna*, 1955, **39**, 352–368. [Ist. Fisiol. Umana, Univ. Pavia.]

Male rats weighing about 100 g. were given a diet deficient in vitamin B_1 for up to 35 days, beginning 5 days after removal of the pituitary gland. Similar rats given the same diet had the adrenal glands removed after varying periods of deprivation, and were then killed after a further 4 to 6 days of the diet. Corresponding groups were maintained on the deficient diet without operation and on a complete diet without hypophysectomy. Neither operation significantly affected the rate of depletion of vitamin B_1 in the liver, muscle and brain. After removal of the pituitary gland, blood pyruvate increased during deprivation much less than in rats with the gland intact; the weight of the adrenal glands decreased slightly, but increased in intact deprived rats. In adrenalectomised rats blood pyruvate increased only slightly during deprivation.—E. M. Hume.

381

CERECEDO, L. R. **Symposium on the antimetabolites. Thiamine antagonists.** *Amer. J. Clin. Nutrit.*, 1955, **3**, 273–281. [Dept. Biochem., Fordham Univ., New York.]

382

EICH, S. and CERECEDO, L. R. **Effects of certain thiamine analogs on the enzymatic decarboxylation of α-ketobutyric acid.** *Arch. Biochem. Biophys.*, 1955, **57**, 285–287. [Dept. Chem., Fordham Univ., New York.]

With conditions similar to those described previously (Abst. 4410, Vol. 24), decarboxylation of α-ketobutyrate by α-carboxylase was studied. Oxythiamine diphosphate inhibited decarboxylation, and its effect was conditioned by the order in which the enzyme and analogue were added to the reaction mixture. If the analogue was added after the enzyme it almost failed to cause inhibition. Oxythiamine and neopyrithiamine had no effect.

A. M. Copping.

383

FUJITA, A., OKAMOTO, T. and NOSE, Y. **Antithiamine factors of ferns.** *J. Vitaminol., Japan*, 1954, **1**, No. 2, 24–38. [Biochem. Inst., Kyoto Prefectural Univ.]

The nature of antivitamin B_1 factors in Japanese fern was investigated with extracts obtained from dried fern with a phosphate buffer at *p*H 7 and a temperature below 60° C. The thermolabile

antivitamin B_1 factor was inactivated by heating at 100° C. for 30 min., and showed optimum activity at 50° C. and *p*H 6. The activity of the thermostable factor increased with temperature up to 100° C. The thermostable factor could be dialysed through cellophane. One of the products of its action on vitamin B_1 was identified as thiochrome. It was activated by O_2, Cu and Mn and inhibited by cysteine. The same substances had the opposite effect on the thermolabile factor, which was activated also by some organic bases. From these and other properties it was concluded that the thermolabile factor resembled thiaminase in its properties but that the thermostable factor was probably not enzymic in nature.—A. M. Copping.

384

MATSUKAWA, D., CHANG, S., FUJIMIYA, M. and MISAWA, H. **Studies on the thiamine deficiency due to bacterial thiaminase. 2. Experiments on hens.** *J. Vitaminol., Japan*, 1954, **1**, No. 2, 53–55. [Dept. Med., Sch. Med., Niigata Univ., Asahi-Machi.]

For part 1 see Abst. 4874, Vol. 25.

When *Bacillus thiaminolyticus* was given to hens on a normal diet of whole rice and greenstuff, thiaminase was detected in the faeces within 6 days and signs of vitamin B_1 deficiency appeared in about 40 days. Hens on the same diet with no *B. thiaminolyticus* remained healthy and their tissues contained more vitamin B_1 than those of hens receiving the bacillus.—A. M. Copping.

385

MAJORI, L. Beri-beri sperimentale nel colombo in equilibrio tiaminico in seguito ad ingestione di *Venerupis decussata*. 2. [**Experimental beriberi in the pigeon in a state of vitamin B_1 balance, after consuming *Venerupis decussata*. 2.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 785–787. [Ist. Igiene, Univ. Messina.]

Groups of 3 or 5 pigeons were given daily 29 g. polished rice. One group received in addition daily 1 g. wheat and 20 g., uncooked, of the mollusc *Venerupis decussata*, taken from Lake Ganzirri. Another group received the same with the mollusc boiled for 10 min., and a third group was given daily 5 μg. vitamin B_1 and 20 g. raw mollusc. The 2 groups receiving the raw mollusc showed the first signs of beriberi in 7 or 8 days; they were injected twice with a total of 0·025 g. cocarboxylase and given a diet of wheat, which brought about their cure. The group given boiled mollusc still showed no sign of beriberi after 3 months. No evidence was thus obtained for the presence of a toxin other than thiaminase in *Venerupis*.—E. M. Hume.

386

SIVARAMAKRISHNAN, V. M. and SARMA, P. S. **The influence of thiamine on nitrogen metabolism.** *Biochim. biophys. Acta*, 1955, **18**, 153–154. [Lab. Biochem., Univ. Madras.]

When green gram seeds were germinated in a medium containing neopyrithiamine the content of asparagine was less, that of glutamine was slightly greater, and that of free ammonia much greater, than in seeds without neopyrithiamine. The disturbance of N metabolism was partly reversed if vitamin B_1 and neopyrithiamine were present together, and almost completely reversed if cocarboxylase was present.

Evidence of impaired N metabolism was obtained also in rats given neopyrithiamine; injection of glutamate into them precipitated acute signs of vitamin B_1 deficiency.—A. M. Copping.

387

SCHOFIELD, F. W. and ROBERTSON, A. **Oedema disease (entero-toxaemia) in swine. 1. Experiments designed to reproduce the disease.**

SCHOFIELD, F. W. and DAVIS, D. **2. Experiments conducted in a susceptible herd.**

SCHOFIELD, F. W. and NIELSEN, S. W. **3. The use of thiamine in its prevention and cure.** *Canad. J. Comp. Med.*, 1955, **19**, 240–242; 242–245; 245–250. [Dept. Pathol., Ontario Vet. Coll., Guelph.]

1. Attempts to produce oedema disease by sudden and drastic change of diet, by adding the ingesta of pigs which had died of the disease to the feed, by reducing peristalsis through giving opium, by movement to and from market, by intravenous injection of filtrates from the stomach and intestine of infected pigs, and by giving unidentified bacteria isolated from pig intestine, failed in experiments with pigs at weaning, the age at which oedema disease usually occurs.

2. In an experiment with pigs from a herd known to be susceptible, streptomycin was given to one group but oedema disease did not develop in either group, and no conclusion could be reached. In another experiment a vaccine was prepared from *Bacterium coli*, which is frequently found in faecal cultures from oedema disease, and one group of pigs was treated with the vaccine; 2 of them died, but results were inconclusive. When susceptible and normal pigs were reared in similar conditions and on similar rations, 4 out of the 6 susceptible pigs died showing signs of oedema disease; the normal pigs were not affected. It was thought that toxogenic organisms were present in the intestines of the susceptible pigs. The use of different standards of feeding for the sows, one standard being comparable with that used in the susceptible herd, did not affect the incidence of oedema disease in the offspring. In this series of

experiments there was no evidence that the disease was contagious, or that it was due to the feed.

3. Experiments designed to test the efficacy of vitamin B_1 for prevention and cure of oedema disease showed that it was of no value, and analysis of feeds in use where the disease had occurred showed that they contained enough vitamin B_1, and that vitamin B_1 deficiency was not the cause.

T. D. Bell.

See also Abst. 336.

RIBOFLAVIN

388

ADAMS, D. H. **Liver catalase in the riboflavin-deficient mouse.** *Biochem. J.*, 1955, **60,** 568–572. [Dept. Cancer Res., London Hosp. Med. Coll., E.1.]

When weanling male mice were maintained for 5 or 6 weeks on a purified diet lacking riboflavin, or were pair-fed on the same diet with riboflavin added, or on a normal diet, the catalase activity of the liver did not rise to the adult values usually attained within 3 weeks. Injection of testosterone restored the catalase activity to normal in the pair-fed mice but not in those deprived of riboflavin. In female mice deprivation of riboflavin did not affect the catalase activity but it did prevent the rise in response to injection of testosterone.

A single injection of a riboflavin antagonist in adult male mice caused a fall in catalase activity within 48 hr., with a subsequent rise to normal. The antagonist did not affect catalase activity in castrated male mice. In riboflavin deficiency there was no change in Hb values.—A. M. Copping.

389

NAVAZIO, F. and SILIPRANDI, N. **Flavines in experimental diabetes.** *Experientia,* 1955, **11,** 280–281. [Inst. Biol. Chem., Univ. Rome.] Italian summary.

With the method of Bessey *et al.* (Abst. 3377, Vol. 19) it was shown that fresh liver tissue from rats with alloxan diabetes contained less riboflavin and less flavin adenine dinucleotide than normal liver tissue. Administration to the rat of riboflavin or flavin mononucleotide with adenosine triphosphate restored the liver riboflavin and flavin enzyme systems to normal.—A. M. Copping.

390

BERNARDINI, A. and LINO, A. Le modificazioni del contenuto in vitamine B dei tessuti di animali irradiati. 1. Le modificazioni della riboflavina. [**Changes in the content of B vitamins in the tissues of animals treated with X-rays. 1. Changes in the riboflavin.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1075–1077. [Ist. Patol., Univ. Catania.]

Rats weighing about 160 g. were fed on a purified, complete diet. Groups of 7 were given a single exposure to X-rays over the head only, over the chest and abdomen, and over the whole body; another group was not exposed at all. Fifteen days later they were killed and riboflavin was estimated by the fluorescence technique of Gourévitch (Abst. 304, Vol. 7) in the liver, muscles and brain. The riboflavin content in the tissues of all 3 groups of rats treated with X-rays was low, especially so in the brain of those irradiated over the head.—E. M. Hume.

391

KLUSSENDORF, R. C. **Riboflavin and the health of farm animals.** *J. Amer. Vet. Med. Assoc.*, 1955, **127,** 76–77. [Vet. Med. Serv., Commercial Solvents Corp., Terre Haute, Ind.]

392

LAMBOOY, J. P. **Symposium on the antimetabolites. Riboflavin antagonists.** *Amer. J. Clin. Nutrit.*, 1955, **3,** 282–290. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

393

HENDRICKX, H. and DE VLEESCHAUWER, A. Het gebruik van wei en afgeroomde melk bij de biosynthese van vitamin B_2 door Eremothecium ashbyii. [**The use of whey and skimmed milk for biosynthesis of vitamin B_2 with *Eremothecium ashbyii.*]** *Meded. Landbouwhogesch. Gent.*, 1955, **20,** No. 2, 229–246. [Rijkszuivelstat., Melle.] French, English and German summaries.

In the Netherlands at least some tens of millions of litres of whey go to waste and foul the watercourses. Cost of processing and limitations of usefulness have so far made utilisation impossible. Literature on the use of whey as a substrate for the growth of micro-organisms is reviewed. In the present study a stock culture of *Eremothecium ashbyii* was maintained on agar slopes prepared from 2 g. yeast extract, 3 g. peptone, 10 g. glucose and 15 g. agar per litre. The whey was from a cheese factory, from pasteurised milk. Tests are described in detail. On the average, whey cultures with 1, 2·5 or 5 per cent. sucrose produced 435, 665 or 755 μg. riboflavin per ml. A mixture of half whey and half skimmed milk with the same additions of sucrose produced from 440 to 800, mean 630; 770 to 1500, mean 1150; and 1125 to 2200,

mean 1575, μg. riboflavin per ml. Skimmed milk alone gave wide variations in yield. Yeast extract gave no extra yield.

The conclusion is that the use of whey or, better, whey and skimmed milk with a fermentable sugar as a culture medium for the production of riboflavin may solve the problem of the whey and skimmed milk surpluses.—I. Leitch.

394

ODRIOZOLA, C. Determinación fluorométrica de riboflavina en frutas. [**Fluorimetric estimation of riboflavin in fruit.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 130–141.

Riboflavin was estimated by the methods of Scott *et al.* (Abst. 4172, Vol. 16) and of Roth (Abst. 3408, Vol 20) in the edible portion of the fresh fruit; 2 samples of 30 varieties were tested by each method. Those having the highest content of riboflavin, in μg. per 100 g. for the 2 samples, were passion fruit 91 and 110, prickly custard-apple (*Anona muricata*) 103 and 105, lucuma 131 and 113, and avocado pear 117 and 120. The poorest sources were coconut and quince.

D. Duncan.

NICOTINIC ACID (NIACIN)

395

JANSEN, B. C. P. Nicotinezuur (amide), (pellagra-preventing factor; niacine). [**Nicotinic acid (amide), the pellagra-preventive factor, niacin.**] *Voeding*, 1955, **16**, 646–652.

A chapter for a new textbook of nutrition (Abst. 3588, Vol. 24; see also Absts. 296, 342).

396

HOPPER, J. H. and JOHNSON, B. C. **The production and study of an acute nicotinic acid deficiency in the calf.** *J. Nutrition*, 1955, **56**, 303–310. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Male calves were given a synthetic milk on the second day of life. When the milk contained 0·17 per cent. tryptophan and 2·60 mg. nicotinic acid per litre they grew well and showed no unusual sign for from 24 to 38 days. If nicotinic acid was omitted appetite failed after 2 days and severe scouring occurred. Administration of nicotinic acid orally or parenterally restored appetite and weight gain. Subsequent deprivation of nicotinic acid did not cause a repetition of the disturbance.—A. M. Copping.

397

CASTELLANI, L. and BERTOLA, G. Steatosi da CCl_4 e metionina epatica. [**Fatty liver caused by CCl_4 and liver methionine.**] Nicotamide e metionina epatica. [**Nicotinamide and liver methionine.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 1204–1205; 1206–1207. [Ist. Clin. Med., Univ. Genoa.]

Fifteen adult guineapigs receiving the laboratory diet were made to inhale CCl_4 vapour for 10 min. daily for 20 days. The degree of fatty liver produced was determined on 5 of the animals, and the concentration of free methionine in the liver was estimated by the method of Albanese *et al.* (Abst. 2889, Vol. 14) for the other 10 and for 10 not treated with CCl_4. The mean value in mg. free methionine per 100 g. fresh liver was for the poisoned animals 0·75 with range 0·62 to 0·94, and for those not poisoned 1·58 with range 1·30 to 1·72.

Free methionine was estimated by the same method in the liver of 10 guineapigs given parenterally 10 mg. nicotinamide daily for 10 days, and of 10 not given it. The mean value in mg. free methionine per 100 g. fresh liver tissue was 0·98 with range 0·83 to 1·06 for those given nicotinamide and 1·51 with range 1·42 to 1·85 for those not given it.—E. M. Hume.

398

RICCI, C. Ricerche sull'ossidazione del succinato nel fegato di ratti trattati con nicotinamide. [**Oxidation of succinate in the liver of rats treated with nicotinamide.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 1040. [Ist. Chim. Biol., Univ. Genoa.]

A larger amount of triphenyltetrazolium was reduced in presence of succinate by homogenates of whole liver from rats given extra nicotinamide than from rats not given it. In absence of succinate there was no difference. There was no difference in the behaviour of mitochondria isolated from the homogenates. Tests for succinic oxidase depending on the reduction of cytochrome *c* showed no difference in the behaviour of liver homogenates from the 2 groups of rats.

E. M. Hume.

399

VILLA, L. and DIOGUARDI, N. In tema di metabolismo epatico e di patologia enzimatica. Considerazioni intorno alle cosiddette "ossidazioni di emergenza". [**Metabolism in the liver and enzyme disturbances. The so-called "emergency oxidations".**] *Acta vitaminol.*, 1955, **9**, 97–100. [Ist. Clin. Med. Gen., Univ. Milan.] French, English, German and Spanish summaries.

Experiments were made of the same type as those previously described (Absts. 1951, 4890, Vol. 25), which were interpreted as showing that in rats after fasting, or when fed on a low-protein diet, oxidation by liver homogenates followed a path which was not that of the Krebs cycle. Nicotinamide increased such "emergency" oxidation, but reduced oxidation by liver homogenates from normal rats. Sub-lethal poisoning with the toxin of the fungus *Amanita phalloides* provided another set of conditions in which such emergency oxidation took place.—E. M. Hume.

400

La Rosa Bazalar, D. Influencia de la nicotinamida sobre la hiperglucemia de la diabetes aloxánica. [**Effect of nicotinamide on the hyperglycaemia of alloxan diabetes.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4,** 245–255.

Six male and 6 female rabbits weighing from 1150 to 2360 g. were made diabetic by injection of from 100 to 150 mg. alloxan per kg. bodyweight and, a few hours later, when the blood sugar had risen, received intraperitoneally 0·005, 0·01 or 0·015 mg. nicotinamide per kg. bodyweight. A drop in blood sugar followed, lasting up to 24 hr. Male animals were more sensitive than females. Several rabbits died with very low blood sugar values.—D. Duncan.

401

Henderson, L. M., Koski, R. E. and D'Angeli, F. **The rôle of riboflavin and vitamin B_6 in tryptophan metabolism.** *J. Biol. Chem.*, 1955, **215,** 369–376. [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

In normally fed rats and in animals deprived of riboflavin or vitamin B_6, excretion of nicotinic, quinolinic and xanthurenic acid in response to doses of tryptophan, kynurenine or 3-hydroxyanthranilic acid was studied. Deprivation of vitamin B_6 reduced the excretion of metabolites containing the pyridine nucleus. Lack of riboflavin had no such effect. In rats deprived of riboflavin, excretion of xanthurenic acid rose in response to administration of tryptophan, but the xanthurenic acid excreted in response to kynurenine and 3-hydroxykynurenine fell slightly. Paper chromatograms of urine from rats deprived of riboflavin and receiving tryptophan showed the presence of compounds likely to be excreted if hydroxylation of kynurenine was impaired. In vitamin B_6 deficiency blocking of anthranilic acid formation from kynurenine appeared to be the characteristic defect in the metabolism of tryptophan.—A. M. Copping.

402

Della Pietra, G. and Rogliani, E. Metabolismo dell'acido 3-ossiantranilico. [**Metabolism of 3-hydroxyanthranilic acid.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1419–1421. [Ist. Chim., Fac. Med. Chirurg., Univ. Naples.]

Homogenates of 12-day chick embryo were incubated with and without 3-hydroxyanthranilic acid in a range of concentrations, in Krebs Ringer phosphate. The amount of 3-hydroxyanthranilic acid, estimated fluorimetrically, remained unchanged at all concentrations.—E. M. Hume.

403

Quagliariello, E. and Auricchio, S. Sulla trasformazione dell'acido 3-ossiantranilico in acido chinolinico in presenza di omogenati di embrione di pollo. [**Transformation of 3-hydroxyanthranilic acid into quinolinic acid in presence of chick embryo homogenates.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1421–1423. [Ist. Chim., Fac. Med. Chirurg., Univ. Naples.]

Homogenates of 12-day chick embryos were incubated in Krebs Ringer phosphate solution with and without different concentrations of 3-hydroxyanthranilic acid. A known amount of quinolinic acid was added to all the preparations before incubation. The amount found after incubation was always the same as it was before.—E. M. Hume.

404

Federico, L. and Valle, T. Sulla relazione tra triptofano e acido nicotinico nei vegetali. [**Relation between tryptophan and nicotinic acid in plants.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1379–1381. [Centro Chim. Fermentaz., Sez. Chim., Univ. Milan.]

Pea and lupin seedlings, germinated on paper and transferred to a culture solution with and without *l*-tryptophan, produced more nicotinic acid in the former than in the latter.—E. M. Hume.

405

Ricci, C. and Marré, E. Attività coenzimatica del nucleotide piridinico biosintetizzato nel fegato di animali trattati con nicotinamide su sistemi deidrogenasici vegetali. [**Coenzyme activity on plant dehydrogenase systems of the pyridine nucleotide synthesised in the liver of animals treated with nicotinamide.**]

Ricci, C. and Ivaldi, G. Separazione delle frazioni citoplasmatiche del fegato di ratto mediante nicotinamide. [**Separation of cytoplasmic fractions from the liver of the rat by the use of nicotinamide.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1041–1043; 1043–1044. [Ist. Chim. Biol., Univ. Siena.]

VITAMIN B_6 (PYRIDOXINE, ADERMIN)

406

PARRISH, W. P., LOY, H. W. (Jr.) and KLINE, O. L. **A study of the yeast method for vitamin B_6.** *J. Assoc. Off. Agric. Chem.*, 1955, **38,** 506–513. [Food and Drug Admin., Dept. Health, Washington, D.C.]

Modifications were made in the method of Atkin *et al.* (Abst. 1099, Vol. 13) in which *Saccharomyces carlsbergensis* is used to estimate vitamin B_6. Results were more accurate when the yeast inoculum was taken from a culture growing in the medium to be used for the test and when the basal medium and test solutions were sterilised separately. Separate sterilisation was most important when pyridoxal and pyridoxamine were under test, since they reacted with heated sugars. Incubation at 25° C. for from 22 to 28 hr. with constant agitation of the tubes gave consistent results; the growth response to pyridoxine and pyridoxal was about the same but to pyridoxamine it was only from 50 to 60 per cent. of that to pyridoxine.

A. M. Copping.

407

FASELLA, P., LIS, H. and SILIPRANDI, N. Studio elettroforetico di alcune reazioni di transaminazione. **[Electrophoretic study of some transamination reactions.]** *Riv. Ist. sieroterap. ital.*, 1955, **30,** 206–210. [Ist. Chim. Biol., Univ. Rome.] English summary.

Mixtures of Na pyruvate with pyridoxamine and of alanine with pyridoxal, with a suitable buffer including aluminium ammonium sulphate, were heated for an hour at 100° C., and subjected to electrophoresis on paper and on a cellulose column, the resulting substances being identified by exposure to ultraviolet light and by spraying with *p*-aminoacetophenone and ninhydrin. In the first mixture spots corresponding with pyridoxal and alanine appeared, and in the second with pyruvate and pyridoxamine; in both there was also a highly fluorescent intermediate substance, which was without free amine or aldehyde groups and on hydrolysis at 90° C. gave rise to alanine and pyridoxal. The presence of Al was necessary for its production.—E. M. Hume.

408

HAWKINS, W. W. **Skin symptoms of vitamin-B_6 deficiency in the dog.** *Science*, 1955, **121,** 880. [Maritime Reg. Lab., Nat. Res. Counc., Halifax, N.S.]

Severe skin lesions occurred in only 3 of 9 puppies receiving a diet lacking vitamin B_6 and containing deoxypyridoxine and 40 per cent. casein. The lesions were cured when deoxypyridoxine was withdrawn and pyridoxine given. Skin lesions did not occur in adult dogs deprived of vitamin B_6 and showing blood changes typical of the deficiency.—A. M. Copping.

409

HAWKINS, W. W. and YOUNG, E. G. **Nitrogen metabolism in vitamin B_6 deficiency in the dog.** *Amer. J. Physiol.*, 1955, **181,** 196–202. [Dept. Physiol., Univ. Manitoba, Winnipeg.]

Dogs were given purified diets lacking vitamin B_6 and containing 18 or 40 per cent. casein. Some dogs were given 1·5 mg. pyridoxine hydrochloride daily, and others had deoxypyridoxine to make the deficiency more severe. Growth was not significantly affected by lack of vitamin B_6 and there was no rise in the concentration of urea in the blood or in the amount of N excreted, a result in contrast with findings in the rat deprived of vitamin B_6. Administration of deoxypyridoxine caused a small increase in N excretion. There was no significant difference in the concentration or distribution of proteins, N.P.N. or urea N in the blood between the several groups of dogs. No excess urea or amino-N appeared in the blood after test doses of urea or alanine, even after long periods of vitamin B_6 deprivation.—A. M. Copping.

410

BEATON, J. R. and OZAWA, G. **Activity of liver glutaminases in vitamin B_6-deficient rats.** *J. Biol. Chem.*, 1955, **214,** 685–691. [Dept. Pub. Health Nutrit., Univ. Toronto, Ont.]

The activities of the phosphate-activated glutaminase I and the pyruvate-activated glutaminase II were estimated in preparations of rat liver by methods previously described (Abst. 3532, Vol. 25; *Proc. Soc. Exp. Biol. Med.*, 1954, **87,** 238). With pair-fed groups of rats with and without vitamin B_6 in a purified diet, glutaminase I was significantly higher and glutaminase II significantly lower in the deprived than in the non-deprived animals. Addition of pyridoxal phosphate to extracts of the liver from deprived rats restored only a small part of the activity of glutaminase II. Dialysis of liver extracts from normally fed rats caused loss of glutaminase II activity. Addition of pyridoxal phosphate to the dialysed extracts increased glutaminase II activity in some but not in others. Free glutamine was estimated in liver and kidney tissue and gave no indication that decrease of enzyme activity was directly related to decrease of available substrate.

A. M. Copping.

411

ZBINDEN, G. and STUDER, A. Vergleichende Untersuchungen über die Wirkung von Pyridoxin, Pyridoxal-5′-phosphat und Pyridoxal-isonicotinylhydrazon auf die experimentelle Isoniazid-"Neuritis" der Ratte. [**Comparative studies of the effects of pyridoxine, pyridoxal-5′-phosphate and pyridoxal *iso*nicotinylhydrazone on experimental isoniazide "neuritis" in the rat.**] *Internat. Ztschr. Vitaminforsch.*, 1955, **26**, 130–137. [Med. Lab., Hoffmann La Roche A.G., Basle.] French and English summaries.

When rats were injected with 250 or 500 mg. isoniazide per kg. bodyweight daily for 15 days or longer, severe degeneration occurred in the peripheral nerves. The degeneration was prevented if pyridoxine or pyridoxal phosphate, 10 to 50 mg. per kg. bodyweight, was injected subcutaneously, and the two substances were equally effective.

Pyridoxal *iso*nicotinylhydrazone, which had a small antituberculosis activity, produced slight nerve degeneration when it was given in large doses of 1000 mg. per kg. bodyweight.

A. M. Copping.

412

BEATON, J. R. ***In vitro* studies on carbohydrate metabolism in the vitamin-B_6-deprived rat.** *Canad. J. Biochem. Physiol.*, 1955, **33**, 562–567. [Dept. Pub. Health Nutrit., Univ. Toronto, Ont.]

The disturbance of carbohydrate metabolism in rats deprived of vitamin B_6 (Absts. 2930, Vol. 23; 1963, Vol. 25) was investigated by enzyme studies on tissues from rats deprived of vitamin B_6 and from pair-fed non-deprived animals. The utilisation of glucose by leg muscle and the cytochrome oxidase activity of liver tissue showed no significant difference between the groups. In vitamin B_6 deficiency liver catalase activity rose in female but not in male rats; liver aldolase activity fell and alkaline phosphatase of the blood rose. The relation of the findings to the variations recorded for deprived rats in blood values for sugar, pyruvate and lactic acid, and in liver glycogen, is discussed.

A. M. Copping.

413

KOTAKE, Y. **Xanthurenic acid, an abnormal metabolite of tryptophan and the diabetic symptoms caused in albino rats by its production.** *J. Vitaminol., Japan*, 1954, **1**, No. 2, 73–87. [Dept. Biochem., Wakayama Med. Coll.]

See Absts. 1973, Vol. 22; 5013, Vol. 23; Titles 1797, 2344, Absts. 3061, 4443, Vol. 24.

414

UMBREIT, W. W. **Symposium on the antimetabolites. Vitamin B_6 antagonists.** *Amer. J. Clin. Nutrit.*, 1955, **3**, 291–297. [Merck Inst. Therap. Res., Rahway, N.J.]

415

MAKINO, K. and KINOSHITA, T. **On the atoxopyrimidine action of B_6 group-vitamins.** *J. Vitaminol., Japan*, 1954, **1**, No. 2, 14–17. [Dept. Biol. Chem., Sch. Med., Kumamoto Univ., Ninomaru.]

When mice receiving a purified diet without vitamin B_6 were given injections of the pyrimidine component of vitamin B_1 severe convulsions occurred and the animals died. Convulsions occurred also when the diet contained vitamin B_6 but their severity was related to the size of the dose of pyrimidine. Simultaneous injection of pyridoxine or pyridoxamine prevented the toxic effects of pyrimidine. The relation of structure to biological antagonism is discussed with reference to pyrimidine and derivatives of pyridoxine.

A. M. Copping.

See also Absts. 171, 352, 401.

PANTOTHENIC ACID

416

BIANCHINI, P. Estrazione del coenzima "A". [**Extraction of coenzyme A.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 1378–1379. [Lab. Ric. "Crinos", Indust. Farmacobiol., Milan.]

A method is described in detail for preparing coenzyme A from pig's liver. The yield was never greater than between 600 and 700 mg. from 20 kg. fresh liver. It was considered that it could be improved, and that the fault probably lay in the kind of carbon used in an adsorption process of purification. The matter is being further investigated.—E. M. Hume.

417

FIDANZA, A., GIUNCHI, G., SCURO, L. A. and SORICE, F. Eliminazione urinaria e fecale di acido pantotenico in ratti alimentati con dieta sintetica priva della vitamina ed addizionata di aureomicina. [**Urinary and faecal excretion of pantothenic acid in rats fed on a synthetic diet without the vitamin and with added aureomycin.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 979–983. [Ist. Fisiol., Univ. Rome.]

Rats weighing about 50 g. received a complete diet or the same without pantothenic acid, with or without 0·05 per cent. aureomycin. After 6

weeks, when the rats deprived of pantothenic acid were showing signs of deficiency, 2 rats receiving each diet were isolated, and urine and faeces were collected daily for 5 days. Free pantothenic acid was estimated in them with *Lactobacillus arabinosus* ATCC 8014. The mean values in μg. pantothenic acid excreted in the urine in 24 hr. for the rats separately was, for the diet with pantothenic acid 134·4 and 163·0, for the diet without pantothenic acid 12·2 and 9·1, and for the diet without pantothenic acid but with aureomycin 40·0 and 42·0. The corresponding values for the faeces in μg. per 24 hr. were 47 and 63, 3·4 and 4·8, and 17·8 and 13·8.—E. M. Hume.

418

DINNING, J. S., NEATROUR, R. and DAY, P. L. **A biochemical basis for the interrelationship of pantothenic acid and methionine.** *J. Nutrition*, 1955, **56,** 431–435. [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

Weanling rats were given a basal diet deficient in sulphur amino-acids and in pantothenic acid with varying supplements of methionine and pantothenic acid. After 30 days 50 mg. guanidoacetic acid per 100 g. bodyweight was given by stomach tube and the amount of guanidoacetic acid, creatinine and creatine was measured in the urine during 24 hr. The extent of methylation of guanidoacetic acid was not significantly affected by the amount of pantothenic acid or methionine in the diet. Urinary excretion of creatine was higher in rats given little or no methionine or pantothenic acid. Individual variations were great in the excretion of all constituents.

Coenzyme A was estimated in the liver and the amount bore a relation to the amounts of pantothenic acid and methionine in the diet. The findings showed an interrelation between pantothenic acid and methionine since the latter could increase the liver content of coenzyme A when the former was present in limiting amounts, by which the severity of the pantothenic acid deficiency would be decreased.—A. M. Copping.

419

AMICI, A. and TACCHI, V. Sul comportamento dei lipidi totali del fegato di ratti albini dopo somministrazione di acido pantotenico. [**Behaviour of the total lipids in the liver of albino rats after administration of pantothenic acid.**]

AMICI, A. and DOLCINI, C. Sul comportamento del glicogeno epatico, muscolare, cardiaco e della glicemia di ratti albini dopo somministrazione di acido pantotenico. [**Behaviour of glycogen in the liver, muscle, and heart and of the blood sugar in albino rats after administration of pantothenic acid.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 843–844; 845–846. [Ist. Fisiol., Univ. Perugia.]

See Abst. 1968, Vol. 25.

Thirty-six male rats weighing about 200 g. were fasted for 12 hr. Four were killed before subcutaneous injection of 100 mg. pantothenic acid and 4 more after 1½, 2, 2½, 3, 3½, 4, 6 and 12 hr. Total lipids were estimated in the liver. After a small increase, the amount fell up to 2½ hr., but had begun to rise after 3 hr. and continued to do so up to 4 hr., after which it decreased again.

In an experiment with exactly the same plan, blood sugar, and glycogen in the liver, skeletal muscle and heart were estimated. Glycogen in the liver decreased progressively for 3½ hr., then began to rise and had returned to normal after 6 hr. Glycogen in the heart was somewhat low after 2 hr., but quickly recovered; in skeletal muscle the value fluctuated. Blood sugar values fluctuated also.—E. M. Hume.

420

BIRD, O. D., WITTLE, E. L., THOMPSON, R. Q. and MCGLOHON, V. M. **Symposium on the antimetabolities. Pantothenic acid antagonists.** *Amer. J. Clin. Nutrit.*, 1955, **3,** 298–304. [Res. Labs., Parke, Davis and Co., Detroit, Mich.]

421

STEWART, C. J., CHELDELIN, V. H. and KING, T. E. **Synthesis and biological activities of pantetheine analogues. 16. Pantothenic acid studies.** *J. Biol. Chem.*, 1955, **215,** 319–335. [Dept. Chem., Oregon State Coll., Corvallis.]

The synthesis of 8 new derivatives of pantetheine is described. In tests with *Lactobacillus helveticus* *N*-pantoyl-2-aminoethanethiol, *N*-pantoylethanolamine and bis (*N*-pantoylnorvalyl-2-aminoethyl) disulphide showed no growth-stimulating activity. *N*-(Pantoylglycyl)-2-aminoethanethiol, *N*-(pantoalanyl)-2-aminoethanethiol and bis-(*N*-(γ-hydroxybutyryl)-β-alanylaminoethyl) disulphide had a growth-promoting effect for *L. helveticus* at concentrations of from 100 to 1000 μg. per 10 ml. medium. *N*-pantothenyltaurine had a growth effect for *L. helveticus* and *L. fermenti* at concentrations of from 5 to 60 μg. per 10 ml. *N*-pantothenylethanolamine was a competitive inhibitor of pantetheine for *L. helveticus* but supported growth of *L. fermenti*.—A. M. Copping.

See also Abst. 376.

BIOTIN

422

FILLIPPOV, V. V. Drozhzhevaya metodika opredeleniya biotina. [**Yeast method for estimating biotin.**] *Biokhimiya*, 1955, **20,** 82–87. [Pedagog. Inst., Kabarovsk.]

The strains of yeast found satisfactory, the composition of the culture medium, the preparation of, and extraction of biotin from, the test material and the analytical procedures involved are discussed.—D. W. Taylor.

423

WRIGHT, L. D., CRESSON, E. L. and DRISCOLL, C. A. **Biological precursors of biotin and/or biotin L-sulfoxide.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 234–236. [Sharp and Dohme, Div. Merck and Co., West Point, Pa.]

During studies to isolate biotin sulphoxide from cultures of *Aspergillus niger*, precursors of biotin and its L-sulphoxide were investigated. Pimelic and azelaic acids were precursors, but not any shorter-chain dicarboxylic acid. Compounds such as Tween 80 with structural relationships to pimelic or azelaic acid were inactive. The effect of dicarboxylic acids of 7- or 9-carbon chain length was not increased in presence of purines, pyrimidines or cystine.—A. M. Copping.

FOLIC ACID (PTEROYLGLUTAMIC ACID)

424

BAKER, H., HUTNER, S. H. and SOBOTKA, H. **Estimation of folic acid with a thermophilic bacillus.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 210–212. [Dept. Chem., Mount Sinai Hosp., New York.]

When the nutritional requirements of thermophilic bacilli were studied, a strain of *Bacillus coagulans* was found to have a requirement which could be satisfied by *p*-aminobenzoic acid or pteroylglutamic acid or folinic acid or other folic acid conjugates. The value of the organism in tests for folic acid and related compounds was demonstrated in metabolism studies on subjects given doses of 5 mg. pteroylglutamic acid. Within 10 hr., from 60 to 80 per cent. of the dose was recovered from the urine. The results with *B. coagulans* were in good agreement with earlier results obtained with *Streptococcus faecalis* by Jukes *et al.* (Abst. 1273, Vol. 18).—A. M. Copping.

425

CARVALHO DA SILVA, A., DE ANGELIS, R. C., PONTES, M. A. and MANSUR GUÉRIOS, M. F. **The domestic cat as a laboratory animal for experimental nutrition studies. 4. Folic acid deficiency.** *J. Nutrition*, 1955, **56,** 199–213. [Dept. Physiol., Fac. Med., Univ. São Paulo.]

For previous parts see Absts. 831, Vol. 21; 1951, Vol. 22.

Folic acid deficiency was produced in cats receiving a purified diet of casein, sucrose, lard, peanut oil and salt mixture, with vitamins and sulphaguanidine or sulphathalidine. Loss of weight, macrocytic anaemia and leucopenia were the signs of deprivation. The results were more uniform in cats which did not have sulphonamide during a preliminary period, and the blood changes appeared to develop more rapidly when sulphonamides were then added to the diet. The average time for appearance of signs was 172 days in cats which had had sulphonamides from the beginning of the experiment, and 85 days after institution of sulphonamides in those which had previously received the diet without folic acid for several months. Blood clotting time was increased and plasma Fe values were low. For full recovery of the normal blood picture a single dose of 2 mg. folic acid was enough. The response was better if vitamin B_{12} or liver extract was given with the folic acid. Bodyweight increased with a single dose of 1 mg. folic acid or 0·8 mg. folinic acid, but the red and white cell counts were not normal.

A. M. Copping.

426

NELSON, M. M., WRIGHT, H. V., ASLING, C. W. and EVANS, H. M. **Multiple congenital abnormalities resulting from transitory deficiency of pteroylglutamic acid during gestation in the rat.** *J. Nutrition*, 1955, **56,** 349–363. [Inst. Exp. Biol., Univ. California, Berkeley.]

When a diet lacking pteroylglutamic acid was given to rats for 24, 48 or 72 hr. at some period during the first 14 days of gestation, abnormalities were produced in the young when the deprivation for 48 or 72 hr. occurred after the seventh day, that is, after implantation. All the embryos were resorbed when the rats were deprived from the 7th, 8th or 9th day of gestation, and all the young were abnormal when the deprivation was from the 10th to the 13th day. The mothers gained weight and remained in good condition notwithstanding. The early phases of embryonic development were more severely affected by deprivation than the

later phases. The time of deprivation appeared to be critically related to the date of implantation. The defects were multiple in the nervous, ocular, skeletal, respiratory, cardiovascular and urogenital systems. The nature of the abnormalities was related to the duration of deprivation and the time after implantation.—A. M. Copping.

427

ASLING, C. W., NELSON, M. M., WRIGHT, H. V. and EVANS, H. M. **Congenital skeletal abnormalities in fetal rats resulting from maternal pteroylglutamic acid deficiency during gestation.** *Anat. Rec.*, 1955, **121,** 775–799. [Inst. Exp. Biol., Univ. California, Berkeley.]

A report is made in detail on the nature and incidence of malformations in the skeleton behind the head of young from normal female rats receiving a diet lacking in pteroylglutamic acid during the latter half of pregnancy (see Abst. 1637, Vol. 23). Every foetus showed defects in the ribs, over 80 per cent. in the radius and ulna, and about 50 per cent. in the scapula, tibia and sternum. Syndactyly occurred in the hind paws of 50 per cent. and in the fore paws of 25. There was dwarfing in the crown to rump measurement of every foetus and in most long bones. The normal sequence of ossification was disturbed in most bones, especially in the segments of the sternum and caudal vertebrae.

The skeletal changes are shown in a series of pictures of bones and in photomicrographs of bone sections. They are discussed with reference to the changes occurring in maternal deficiency of other dietary essentials.—A. M. Copping.

428

DE BELLA, G. and COLELLA, S. Acido folico e metabolismo basale nel ratto. [**Folic acid and basal metabolism in the rat.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1307–1309. [Ist. Fisiol., Univ. Naples.]

The B.M.R. was estimated of 2 groups of male rats weighing from 221 to 335 g., which had been maintained for 30 days on a diet without folic acid, one group having received the addition of 100 μg. folic acid per 100 g. diet. The B.M.R. was higher in the rats deprived of folic acid, and when folic acid was subsequently given to them for 15 days, it fell to be the same as in the non-deprived.

E. M. Hume.

429

REID, B. L. and COUCH, J. R. **Factors affecting the *in vitro* conversion of folic acid to citrovorum factor.** *Arch. Biochem. Biophys.*, 1955, **56,** 388–393. [Dept. Biochem., Texas Agric. and Mech. Coll. System, College Station.]

Homogenates of the liver from chicks aged from 5 to 16 weeks contained an enzyme capable of stimulating conversion of folic acid to citrovorum factor. The enzyme was present in the clear supernatant fluid after differential centrifuging and was partly precipitated with 40 per cent. ethanol. Enzymic conversion was greater in presence of ascorbic acid, Mg, diphosphopyridine nucleotide and adenosine triphosphate, absence of any one of which decreased the amount of citrovorum factor formed. Formate did not appear to be essential. Aminopterin inhibited formation of citrovorum factor. Serine and homocysteine increased the activity of the enzyme system. Livers from chicks deprived of vitamin B_{12} had less of the enzyme activity than livers from chicks which had received an injection of 200 μg. vitamin B_{12} 3 days before they were killed.—A. M. Copping.

430

FATTERPAKER, P., MARFATIA, U. and SREENIVASAN, A. **Rôle of folic acid and vitamin B_{12} in transmethylations. 2. A sparing effect by formate or methanol on the impairment of creatine metabolism in folic acid deficiency. 3. An influence of folic acid on the methylation of nicotinamide. 4. Non-participation of folic acid in the biosynthesis of methyl compounds from precursors.** *Indian J. Med. Res.*, 1955, **43,** 337–341; 343–348; 349–353. [Dept. Chem. Technol., Univ. Bombay.]

2. Swiss mice were given for 5 weeks a purified diet lacking folic acid, and then formate or methanol with or without folic acid was added to the diet. Mice were killed 5, 8 or 9 days after the changes of diet and creatine was estimated as described previously (Abst. 3558, Vol. 25). Impairment of creatine metabolism as shown by reduced excretion and liver content in mice deprived of folic acid was partly restored by inclusion of formate or methanol in the diet. These supplements had no significant effect on the blood picture in mice deprived of folic acid.

3. Synthesis of N^1-methylnicotinamide *in vivo* and *in vitro* was studied in mice deprived of folic acid; the results given in a preliminary paper (Abst. 1945, Vol. 22) were confirmed and extended. Excess of nicotinic acid was toxic and its toxicity was increased by folic acid deficiency. Vitamin C, choline or folic acid given to deficient mice improved the methylating mechanism and produced increased excretion of N^1-methylnicotinamide.

4. See Abst. 3079, Vol. 24.—A. M. Copping.

431

TENTORI, L. and VIVALDI, G. **Inorganic and total "acid soluble" phosphate in the blood of folic acid deficient rats.**

Catalase activity of erythrocytes from folic acid deficient rats. *Rev. belg. Pathol. Méd. exp.*,

1955, **24,** 321–324; 325–328. [Ist. Super. Sanità, Rome.]

432

PENHOS, J. C. **Relationship between folic acid and sexual hormones in toads and rats.** *Acta physiol. Latino Amer.*, 1955, **5,** 22–30. [Inst. Biol. Med. Exp., Costa Rica 4185, Buenos Aires.]

In immature and mature female toads folic acid enhanced the effect of oestradiol in increasing the weight of the oviduct. Folic acid increased also the effect of testosterone on the weight of the testes and the development of the thumb callosity in immature male toads. The effects of oestrogen and testosterone on immature female and male rats were increased also when folic acid was given with the hormone. Folic acid alone had no effect on the reproductive system of toads or rats.

A. M. Copping.

433

GRIMBERGEN, A. H. M. Microorganismen, antibiotica en vitamine B_{12} in oud strooisel. [**Micro-organisms, antibiotics and vitamin B_{12} in old litter.**] *Tijdschr. Diergeneesk.*, 1955, **80,** 605–615. [Inst. Moderne Veevoeding "De Schothorst", Hoogland.] English, French and German summaries.

In an attempt to explain the effect of old litter on resistance to infection in poultry and on growth of chicks, litter one or several years old was tested for antibiotic activity, with *Micrococcus pyogenes* var. *aureus* (Oxford strain) as test organism and with particles of litter or an extract of litter. There was no evidence of activity except a temporary development coinciding with a growth of *Thermoactinomyces monospora* which, in pure culture, formed an antibiotic active against *Micrococcus pyogenes* but not against *Bacterium coli*. That and other actinomyces belong to the normal flora of litter but grow only at temperatures between 35° and 50° C. and at *p*H less than 6·5. The antibiotic formed was unstable. A fungus was isolated, probably *Thermoidium sulphureum*, which formed a penicillin-like antibiotic, also unstable. No active spore-forming organism was found.

In two samples of 4-year-old litter and in one of 1-year-old, the amount of vitamin B_{12} was estimated as 0·67, 0·74 and 0·87 μg. per g. dry matter. Chromatographic analysis showed that most of the activity was due to vitamin B_{12}; most of the activity of poultry manure was due to other substances designated factor A.

It is suggested that the effects of old litter may be due, in small part, to uptake of a little antibiotic, in some part to uptake of vitamin B_{12} and possibly also to the uptake of bacterial protein, old litter resembling in this respect the rumen, which may provide an effective supplement to the protein of the diet.—I. Leitch.

434

BURCHENAL, J. H. **Symposium on the antimetabolites. Folic acid antagonists.** *Amer. J. Clin. Nutrit.*, 1955, **3,** 311–320. [Chemotherap. Serv., Mem. Centre Cancer and Allied Dis., Sloan-Kettering Inst., New York.]

435

NANETTI, L. Influenza dell'aminopterina sulla rigenerazione epatica. [**Effect of aminopterin on liver regeneration.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 927–930. [Ist. Semeiotica Med., Univ. Ferrara.]

Thirty rats had part of the liver removed, and the process of regeneration was watched in 15 which were untreated and in 15 which 10 hr. later were given 0·5 mg. aminopterin per kg. bodyweight. The surviving rats were killed after about 70 hr., when those given aminopterin were dead or moribund. In the latter the liver weighed from 30 to 40 per cent. less than in those not given aminopterin, and it showed massive fatty degeneration, visible macroscopically and microscopically.

E. M. Hume.

436

GOLDIN, A., VENDITTI, J. M., HUMPHREYS, S. R., DENNIS, D., MANTEL, N. and GREENHOUSE, S. W. **A quantitative comparison of the antileukemic effectiveness of two folic acid antagonists in mice.** *J. Nat. Cancer Inst.*, 1955, **15,** 1657–1664. [Lab. Chem. Pharmacol., Nat. Cancer Inst., Nat. Insts. Health, Bethesda, Md.]

VITAMIN B_{12}

437

ØSTERGAARD KRISTENSEN, H. P. **Investigations into the Euglena gracilis method for quantitative assay of vitamin B_{12}.** *Acta physiol. scand.*, 1955, **33,** 232–237. [Inst. Biochem., Univ. Copenhagen.]

In a study of the test for vitamin B_{12} with *Euglena gracilis* as modified by Ross (Abst. 386, Vol. 23) it was found that the sensitivity and accuracy were increased if the *Euglena* cultures were washed and diluted. The medium of strongly growing cultures appeared to contain a thermolabile

factor which inhibited subsequent growth if it was transferred with the cells to a fresh medium.

A. M. Copping.

438

WOLFF, R., KARLIN, R. and PAYSANT, P. A propos du dosage microbiologique de la vitamine B_{12} dans le sérum. [**Microbiological estimation of vitamin B_{12} in serum.**] *Bull. Soc. Chim. biol.*, 1955, **37**, 735–738. [Lab. Chim. Physiol., Fac. Méd., Nancy.]

The method was studied of preparing the sample for estimating vitamin B_{12} in serum with *Lactobacillus leichmannii*. When HCN was added during precipitation of protein and the sample was then autoclaved for 6 min., significantly higher values were obtained than in samples containing no HCN. It is suggested that a thermolabile form of vitamin B_{12} present in serum was stabilised by cyanide treatment.—A. M. Copping.

439

HINE, D. C., DAWBARN, M. C. and SMITH, J. **The effect of copper on the response to vitamin B_{12} and methionine of a mutant strain of *Escherichia coli*.** *Austral. J. Exp. Biol. Med. Sci.*, 1955, **33**, 349–357. [Div. Biochem., C.S.I.R.O., Adelaide.]

The response of *Bacterium coli* mutant to vitamin B_{12} in tube tests was diminished by the presence of copper sulphate in a concentration of 0·0002 per cent. copper. When the organism was using methionine in place of vitamin B_{12} in the medium, the inhibitory effect of copper was much less. Other sulphur compounds such as cystine, homocystine and homocysteine had a protective effect against copper. Thioglycollic acid increased the toxic effect of copper when vitamin B_{12} was the growth factor but not when methionine replaced vitamin B_{12}. It is suggested that copper had an effect on some stage in the synthesis of methionine with which vitamin B_{12} was concerned.

A. M. Copping.

440

VASQUEZ SANCHEZ, S. DEL S. Determinación colorimétrica de la vitamina B_{12}. [**Colorimetric estimation of vitamin B_{12}.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 386–390.

The method of Boxer and Rickards (Abst. 1836, Vol. 21) which depends on quantitative liberation of cyanogen from vitamin B_{12} by exposure to light was applied to estimate vitamin B_{12} in liver extracts and multivitamin preparations. It gave results in agreement with the stated content of the samples examined. [The paper has a bibliography that belongs elsewhere.]—A. M. Copping.

441

HODGKIN, D. C., PICKWORTH, J., ROBERTSON, J. H., TRUEBLOOD, K. N., PROSEN, R. J. and WHITE, J. G. **The crystal structure of the hexacarboxylic acid derived from B_{12} and the molecular structure of the vitamin.** *Nature*, 1955, **176**, 325–328. [Lab. Chem. Crystallogr., Oxford.]

Direct X-ray analysis of the hexacarboxylic acid isolated from vitamin B_{12} (Abst. 3578, Vol. 25), with a series of calculations of successive degrees of approximation to the correct electron density distribution, provided a solution of the crystal structure for this portion of the molecule and also of a large part of the chemical structure of vitamin B_{12}. A tentative structure corresponding to the empirical formula $C_{63}H_{90}N_{14}O_{14}PCo$ is given with the reservation that the exact number and position of the double bonds are uncertain.

A. M. Copping.

442

BONNETT, R., CANNON, J. R., JOHNSON, A. W., SUTHERLAND, I., TODD, A. R. and SMITH, E. L. **The structure of vitamin B_{12} and its hexacarboxylic acid degradation product.** *Nature*, 1955, **176**, 328–330. [Univ. Chem. Lab., Pembroke St., Cambridge.]

Chemical and X-ray evidence of the nature of vitamin B_{12} crystals and of the hexacarboxylic acid product gave a probable structure. The structure with formula $C_{63}H_{90}N_{14}O_{14}PCo$ contains 6 primary amide groups and one secondary amide joining the aminopropanol residue to the propionic acid grouping in ring D of the nucleus. The vitamin is formulated as a di-ester of phosphoric acid, the free acid group of the phosphate being neutralised by a positive charge on the Co atom, which would account for the relative stability of the phosphate grouping. In defining the conjugated ring system of the nucleus, biogenetic considerations are put forward as additional confirmation of the suggested structure. Full details of the work are to be published in due course.

A. M. Copping.

443

TIXIER, G. and NEUDÖRFFER, J. Facteur intrinsèque. Son dosage dans les préparations opothérapiques. [**Intrinsic factor. Estimation in organotherapeutic preparations.**] *C.R. Soc. Biol.*, 1955, **149**, 249–251.

The method described depends on the ability of intrinsic factor to inhibit the utilisation of vitamin B_{12} in the microbiological method of estimation with *Bacterium coli* 113/3.—H. G. Bray.

444

SKARŻYŃSKI, B., OSTROWSKI, W., NIEWIAROWSKA, A. and ŻAK, Z. Połączenia witaminu B_{12} z białkami. [**Combinations of vitamin B_{12} with proteins.**] *Acta biochim. polon.*, 1955, **2**, 115–127. [Inst. Chem. Physiol. A.M., Cracow.] English and Russian summaries.

By paper electrophoresis and microbiological methods of estimation, it was found that a certain proportion of the vitamin B_{12} in the blood serum of different animals was combined with protein, chiefly with the α-globulin fraction.

The vitamin B_{12} content of the red and white blood cells of horse's blood was about 70 $\mu\mu$g. per ml. erythrocytes and about 500 $\mu\mu$g. per ml. leucocytes. In the former most of the vitamin was bound to non-soluble proteins.

In the liver and kidney cells of the rat most of the vitamin B_{12} was in the mitochondria and was bound to protein. (From summary.)

E. M. Hume.

445

HEDBOM, A. **A native vitamin B_{12}-polypeptide complex.** *Biochem. biophys. Acta*, 1955, **17**, 447. [Inst. Biochem., Univ. Upsala.]

Further purification of a cobalamin polypeptide obtained from beef liver by Wijmenga *et al.* (*Acta haematol.*, 1954, **11**, 372) was achieved by electrophoresis. Two different cobalamin compounds were identified. After treatment with KCN attempts were made to identify the amino-acids of the polypeptide part of the complex. So far, the presence has been demonstrated of glycine, alanine, valine, leucine, threonine, aspartic acid, glutamic acid, tyrosine and histidine, but their sequence in the polypeptide chain has not yet been determined.—A. M. Copping.

446

BRIGGS, G. M. and FOX, M. R. S. **Comparison of vitamin B_{12} and desdimethyl B_{12} activity in the chick.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 318–319. [Lab. Biochem. Nutrit., Nat. Inst. Arthritis and Metabol. Dis., Bethesda, Md.]

A new analogue of vitamin B_{12} in which benzimidazole replaced 5 : 6-dimethylbenzimidazole was obtained from cultures of *Streptomyces griseus*. In growth tests with chicks the desdimethyl analogue had only about 9 per cent. of the activity of crystalline vitamin B_{12}.—A. M. Copping.

447

CAPRARO, V., CRESSERI, A. and BERNINI, G. Osservazioni sull'assorbimento della vitamina B_{12} nel ratto albino. [**Absorption of vitamin B_{12} by white rats.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 1431–1433. [Ist. "Carlo Erba" Ricerch. Terap., Lab. Biol., Milan.]

Groups of from 5 to 9 rats were given a single oral dose of vitamin B_{12} containing ^{60}Co, ranging from 0·025 to 0·1 μg., alone or with intrinsic factor derived from pig's gastric mucosa. Eight hr. later the gastro-intestinal tract was removed ; it was ashed with the faeces, and the radio-activity was measured in the ash. The amount in the ash was not changed by simultaneous administration of intrinsic factor.

In another experiment, when vitamin B_{12} was given to rats made anaemic with phenylhydrazine, regeneration of the red cells was more rapid when intrinsic factor was given also.—E. M. Hume.

448

JACKSON, J. T., MANGAN, G. F., MACHLIN, L. J. and DENTON, C. A. **Absorption of vitamin B_{12} from the cecum of the hen.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 225–227. [Animal and Poultry Husb. Res. Branch, U.S. Dept. Agric., Beltsville, Md.]

Removal of the caecum from hens, fed on a diet of maize and soya bean meal, did not affect the content of vitamin B_{12}, estimated with *Lactobacillus leichmanii*, in the egg or the time required to deplete the egg. If vitamin B_{12} labelled with ^{60}Co was injected into the occluded caecum small amounts of radio-active vitamin B_{12} were found in the blood ; most of the vitamin remained in the caecum, and was probably bound so that it appeared not to be available for absorption. It is suggested that the vitamin B_{12} normally present in the caecum is in the unavailable, bound form. Methionine and sodium sulphate containing ^{35}S were rapidly absorbed from the occluded caecum, which showed that absorption of vitamin B_{12} was not prevented by the conditions of the experiment.

A. M. Copping.

449

KLEINSORGE, H. and RÖSNER, K. Über die Beeinflussbarkeit der basophilen Substanz jugendlicher Erythrozyten durch Vitamin B_{12}. [**On the possibility of influencing the basophil substance in young erythrocytes with vitamin B_{12}.**] *Folia haematol.*, 1955, **73**, 75–79. [Med. Poliklin., Univ. Jena.]

Blood containing numerous erythrocytes showing basophil stippling was obtained from rabbits given non-lethal doses of lead. Samples of 0·1 ml. were diluted with equal volumes of 3·8 per cent. sodium citrate and of a solution containing from 0·75 to 4·5 μg. vitamin B_{12} per ml. or of physiological saline solution, and incubated for from 1 to 48 hr. at 37° C. There was no difference in the degree of basophil stippling after incubation between the blood preparations with vitamin B_{12} and those without it.—L. Wills.

450

ANSELMI, F. and GUZZON, V. Presunta attività anthistaminica della vitamina B_{12} e potere istaminasico ed istaminopessico del sangue. [**Alleged antihistamine activity of vitamin B_{12}**

and the histaminase and histamine-carrying capacity of the blood.] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1390–1393. [Ist. Farmacol., Univ. Milan.]

Of 2 groups of 10 non-pregnant female guinea-pigs weighing about 350 g., one group received daily for 10 days a subcutaneous injection of 250 μg. vitamin B_{12} per kg. bodyweight. Five animals in each group were given by subcutaneous injection 3 mg. per kg. bodyweight of the antihistamine drug pyribenzamine; 15 min. later the same animals were given histamine subcutaneously. Heart blood was taken from all the animals 45 min. later, and tested on isolated guineapig intestine in presence of histamine. No evidence was obtained that treatment with vitamin B_{12} exercised any protection against the action of histamine.—E. M. Hume.

451

PASETTO, N. Influenza della vitamina B_{12} sulla attività beta-glucuronidasica del fegato, milza e rene. [**Influence of vitamin B_{12} on the β-glucuronidase activity of the liver, spleen and kidneys.**] *Sperimentale, Sez. Chim. biol.*, 1954, **5,** 21–24. [Ist. Clin. Obstet. Ginecol., Univ. Genoa.]

In the liver, kidneys and spleen of normally fed rabbits weighing from 2·0 to 2·5 kg., the β-glucuronidase activity was greater, especially in the liver, in 7 rabbits that had been injected daily for 10 days with 5 μg. vitamin B_{12} than in 3 that had had no injection.—E. M. Hume.

452

BENNETT, M. A., HELLERMAN, J. and DONNELLY, A. J. **Influence of vitamin B_{12} on liver disease due to a "labile methyl"-free diet.** *Cancer Res.*, 1955, **15,** 398–402. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

Female rats were maintained from the age of 6 weeks on a purified diet without cystine, methionine, choline or vitamin B_{12}. They were killed when they became ill, so that the tissues were obtained without autolysis. Vitamin B_{12} and fat were estimated in the liver. The average content of vitamin B_{12} was 0·03 μg. per g. dry liver, compared with 0·15 μg. for rats receiving the same diet supplemented with vitamin B_{12}. The fat content of the liver was abnormally high and lesions were apparent in it after 1 year on the diet and were severe after 2 years. Cirrhosis, cystic changes and cholangiofibrosis occurred in the liver without fatty changes. Structural changes resembling those preceding the neoplasms produced by *p*-dimethylaminobenzene were induced, and were delayed by addition of vitamin B_{12} to the diet.—A. M. Copping.

453

MIYAGAWA, K. [**Experimental studies on carbon disulfide poisoning. (Effects of l-methionine and l-methionine combined with V.B_{12} upon CS_2 poisoning.)**] *Shikoku Acta med.*, 1955, **6,** 1–6. [Dept. Physiol., Sch. Med., Tokushima Univ.] In Japanese: English summary.

454

FATTERPAKER, P., MARFATIA, U. and SREENIVASAN, A. **Protective action of vitamin B_{12} in the hyperthyroid rat.** *Nature*, 1955, **176,** 165. [Foods Sect., Dept. Chem. Technol., Univ. Bombay.]

Glutathione was estimated in the liver, adrenal glands and blood of rats having a basal diet with and without vitamin B_{12} or one containing iodinated casein with and without vitamin B_{12}. Glutathione was low in the tissues but high in the blood from hyperthyroid rats, and acetylating mechanisms were impaired. These effects of iodinated casein were prevented by adding vitamin B_{12} to the diet. The vitamin had no significant effect when added to the basal diet without iodinated casein.—A. M. Copping.

455

KLINE, I. T. **Relationship of vitamin B_{12} to stilbestrol stimulation of the chick oviduct.** *Endocrinology*, 1955, **57,** 120–128. [Dept. Obstet., Univ. Hosps., Cleveland, Ohio.]

When chicks from a stock depleted of vitamin B_{12} were kept on a diet deficient in the vitamin, their oviduct response to stilboestrol was significantly less than in chicks receiving vitamin B_{12}. The role of folic acid as a supplement to vitamin B_{12} and as inhibitor of the folic acid antagonist aminopterin was investigated. Addition of extra vitamin B_{12} did not increase the effect of folic acid in inhibiting aminopterin. Both vitamin B_{12} and folic acid were essential for the optimum response of the oviduct to stilboestrol. The interrelations of the two vitamins in this reaction are discussed.—A. M. Copping.

456

BURNS, M. J. and ACKERMAN, C. J. **Effect of dietary choline, methionine, and vit. B_{12} on weight and composition of eggs.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 420–421. [Dept. Animal Husb. Nutrit., Alabama Polytech. Inst., Auburn.]

Chicks were given for from 50 to 60 weeks a basal diet lacking choline, with or without supplements of methionine, choline or vitamin B_{12}. In hens receiving a methionine supplement, yolk size and choline content were increased by 40 and 70 per cent., respectively, but egg size was not affected. A supplement of 3 g. choline per kg.

diet increased egg size, yolk size and total choline content by 17, 59 and 97 per cent., respectively. Addition of 30 μg. vitamin B_{12} per kg. diet increased egg size, yolk size and total choline content by 21, 59 and 102 per cent., respectively. With the highest amount of methionine added, 10 g. per kg. diet, the percentage of fat in the yolk was 60·3; with supplements of vitamin B_{12} or choline it was 63 and 65·1, respectively, compared with 62 in yolks of commercial eggs.

E. M. Cruickshank.

457

NORDFELDT, S., KVARNBÄCK, S. and ALM, H. Utfodringsförsök med prokain-penicillin samt vitamin B_{12} till växande gödsvin. [**Feeding experiments with procaine penicillin and vitamin B_{12} for growing pigs.**] *Kungl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 108, 1954, pp. 10. English summary.

Three different experiments were made with a total of 230 pigs fed on rations with either vegetable or animal protein. In one experiment procaine penicillin at the rate of 20 g. per ton increased the growth rate of pigs fed on a ration containing oats, barley, wheat bran, soya bean oilmeal and other oilcakes by 9 per cent., a significant increase. Further supplementation with vitamin B_{12} at the rate of 13·5 mg. per ton had no additional effect. Supplements of penicillin did not produce as good growth as a ration of dried skimmed milk, fishmeal and meatmeal, but did produce a certain increase in growth when added to the animal-protein ration. In the other 2 experiments growth on a vegetable-protein ration supplemented with vitamin B_{12} was improved by the addition of penicillin at the rate of 5 g. per ton but was still inferior to that on the animal-protein ration. Feed consumption per kg. bodyweight increase tended to decrease when penicillin was used, particularly with the vegetable-protein ration.—A. Hepburn.

458

MOINUDDIN, M. and BENTLEY, O. G. **Microbiological versus biological vitamin B_{12} activity in bovine rumen liquor and feces.** *J. Nutrition*, 1955, **56,** 335–348. [Ohio Agric. Exp. Stat., Wooster.]

Microbiological tests with *Lactobacillus leichmannii* and biological tests with rats and chicks were made against graded doses of crystalline vitamin B_{12} on liquor from the rumen of a steer with a rumen fistula and on lyophilised extracts of dried faeces from the same animal. Weight gains and vitamin B_{12} in the liver and kidneys were the criteria of biological response. The microbiologically active vitamin B_{12} substances present in faeces were fully active for the rat, but only about 70 per cent. of the microbiological activity in the rumen liquor appeared to be available. Chicks failed to show a growth response to graded doses of crystalline vitamin B_{12}, but the extent of the increases in vitamin B_{12} in the liver and kidneys suggested that the microbiological activity of rumen liquor and faeces was not fully available for the chick.—A. M. Copping.

459

DAWBARN, M. C. and HINE, D. C. (with SMITH, J.) **The determination of vitamin B_{12}-activity in the organs and excreta of sheep. 3. The excretion of vitamin B_{12}-active factors in the faeces and urine of sheep.** *Austral. J. Exp. Biol. Med. Sci.*, 1955, **33,** 335–348. [Div. Biochem., C.S.I.R.O., Adelaide.]

For parts 1 and 2 see Absts. 4482, Vol. 24; 3595, Vol. 25.

Vitamin B_{12} activity was measured in faeces and urine by microbiological methods with *Bacterium coli* mutant, *Lactobacillus leichmannii* and *Ochromonas malhamensis*. The results obtained with *Bact. coli* were higher than with the other two organisms but by all the methods it was found that the vitamin B_{12} activity in the faeces was much greater in sheep given adequate cobalt than in those given cobalt-deficient rations. Little vitamin B_{12} was excreted in the urine but it too gave some measure of the animal's cobalt intake. When 500 μg. vitamin B_{12} was given daily by mouth to a sheep on a cobalt-deficient diet about 25 per cent. of the dose was excreted in the faeces and less than 0·3 μg. in the urine. If 50 μg. vitamin B_{12} was given parenterally daily 30 to 36 per cent. was excreted in the urine and some in the faeces also. In one sheep, 2 or more vitamin B_{12} factors were identified in the urine by differential microbiological tests and by ionophoresis.

A. M. Copping.

460

KOVAL'SKIĬ, V. V. and RAETSKAYA, YU. I. Sintez vitamina B_{12} v organisme ovets pod vliyaniem kobal'ta i kal'tsiya v biogeokhimicheskoi provintsii bednoi kobal'tom. [**Synthesis of vitamin B_{12} in the sheep under the influence of cobalt and calcium in a cobalt-deficient biogeochemical region.**] *Dokl. Akad. Nauk. SSSR*, 1955, **100,** 1131–1134. [V.I. Vernadskii Inst. Geochem., Acad. Sci., SSSR.]

The livers of healthy sheep contained, per cent., from 18·6 to 21·7 μg. vitamin B_{12}, those of sheep with slight Co deficiency from 16 to 17·5 μg. and with more severe Co deficiency from 4 to 6·4 μg. Supplements of Co alone or with Cu and I salts increased the vitamin B_{12} content of the liver of deficient sheep. The livers of sheep given 4 mg. $CoCl_2$ daily contained 83 per cent. more vitamin B_{12} than those of sheep having a basal ration low in Co, and when 4 mg. $CoCl_2$ was given with 3 g. $CaCO_3$ daily the increase was 166 per cent.

The vitamin B_{12} content of the liver was not always related to the Co content. One sheep had traces of vitamin B_{12} in the liver and 6·4 μg. Co per cent., 3 others had almost no vitamin B_{12} and from 4·2 to 4·6 μg. Co per cent.

Only about 20 per cent. of the Co in the liver was in the form of vitamin B_{12}, even when large amounts of the vitamin were present.

H. Scherbatoff.

461

KERCHER, C. J. and SMITH, S. E. **The response of cobalt-deficient lambs to leucovorin and chlortetracycline.** *J. Animal Sci.*, 1955, **14,** 878–884. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

Lambs given a ration deficient in cobalt developed signs of Co deficiency after 6 months, though they increased from 48 lb. initial weight to 69 lb. during the period. Deficient lambs could not be cured by injection of leucovorin or by giving chlortetracycline by mouth. Vitamin B_{12} given by vein relieved the signs of deficiency.

T. D. Bell.

462

KLINE, E. A., KASTELIC, J. and ASHTON, G. C. **The effect of vitamin B_{12}, cobalt and antibiotic feeding on the composition of pork tissue of 100-pound pigs.** *J. Nutrition*, 1955, **56,** 321–334. [Dept. Animal Husb., Iowa State Coll., Ames.]

With diets and general experimental procedures similar to those previously reported (Abst. 2027, Vol. 25), tests were made of the effect of adding vitamin B_{12} or cobalt to diets with or without antibiotic supplements for pigs up to 100 lb. liveweight. Measurements were made of thickness of back fat, percentage lean, weight of liver, kidney, spleen, bone and bone marrow, and breaking strength of bone in the femur. There was little consistent difference in fat or carcase quality with the several treatments. Inclusion of antibiotics in the ration did not affect the vitamin B_{12} content of the kidney, liver, spleen or muscle. Without antibiotics, inclusion of vitamin B_{12} in the ration increased the amount of the vitamin in the tissues and also the P content of the tissues. Addition of Co had no significant effect on tissue composition.

The results are discussed with those reported in Abst. 2027, Vol. 25, and are not considered to explain adequately the improved growth of young pigs receiving a diet lacking vitamin B_{12} but containing antibiotics.—A. M. Copping.

463

PEYNAUD, É. and LAFOURCADE, S. Sur la présence de vitamine B_{12} dans les vins. **[Presence of vitamin B_{12} in wine.]** *C.R. Acad. Sci.*, 1955, **241,** 127–129.

Small amounts of vitamin B_{12} activity as measured with *Bacterium coli* were found in crushed grapes and in red and white wines. The amounts ranged from 0 to 0·13 μg. per litre and, in general, the wines contained more than the grapes, which was evidence of some synthesis during fermentation.—A. M. Copping.

464

NEUJAHR, H. Y. **On vitamins in sewage sludge. 2. Formation of vitamin B_{12}-, folic acid-, and folinic acid factors in municipal sludge. 3. Vitamin B_{12} activity of different types of sewage sludge.** *Acta chem. scand.*, 1955, **9,** 622–630; 803–806. [Div. Food Chem., Royal Inst. Technol., Stockholm.]

2. In a previous study (Abst. 1850, Vol. 24) the presence of vitamin B_{12}, folic acid and folinic acid activity was demonstrated in municipal sludge. The process of formation of these substances during aerobic and anaerobic fermentation was investigated. It was found that some of the micro-organisms used cyanocobalamin and others produced it or factors related to it. At different stages of fermentation, cyanocobalamin, pseudovitamin B_{12} and factors A, B, C_1 and C_2 were identified by bio-autographic methods. It is suggested that complicated symbiotic and synergistic processes were concerned in the synthesis of vitamin B_{12} factors and also of folic and folinic acids; isolation of the organisms responsible for definite syntheses has not yet been achieved.

3. With microbiological and chromatographic methods of analysis vitamin B_{12} activity was studied in sewage sludge from 5 plants with different digestion processes. The amounts of vitamin B_{12} activity present were related to the nature of the incoming fresh solids and to the processes of aerobic or anaerobic digestion employed in treating the sludge. Higher values were found in sludge from a food factory than in ordinary municipal digested sludge. In one process 27 samples taken over a period of 3 years gave an average of 14 mg. vitamin B_{12} activity per kg. dry solids, with a range from 7 to 30 mg.

A. M. Copping.

465

JANSEN, B. C. P. and AUSSEN, B. S. **Trassi, a far-eastern source of cobalamin (vitamin B_{12}).** *Doc. Med. geogr. trop.*, 1955, **7,** 50–52. [Lab. Physiol. Chem., Univ. Amsterdam.]

The results of microbiological tests showed that vitamin B_{12} was present, even after 2 years' storage, in considerable amounts in *trassi*, which is a preparation of fermented shrimps or fish eaten by the indigenous population in Java. The amount of the vitamin present varied from 110 to 430 μg. per g. dry substance, but it was not possible to determine whether the concentration of vitamin

B_{12} changed during fermentation. The average daily intake was from 1 to 5 g. among the poorer people and from 5 to 10 g. among those better off; such amounts would probably cover the daily requirement.—L. Wills.

466

ROHATGI, K., BANERJEE, M. and BANERJEE, S. **Effect of germination on vitamin B_{12} values of pulses (leguminous seeds).** *J. Nutrition*, 1955, **56**, 403–408. [Dept. Physiol., Presidency Coll., Calcutta.]

For estimating vitamin B_{12} in pulses before and after germination, methods of extracting the vitamin were investigated. Trypsin digestion followed by autoclaving in the presence of cyanide gave the best results. *Lactobacillus leichmannii* was used as test organism. In seven varieties of Indian pulses, *Phaseolus mungo*, *P. radiatus*, *Lens esculenta*, *Pisum sativum*, *Lathyrus sativus*, *Cajanus indicus* and *Cicer arietinum*, the vitamin B_{12} content of the ungerminated seed ranged from 0·36 to 0·61 μg. per 100 g. Germination for 48 hr. caused a considerable increase and for 96 hr. up to a six-fold increase. The relation of the findings to the comparative rarity of pernicious anaemia among Indian vegetarians is discussed.—A. M. Copping.

See also Abst. 1264.

OTHER B VITAMINS

467

GREENBERG, S. M. and ERSHOFF, B. H. **Comparative effects of liver residue and dietary fat on mineral oil toxicity in rats fed a low fat ration.** *Exp. Med. Surg.*, 1955, **13**, 143–155. [Emory W. Thurston Labs., Los Angeles, Calif.]

When immature rats were fed for 6 weeks on a purified low-fat diet containing 7·5 per cent. mineral oil, they grew less and had a higher mortality than rats on the same diet without mineral oil. They also developed alopecia, and some had the spastic gait and humped back characteristic of biotin deficiency. The replacement of sucrose by defatted, desiccated whole liver as 10 per cent. of the diet protected the animals. Several other supplements replacing equal amounts of sucrose were added to the diet or were given parenterally; B vitamins given orally alone or with liver extract given parenterally and biotin, or a liver concentrate, or casein had no significant protective action, but defatted liver residue, or cottonseed oil or hydrogenated coconut oil as 10 per cent. of the diet all had protective action. Cottonseed oil in doses as small as 20 or 100 mg. daily also had protective action but the same amounts of hydrogenated coconut oil had none. The results are discussed and it is suggested that the defatted, water-soluble fractions of liver contain a factor or factors distinct from any of the known nutrients which can replace dietary fat in counteracting the toxic effect of mineral oil on rats given a diet low in fat.—L. Wills.

VITAMIN C (ASCORBIC ACID)

468

SULLIVAN, M. X. and CLARKE, H. C. N. **A highly specific procedure for ascorbic acid.** *J. Assoc. Off. Agric. Chem.*, 1955, **38**, 514–518. [Georgetown Univ., Washington, D.C.]

The method is based on reduction of $FeCl_3$ by ascorbic acid at *p*H 1 to 2 and estimation of the resulting $FeCl_2$ with $\alpha\alpha'$-dipyridyl. Reductone was the only one of several reducing agents which interfered with the reaction and its interference was prevented with orthophosphoric acid. The method was applied to urine, orange juice and honey and the values were smaller than those obtained with the indophenol method.

A. Hepburn.

469

UYAMA, Y. and OGINO, S. **Study on the metabolism of vitamin C in the crystalline lens. 1. Biological formation of ascorbic acid from hexose.**

UYAMA, Y., OGINO, S. and MISHIMA, K. **2. Biological formation of ascorbic acid from mannose in the bovine lens (biological observation on the basis of antiscorbutic activity).** *Med. J. Osaka Univ. (Engl. Ed.)*, 1955, **6**, 217–224; 225–228. [Dept. Ophthalmol., Med. Sch., Osaka Univ.]

1. Ascorbic acid was synthesised when an extract of rabbit crystalline lens was incubated with mannose or, to a less extent, with glucose. Fructose, galactose and ribose gave no synthesis. Synthesis took place mainly in the cortex of the lens and not in the cornea, ciliary body or retina. Ascorbic acid was readily synthesised by the bovine lens but only to a slight extent by the guineapig lens.

2. Injection of the reaction mixture of mannose and bovine lens prolonged the life of scorbutic guineapigs, proving the synthesis of ascorbic acid.

A. Hepburn.

470

BURNS, J. J., MOSBACH, E. H., SCHULENBERG, S. and REICHENTHAL, J. **Studies on the incorporation of C^{14} administered as L-sorbose into L-ascorbic acid and D-glucose in rats.** *J. Biol. Chem.*, 1955, **214**, 507–514. [Res. Serv., Third (New York Univ.) Med. Div., Goldwater Mem. Hosp., New York.]

D-Glucose, L-sorbose uniformly labelled with ^{14}C and L-sorbose-6-^{14}C were injected into rats treated with chloretone. About 0·3 per cent. of the ^{14}C administered was isolated in each case from the urinary L-ascorbic acid. In the degradation products of ascorbic acid from rats receiving L-sorbose-6-^{14}C about half the radio-activity was distributed equally between carbon atoms 1 and 6, which was evidence that L-sorbose was converted to ascorbic acid only after cleavage of the carbon chain and was not, therefore, a direct precursor in the synthesis of ascorbic acid from glucose. L-Sorbose was extensively metabolised to CO_2 and was found to be converted to glucose of the liver glycogen after cleavage of the molecule.

A. Hepburn.

471

CHIU, Y. Y. **The effect of diet on the excretion of ascorbic acid in rabbit urine.** *Shikoku Acta Med.*, 1955, **6**, 259–261. [Sakuramachi Hosp. St. John the Evangelist, Tokyo.] Japanese summary.

Four rabbits were maintained for 11 days on a vitamin-C-deficient diet of bean-curd refuse, another rabbit having green feed in addition. The deprived animals were then given a daily injection of 20 mg. ascorbic acid for 9 days. There was no appreciable change in the volume of urine, and daily excretion of ascorbic acid rose only from about 1 to 2 mg. to 1·5 to 2·5 mg., from which it is concluded that the rabbit does not synthesise ascorbic acid to any great extent. None of the rabbits showed signs of scurvy.—J. S. Thomson.

472

CHALOPIN, H. Électrophorèse du sérum de cobaye scorbutique. **[Electrophoresis of the serum of scorbutic guineapigs.]** *C.R. Soc. Biol.*, 1955, **149**, 265–267.

On examination by paper electrophoresis, serum from scorbutic guineapigs showed several differences from normal serum. The albumin : globulin ratio was less by about 20 per cent. and the mobility of each fraction was below normal.

A. Hepburn.

473

REHELL, B. and RÄIHÄ, C. E. **Influence of ascorbic acid deficiency on the adenosine triphosphate content of the blood.** *Ann. Paediat. Fenn.*, 1954–55, **1**, 78–81. [Child. Clin., Univ. Helsinki.]

Ascorbic acid decreased somewhat in whole blood from guineapigs fed for 4 weeks on a scorbutogenic diet, and the amount of adenosine triphosphate in the blood cells increased to about twice that normally found.—A. Hepburn.

474

TAKEDA, Y. and HARA, M. **Significance of ferrous ion and ascorbic acid in the operation of the tricarboxylic acid cycle.** *J. Biol. Chem.*, 1955, **214**, 657–670. [Dept. Nutrit., Sch. Med., Univ. Osaka, Japan.]

Liver mitochondria from guineapigs into which $\alpha\alpha'$-dipyridyl had been injected to make them iron-deficient, or which had been deprived of ascorbic acid, had less than the normal capacity to oxidise citrate. Aconitase activity also was low but it was restored, though only partly, in scorbutic guineapigs, by the addition of ferrous ion and ascorbic acid to the mitochondria. Urinary citric acid in both groups greatly increased after the administration of butyrate with malate or citrate. It was assumed that the primary lesion in ascorbic acid deficiency is loss of power to mobilise ferrous iron, from which follows the inactivation of the enzymes that require iron as a cofactor, such as homogentisicase and aconitase. The inactivation of aconitase interrupts the tricarboxylic acid cycle and hence disturbs metabolism.—A. Hepburn.

475

ROSSI, C. S. Rapporti fra vitamina 'C' e tributirrinasi epatica e pancreatica. **[Relation between vitamin C and tributyrinase in the liver and pancreas.]** *Sperimentale, Sez. Chim. biol.*, 1954, **5**, 11–17. [Ist. Chim. Biol., Univ. Padua.]

In the liver and pancreas of normal and scorbutic guineapigs, tributyrinase was estimated by measuring the amount of CO_2 liberated from Ringer bicarbonate solution by the action of butyric acid derived from tributyrin.

In the liver of deprived guineapigs [no numbers given] the mean tributyrinase activity fell up to about the 10th day, then rose until, about the 25th day, it had reached the original value. Addition of ascorbic acid *in vitro* had no consistent effect with normal liver tissue; it usually increased the activity of preparations from deprived animals.

In the pancreas, tributyrinase activity was not affected by deprivation of vitamin C. Results of adding ascorbic acid *in vitro* were not consistent.

It is concluded that in the guineapig the tributyrinase of the liver is distinct from that of the pancreas, and that vitamin C does not function as their coenzyme.—E. M. Hume.

476

LINO, A. and BARNARDINI, A. Attività lisozimica dei tessuti di animali carenti di acido ascorbico. [**Lysozyme activity of the tissues of animals deficient in ascorbic acid.**] *Boll. Soc. ital. Biol. sper.*, 1954, **30,** 1070–1073. [Ist. Patol., Univ. Catania.]

Guineapigs were given a scorbutogenic diet, 10 of them with, and 10 without, a daily addition of 750 μg. ascorbic acid. After 30 days they were killed, and ascorbic acid was estimated in the liver and adrenal glands, and lysozyme in the liver, spleen and lungs. No ascorbic acid could be detected in the tissues of the deprived animals, and the lysozyme content of all 3 tissues of the deprived was less than of the non-deprived guineapigs.—E. M. Hume.

477

RIDGE, J. W. **Sodium and chloride of the aqueous humour of normal and scorbutic guinea-pigs.** *Brit. J. Ophthalmol.*, 1955, **39,** 534–539. [Med. Res. Counc. Ophthalmol. Res. Unit, Inst. Ophthalmol., Univ. London.]

The ratio of the concentration of sodium in the aqueous humour to that in the plasma from normal guineapigs was found to be 1·04, a value considerably greater than that found in other animals and in agreement with the findings of Scholz (*Amer. J. Ophthalmol.*, 1953, **36,** No. 6, 64). When guineapigs were given a scorbutogenic diet until no ascorbic acid was detected in the aqueous humour and the guineapigs were in a sub-clinical state of scurvy there was no change in the ratio, which was found by Scholz to decrease in guineapigs with severe scurvy. Saturation with ascorbic acid had no effect. The normal ratio for chloride, 0·90, also was unaffected by scurvy or saturation with ascorbic acid.—A. Hepburn.

478

CASENTINI, S. L'acido pantotenico e la sua azione di risparmio sulle scorte tissutali di ac ascorbico nella cavia. [**Sparing action of pantothenic acid on the depletion of tissue ascorbic acid in guineapigs.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1388–1390. [Ist. Farmacol., Univ. Milan.]

Ascorbic acid was estimated by the method of Roe and Kuether (Abst. 261, Vol. 13) in certain tissues of 12 male guineapigs weighing about 235 g., maintained on a constant diet. Six of them received daily for 10 days an intramuscular injection of 10 mg. Na pantothenate per 100 g. bodyweight. The mean ascorbic acid content of the tissues of those given pantothenate was higher than of those not given it by, per cent., liver 54, muscle 41, adrenal glands 18, spleen 18 and brain 11.—E. M. Hume.

479

SCALABRINO, R. and ROSSANDA, M. Effetto degli aminoacidi solforati (cisteina, cistina, metionina) sul contenuto in acido ascorbico dei tessuti del ratto. [**Effect of sulphur aminoacids (cysteine, cystine and methionine) on the ascorbic acid content of rat tissues.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1372–1374. [2. Div. Med., Osp. Fatebenefratelli, Milan.]

Ascorbic acid was estimated by the method of Roe and Kuether (Abst. 261, Vol. 13) in the blood, liver and adrenal glands of 4 groups of 7 or 8 male rats weighing about 85 g. which had been maintained for 15 days on the diet of Randoin and Causeret (Abst. 3159, Vol. 17) with addition of 1 per cent. of cystine or cysteine or methionine or with no addition. There was no loss of weight or sign of intoxication. There was little difference between the groups in the amount of ascorbic acid in the blood or liver. In the adrenal glands the amount was slightly low in the groups given cystine or cysteine and, more definitely, high in those given methionine.—E. M. Hume.

480

LACHANCE, J. P. and PAGÉ, É. Effets de l'insuline et de la thyroxine sur la graisse brune interscapulaire et sur sa teneur en glycogène et en acide ascorbique. [**Effects of insulin and of thyroxine on the brown interscapular fat and on its content of glycogen and ascorbic acid.**] *Rev. canad. Biol.*, 1955, **14,** 74–88. [Dept. Physiol. Nutrit., Fac. Med., Laval Univ., Quebec.] English summary.

The weight of brown interscapular fat was measured in rats normally fed, or fasting for 18 hr. with or without a single dose of insulin. Fasting greatly reduced the weight of the brown fatty tissue. The loss was rapidly repaired after a dose of insulin. The glycogen content of the brown fat increased after insulin but the ascorbic acid content was not affected. Prolonged treatment with insulin had no significant effect on the weight, ascorbic acid or glycogen content of the brown fat.

Treatment with thyroid powder for 19 days caused an increase in the amount of brown interscapular fat and a complete disappearance of white perinephric fat. In the brown fat tissue there was an apparent decrease in the ascorbic acid content associated with the hypertrophy, but there was no significant decrease in the content of ascorbic acid or glycogen which could be attributed to the treatment with thyroxine.—A. M. Copping.

481

KERTAI, P. and LUDÁNY, G. Die vegetative Nerventätigkeit und der Ascorbinsäuregehalt des Blutplasma. 2. [**Activity of the vegetative nervous system and the ascorbic acid**

content of the blood plasma. 2.] *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1954, **6,** 379–390. [Patho-physiol. Inst., Med. Univ., Budapest.] English and French summaries.

Ascorbic acid was estimated by a modification of the method of Roe and Kuether (Abst. 261, Vol. 13). In dogs anaesthetised with Evipan, the ascorbic acid content of the blood rose within 15 min. after intravenous injection of adrenaline even when the vessels from the adrenal glands were tied. In 3 human subjects also, the ascorbic acid content of the blood rose after subcutaneous injection of adrenaline. In the dogs the blood sugar value rose and reached its maximum after the ascorbic acid value had begun to fall. The blood ascorbic acid value rose also after direct stimulation of the splanchnic nerve fibres (see Abst. 4669, Vol. 8), sympathetic stimulation by way of the carotid sinus, and intravenous injection of *dl*-noradrenaline. The ascorbic acid content of the blood in the veins from the adrenal glands did not rise on direct stimulation of the splanchnic nerve fibres, which caused it to rise in the blood in the femoral vein, nor was there loss of ascorbic acid from an adrenal gland after such stimulation, the other adrenal gland having been previously removed. Administration of insulin or pilocarpine or stimulation of the vagus nerve had no effect on the blood ascorbic acid value.

E. M. Hume.

482

Oertel, G. and Hein, H. Ausscheidung von 17-Oxy-corticosteron im Harn skorbutischer Meerschweinchen. [**Excretion of 17-hydroxycorticosterone in the urine of scorbutic guinea-pigs.**] *Hoppe-Seyler's Ztschr.*, 1955, **301,** 191–193. [Lab. Firma Byk-Gulden-Lomberg, Chem. Fabrik G.m.b.H., Constance.]

In continuation of previous work (Abst. 5007, Vol. 25) 17-hydroxycorticosterone was isolated from the pooled 24-hr. urine of 24 guineapigs and estimated by paper chromatography. After 7 days of a normal diet the amount found was 7 μg. per animal; after 8 days of a vitamin-C-free diet of autoclaved roots, 53 μg. Since the concentration of 17-hydroxycorticosteroids in the blood of scorbutic guineapigs is high also (Abst. 1872, Vol. 24), the amount produced must be considerably increased. Physiological implications will be discussed elsewhere.—W. M. Deans.

483

Harris, L. J., Constable, B. J., Hughes, R. E. and Loewi, G. **Influence of cortisone on ascorbic-acid requirements of guinea-pigs: an assessment by the tooth-structure method.** *Brit. J. Nutrition*, 1955, **9,** 310–316. [Dunn Nutrit. Lab., Univ. Cambridge.]

Six groups of 12 guineapigs were fed for 14 days on a diet with 0, 0·5, 1·0, 2·0 or 4·0 mg. ascorbic acid daily. Another group received 15 g. cabbage daily. Half of each group received 7·5 mg. cortisone daily by intramuscular injection. Although cortisone caused a relative decrease in the content of ascorbic acid in the adrenal glands it did not affect the degree of protection from ascorbic acid deficiency as assessed by the dental histology method.—A. Hepburn.

484

Lever, J. D. **Adreno-cortical histogenesis in the rat: with observations on lipid and ascorbic acid distribution.** *J. Anat.*, 1955, **89,** 293–300. [Dept. Anat., Univ. Cambridge.]

485

Kersten, W., Schmidt, H. and Staudinger, H. Stoffwechsel der Nebennierenrinde und Biosynthese der Corticosteroide. Ascorbinsäure und Wasserstofftransport. 7. [**Metabolism of the adrenal cortex and biosynthesis of corticosteroids. Ascorbic acid and hydrogen transport. 7.**] *Biochem. Ztschr.*, 1955, **326,** 469–473. [Zentrallab., Städt. Krankenanst., Mannheim.]

For part 6 see Abst. 4559, Vol. 24.

Mitochondria were isolated from fresh pig adrenal glands by a method described. Fresh adrenal tissue contained from 200 to 300 mg. per cent. of ascorbic and dehydroascorbic acids, but the mitochondria contained at most 2 or 3 mg. per cent., which may have been due to imperfect isolation. The mitochondria were suspended in ice-cold Krebs Ringer solution at *p*H 6·5 and the proportions of diphosphopyridine nucleotide and dihydrodiphosphopyridine nucleotide were studied photometrically.

The removal of hydrogen from added dihydrodiphosphopyridine nucleotide was activated by cytochrome *c* but less readily than by ascorbic acid, which was most effective at *p*H 6·5. Dehydroascorbic acid could not replace ascorbic acid as hydrogen acceptor in this system.—D. Duncan.

486

Milković, S. **Influence of vitamin C on non-adrenal-mediated action of ACTH in castrated DOCA treated rats.** *Arch. internat. Physiol.*, 1955, **63,** 238–240. [Dept. Pharmacol., Med. Fac., Univ. Zagreb.]

In castrated rats given injections of deoxycorticosterone acetate daily for 3 weeks, with adrenocorticotropic hormone and sodium ascorbate also for the last week, there was a significant decrease in the weight of the adrenal and thymus glands. The preputial glands showed significant hypertrophy. When ascorbate was replaced by

bicarbonate the adrenal gland weights increased slightly, thymus weights remained low and there was no significant hypertrophy of the preputial glands.—A. Hepburn.

487

BOOKER, W. M., TUREMAN, J. R., DACOSTA, F. M., POULSON, J. and MITCHELL, S. Q. **Relationship between glutathione and ascorbic acid in adrenocortical function.** *Amer. J. Physiol.*, 1955, **181,** 371–374. [Dept. Pharmacol., Sch. Med., Howard Univ., Washington, D.C.]

The ascorbic acid content of the whole body of intact and adrenalectomised mice exposed and not exposed to cold stress was about the same. Ascorbic acid decreased significantly after stress in intact mice treated with ascorbic acid or glutathione. Glutathione in doses of from 0·25 to 14 mg. per 25 g. bodyweight prolonged the survival of intact mice, and to a less extent of adrenalectomised mice, exposed to cold stress. In the latter small doses were often more effective than large.

Ascorbic acid in the adrenal glands of rats exposed to cold stress decreased but returned to normal after 12 hr. Cortisone prevented the decline of ascorbic acid but not of cholesterol.

A. Hepburn.

488

DUGAL, L. P., DESMARAIS, A. and GAGNON, P. M. **Influence of exposure to cold and ascorbic acid administration on the weight and the metabolic activity of the adrenal gland of hypophysectomized rats given ACTH.** *Canad. J. Biochem. Physiol.*, 1955, **33,** 677–680. [Dept. Exp. Physiol., Fac. Med., Laval Univ., Quebec.]

The left adrenal gland was removed from 178 hypophysectomised male rats, of which 94 were then exposed to a temperature of 14° ± 2° C. and the rest were kept at room temperature, 22° C. All received adrenocorticotropic hormone daily, and 6 days later the right adrenal gland was removed. Cold stress significantly increased the weight and succinic dehydrogenase activity of the adrenal glands and decreased the weight of the thymus. In a similar experiment the groups were divided and, during exposure to the 2 temperatures, were given sodium ascorbate or $NaHCO_3$. Ascorbate increased the response of the adrenal glands to the hormone at both temperatures, and cold stress produced no additional effect.

A. Hepburn.

489

FEENEY, G. C., CARLÓ, P. and SMITH, P. K. **Action of salicylates and related compounds on carbohydrate metabolism and on adrenal ascorbic acid and cholesterol concentrations.** *J. Pharmacol. Exp. Therap.*, 1955, **114,** 299–305. [Dept. Pharmacol., Sch. Med., George Washington Univ., Washington 5, D.C.]

490

BRAUN, H. Die Ascorbinsäure in Rattennebennieren, ihr Verhalten nach Applikation pharmakologisch wirksamer Substanzen und ihre Beziehung zur Corticosteroidsekretion und zur Entzündungshemmung. [**Ascorbic acid in the adrenal glands of the rat; its behaviour after administration of pharmacologically active substances and its relation to corticosteroid secretion and prevention of inflammation.**] *Arch. internat. Pharmacodyn.*, 1955, **101,** 381–397. [Pharmakol. Inst., Univ. des Saarlandes, Homburg.]

Ascorbic acid, estimated by the method of Roe and Kuether (Abst. 261, Vol. 13) in the adrenal glands of rats, decreased after all the substances injected except cortisone acetate, which caused an increase. The decrease was greatest after adrenocorticotropic hormone.—E. M. Hume.

491

MÖRSDORF, K. Zur Beeinflussung der Ascorbinsäureverteilung durch Antiphlogistica. [**The effect of anti-inflammatory agents on the distribution of ascorbic acid.**] *Arch. internat. Pharmacodyn.*, 1955, **102,** 249–265. [Pharmakol. Inst., Univ. des Saarlandes, Homburg.]

Ascorbic acid was estimated by the method of Roe and Kuether (Abst. 261, Vol. 13) in the adrenal glands, heart, liver, lungs, spleen and kidneys of groups of 16 male rats weighing about 150 g., killed from 120 to 150 min. after subcutaneous injection of one of the test substances. Normal values were established with 60 untreated animals. The substances tested were adrenocorticotropic hormone, cortisone, aminopyrin, phenazone, phenylbutazone, butapyrin, Na salicylate, acetylsalicylic acid, *p*-aminosalicylic acid, formalin, carbon tetrachloride and diphtheria toxin. All of them reduced the ascorbic acid content of the adrenal glands except cortisone, which left it unaffected. On the other organs the different substances had no constant effect, and no evidence emerged that the disappearance of ascorbic acid from the adrenal glands brought about an emission from them of hormones of the cortisone type antagonistic to inflammatory processes.—E. M. Hume.

492

NARPOZZI, A. and ROSSI, F. Potere complementare ed edema da albume d'ovo. [**Complement titre and oedema caused by egg albumin.**]

ROSSI, F. and NARPOZZI, A. Acido ascorbico ed edema da albume d'ovo nel ratto surrenalectomizzato. [**Ascorbic acid and oedema caused by egg albumin in adrenalectomised rats.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1163–1165; 1165–1168. [Ist. Patol., Univ. Padua.]

Serum complement was estimated in 18 rats weighing about 200 g., maintained on a normal diet, before, and 30, 80 and 360 min. after peritoneal injection of 1 ml. fresh egg white. Oedema had not appeared after 30 min., was at its peak after 80 min., and was still evident after 360 min. The complement value had begun to fall already after 30 min., was much lower after 80 min., and was beginning to recover after 360 min.

In a similar experiment with 28 rats, a dose of 200, 300 or 450 mg. ascorbic acid per 100 g. bodyweight was given from 20 to 30 min. before the injection with egg white. With 450 mg. the appearance of oedema was inhibited or greatly retarded in comparison with rats not given ascorbic acid. With the smaller amounts there was retardation. The experiment was repeated with 19 rats from which the adrenal glands had been removed 2 days previously. In the rats not given ascorbic acid, the reaction to egg white was very severe and 2 died. When ascorbic acid was given the reaction was retarded and somewhat less severe, but several animals died.—E. M. Hume.

493

MURNEEK, A. E., MAHARG, L. and WITTWER, S. H. **Ascorbic acid (vitamin C) content of tomatoes and apples.** *Univ. Missouri Agric. Exp. Stat. Res. Bull.* No. 568, October 1954, pp. 24.

Ascorbic acid was estimated by the method of Bessey and King (Abst. 4168, Vol. 3). Dehydroascorbic acid was not estimated. The ascorbic acid content of tomatoes was greatly influenced by light, and increased in tomatoes grown in a greenhouse or outdoors after a few days of sunshine. Shaded tomatoes contained less than exposed fruit and the shaded halves of tomatoes contained least ascorbic acid. Greenhouse tomatoes grown during winter and spring usually contained less than tomatoes grown outside during summer and autumn, chiefly because of the lower light intensity. The content in field tomatoes increased from early to late summer. Mature (green) greenhouse tomatoes contained less ascorbic acid than ripe tomatoes but the comparatively high content of field tomatoes might decrease on ripening, especially if the temperature was high. The same decrease occurred in tomatoes ripened off the vine at a high temperature. In greenhouse tomatoes ripened off the vine at a relatively low room temperature ascorbic acid increased. An increase of soil N usually caused a decrease in ascorbic acid content. Growth hormone sprays did not seem to have any effect.

The ascorbic acid content of apples differed according to the variety, and was highest in Winesap. Summer apples generally contained more than autumn varieties. The content increased as maturing progressed, then decreased, except in summer apples and in Winesap where there was only a decrease during maturation. The last was the only variety which did not rapidly lose ascorbic acid on storage at from 70° to 80° F. Even at from 35° to 45° F. there was, in general, rapid loss during the first 2 weeks. Heavy N fertilisation of the soil reduced the ascorbic acid content, which was therefore greater in apples from weak than from strong trees. Apples on well exposed outside branches contained more ascorbic acid than on shaded branches, and the exposed halves of apples contained more than the shaded. Up to half the ascorbic acid content could be removed by peeling and much was destroyed on cooking especially in autumn apples. When cut or pulped, apples and tomatoes rapidly lost ascorbic acid on exposure to air.—A. Hepburn.

494

HOPP, R. and LAMDEN, M. P. **Ascorbic acid content of some Vermont-grown fruits and vegetables.** *Univ. Vermont Agric. Exp. Stat. Bull.* No. 579, May 1955, pp. 26.

By a method adapted primarily from that of Roe and Oesterling (Abst. 1225, Vol. 14) ascorbic acid was estimated over a 4-year period in a number of fruits and vegetables grown in Vermont. The yearly averages were not always from the same number of analyses, nor were the same varieties always used. The existence of varietal differences was confirmed. Ascorbic acid content was greatest in crops grown under their most suitable climatic conditions. Crops that do best in cool conditions, blueberries, raspberries, strawberries, broccoli, cabbage, peas, spinach and beans, had higher values for ascorbic acid than those given in the U.S. Dept. Agric. Handbook (Abst. 4782, Vol. 20); warm-weather crops like melons, peppers, summer squash and tomatoes were near to or below the standard values.—A. Hepburn.

495

LU, Y. C. and CHOU, Y. C. **The vitamin C content of winter vegetables and fruits in Ch'angsha.** *Chinese Med. J.*, 1955, **73,** 206–213. [Dept. Biochem., Hunan Med. Coll., Ch'angsha.]

After extraction with oxalic acid, ascorbic acid and dehydroascorbic acid were estimated by the 2 : 4-diphenylhydrazine method of Roe and Oesterling (Abst. 1225, Vol. 14), as modified by Penney and Zilva (*Biochem. J.*, 1945, **39,** 392), in 26 common kinds of fruits and vegetables, freshly purchased in the market in the winter of 1954. Oranges were gathered from the trees. Ascorbic acid and dehydroascorbic acid added to some of the foods were well recovered. The values are tabulated with the Chinese, English and Latin names of the plants.

In general, more than 10 per cent. of the vitamin C activity was present as dehydroascorbic acid ; the percentage ranged from 2·5 in long red peppers to 87·2 in yams, and was highest in material that had been stored before marketing. Graphs show the rate of decrease of ascorbic acid and of increase of dehydroascorbic acid in Ch'angsha oranges stored for 4 weeks at 0° C. and at room temperature (5° to 18° C.). The accumulation of dehydroscorbic acid at 0° C. is particularly noticeable. The best sources of vitamin C were peppers (*Capsicum*), mustard leaves, Hengyang orange and Hungkiang pomelo with values, in mg. total ascorbic acid per 100 g. fresh tissue, ranging from 77·5 to 240·6. Other good sources were purple colza (*Brassica campestris*, L., var.) shoots, garlic, spinach, fresh mustard root, onion, lotus root and celery with values from 37·5 to 66·5. Those available in the winter are considered to provide an adequate supply of vitamin C for the people.

E. M. Hume.

496

Fisher, K. H. and Dodds, M. L. **Reduced and total ascorbic acid values of thirty-four foods.** *Food Res.*, 1955, **20,** 247–249. [Coll. Home Econ., Pennsylvania State Univ.]

The foods analysed were canned fruits, cooked meat and fish, fresh, frozen and canned vegetables, milk and ice-cream. The amount of total ascorbic acid was slightly higher than of reduced ascorbic acid in most of the foods and was much higher in frozen asparagus and canned orange juice.

A. Hepburn.

See also Absts. 7, 261, 265, 784.

OTHER VITAMINS

497

Géro, É. Stabilisation de l'acide déhydro-ascorbique par le pyrocatéchol. [**Stabilisation of dehydroascorbic acid with pyrocatechol.**] *C.R. Acad. Sci.*, 1955, **240,** 2176–2178.

The irreversible oxidation of dehydroascorbic acid in air was considerably reduced by the presence of pyrocatechol. It is suggested that pyrocatechol or a similar compound may be the active constituent of substances possessing vitamin P activity.—A. Hepburn.

498

Fuhrman, F. A. **Influence of dietary flavonoids on frostbite in the rat.** *Amer. J. Physiol.*, 1955, **181,** 123–127. [Dept. Physiol., Sch. Med., Stanford Univ., Stanford, Calif.]

In rats tissue loss caused by experimental frostbite of the feet was less when vitamin P as hesperidin methyl chalcone or calcium flavonate glucoside from lemon was added to a purified diet. The protective effect of flavonoids was greater on mild than on severe frostbite. Arrest of blood flow in response to adrenaline in the terminal vascular bed of the rat meso-appendix was more rapid in rats given flavonoids than in those given a flavonoid-free diet. It is suggested that flavonoids prevent rapid loss of fluid through the capillary walls in the injured tissue and possibly prevent stasis, which is one of the dangers of cold injury.

A. M. Copping.

499

Barkow, W. and Goetsch, W. Unspezifische Beziehungen zwischen den Vitaminen der B-Gruppe und dem Faktor T. [**Non-specific relations between the vitamins of the B group and factor T.**] *Naturwissenschaften*, 1955, **42,** 346. [Pasoje Maluquer 9, Barcelona.]

Five preparations with factor T activity were found on analysis to contain varying amounts of vitamin B_1, riboflavin, vitamin B_6, nicotinic acid, pantothenic acid, folic acid, biotin, *p*-aminobenzoic acid and choline. Vitamin B_{12} was present in one preparation. The factor T potency did not appear to be related to the content of vitamin B complex and, in tests with tadpoles, a mixture of B vitamins had not the full effect of factor T.

A. M. Copping.

500

Quatrini, U., Giacalone, O. and Castro, V. Effetti della vitamina T di Goetsch sul contenuto in azoto totale, glicogeno, grassi ed acqua di alcuni organi e sull'apparato scheletrico del ratto albino. [**Effect of vitamin T Goetsch on the content of total nitrogen, glycogen, fat and water in certain organs and on the skeleton of white rats.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1354–1355. [Ist. Fisiol., Univ. Palermo.]

Two groups of young rats weighing about 37 g. were given the same amount of a diet of milk, meat, bread and greenstuff. One group received in addition daily for 40 days 0·4 ml. of a preparation of vitamin T devoid of vitamin B_{12} ; their mean weight increase was 370 per cent. compared with 255 per cent. for those not given vitamin T. Differences in body composition between the groups were small or non-existent.

E. M. Hume.

501

Chiancone, F. M., Ginoulhiac, E., Mainardi, L., Tenconi, L. T. and Lamanna, A. Acido orotico : studio general ed osservazioni sperimentali come fattore di crescita nel ratto. [**Orotic acid as a growth factor for rats: a general study and experimental observations.**]

Acta vitaminol., 1955, **9**, 101–120. [Lab. Direzione Med. Centrale, Lepetit S.p.A., Milan.] French, English, German and Spanish summaries.

When 2 groups of 20 rats weighing about 60 g. were fed on a purified diet, complete except for vitamin E, and one group was given daily for 6 weeks an addition of 186 mg. K orotate per kg. diet, there was no difference in growth rate between the groups. When groups of 10 rats were given the same diets with only 7 per cent. protein and with vitamin E, there was again no difference in growth rate.

Other comparisons were made with the diets with and without orotate. When the diet lacked the whole vitamin B complex, loss of weight began a little later and was slightly less severe in the rats given orotate. When the whole vitamin B complex was then given to the same rats, recovery of weight was more rapid with orotate than without. When vitamin B_1 or pyridoxine was thus given instead of the whole complex there was no difference between the groups. In rats deprived of vitamin B_6, orotate in no way mitigated the effects of the deprivation. In rats starved for 10 days and then given a diet high or low in protein, administration of orotate had no effect on the rate of recovery. Of rats given sulphaguanidine and deprived of vitamin B_{12} and folic acid, fewer died when orotate was given. When sulphaguanidine was withdrawn, addition of orotate or folic acid and vitamin B_{12} brought about weight increase; addition of all 3 had the best effect. Orotate had no power to potentiate a synthetic oestrogen or to replace folic acid in counteracting the effect of aminopterin.—E. M. Hume.

502

VIVIANI, R., MARCHETTI, M., RABBI, A. and MORUZZI, G. **Relationship between orotic acid and animal protein factors of casein.** *Nature*, 1955, **176**, 464–465. [Ist. Chim. Biol., Univ. Bologna.]

Rats fed on a diet with purified casein as the sole source of animal protein grew poorly and many died. Surviving rats of the first generation did not grow well when fed on the deficient diet, but crude casein or orotic acid had a beneficial effect. Orotic acid appeared to be able to act as a growth factor for rats deficient in animal-protein factor.—A. Hepburn.

4. PHYSIOLOGY OF NUTRITION

ENZYMES

503

AXELROD, B. **Nonoxidative, nonproteolytic enzymes.** *Annu. Rev. Biochem.*, 1955, **24**, 45–82. [Dept. Biochem., Purdue Univ., Lafayette, Ind.]

504

GREEN, D. E. and BEINERT, H. **Biological oxidations.** *Annu. Rev. Biochem.*, 1955, **24**, 1–44. [Inst. Enzyme Res., Univ. Wisconsin, Madison.]

505

MORENO DE VEGA, F. and MORENO DE VEGA, A. El citocromo C. **[Cytochrome *c*.]** *Rev. clín. española*, 1955, **57**, 46–51. [Ist. Llorente.]

A review.

506

GREEN, D. E. **Oxidation and synthesis of fatty acids in soluble enzyme systems of animal tissues.** *Clin. Chem.*, 1955, **1**, 53–67. [Inst. Enzyme Res., Univ. Wisconsin, Madison.]

A lecture review with 47 references.

507

LENTI, C. and BARGONI, N. Sulla colinadeidrogenasi del fegato. **[Choline dehydrogenase in the liver.]** *Arch. Sci. biol., Bologna*, 1955, **39**, 313–323. [Ist. Chim. Biol., Univ. Sassari.]

508

SIMAKOV, P. V. Vliyanie kolichestva i kachestva belkov pishchi na termostabil'nost' nekotorykh zhelezosoderzhashchikh fermentov. **[Influence of the quantity and quality of dietary protein on the thermostability of some iron-containing enzymes.]** *Vop. Pitan.*, 1955, **14**, No. 3, 22–26. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

Young rats in 4 groups were given a standard diet containing 18 per cent. protein, a similar diet containing only 10·7 per cent. protein and more carbohydrate, or a diet containing 18 per cent. protein but deficient in tryptophan or histidine. After from 1 to 60 days blood catalase and peroxidase were estimated at 20° C. and after heating to a temperature just below that normally required to inactivate the enzymes.

N.A. and R., January 1956

The samples from the first group showed progressively reduced enzyme activity after heating. In the second group this effect was much greater for catalase, but was of the same order for peroxidase. The rats on the tryptophan- and histidine-deficient diets gave low values for both enzymes at both temperatures.—D. W. Taylor.

509

SCHWERT, G. W. **Proteolytic enzymes.** *Annu. Rev. Biochem.*, 1955, **24,** 83–112. [Dept. Biochem., Sch. Med., Duke Univ., Durham, N.C.]

510

MAGEE, D. F. and ANDERSON, E. G. **Changes in pancreatic enzymes brought about by alteration in the nature of the dietary protein.** *Amer. J. Physiol.*, 1955, **181,** 79–82. [Dept. Pharmacol., Sch. Med., Univ. Washington, Seattle.]

Estimations were made of the trypsin and lipase contents of dried pancreas from rats given synthetic diets. Of 4 groups each of 10 animals 3 had mixtures rich in protein, with 30 per cent. casein, gelatine or zein and 1 had the same diet with only 5 per cent. casein and 25 per cent. glucose. For the whole pancreas the contents of both enzymes were greater in the casein than in the 3 other groups, which were comparable with each other. When expressed per 100 mg. tissue the same was true for the trypsin, but for lipase the value for the casein groups was significantly greater only in comparison with the low-protein group.

To test the hypothesis that the pancreas may secrete the enzymes only if stimulated to do so by pancreozymin produced in adequate amount by the duodenum, a second experiment was made. Of 3 groups of 10 rats each, 2 were given similar diets with 8 per cent. casein without and with daily subcutaneous injections of 400 μg. urethane of β-methylcholine chloride (Urecholine), a pancreatic stimulant, and the third had 7 per cent. casein and 1 per cent. *dl*-valine. The mean content of each enzyme was significantly higher in both the Urecholine and the valine groups than in the casein group, expressed on either basis.

It is concluded that for enzyme production by the pancreas of the rat an adequate stimulus for the release of pancreozymin is of greater importance than is the quality of the protein in the diet, and that *dl*-valine is potent in stimulating this function of the duodenum.—D. Harvey.

511

MATTSON, F. H. and BECK, L. W. **The digestion *in vitro* of triglycerides by pancreatic lipase.** *J. Biol. Chem.*, 1955, **214,** 115–125. [Res. Div., Procter and Gamble Co., Cincinnati, Ohio.]

The hydrolysis of low-melting glycerides of cottonseed oil by pancreatic lipase was promoted by a high electrolyte concentration of 1 to 2 *M* and by low concentrations of bile salts; higher levels of bile salts were inhibitory. Hydrolysis allowed to proceed for less than 1 hr. produced appreciable amounts of 2-monoglyceride in addition to 1-monoglycerides. When 2-oleoyl dipalmitin was used as substrate, the diglyceride formed was oleoyl palmitin and the monoglyceride was mono-olein. Thus the hydrolysis of triglycerides *in vitro* appears to follow the same path as that *in vivo*, namely: triglyceride → 1 : 2-diglyceride → 2-monoglyceride. It is suggested that the enzyme lipase is specific for esterified primary alcohol groups.

G. A. Garton.

512

KORN, E. D. and QUIGLEY, T. W. (Jr.) **Studies on lipoprotein lipase of rat heart and adipose tissue.** *Biochim. biophys. Acta*, 1955, **18,** 143–145. [Lab. Cellular Physiol. Metabol., Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

513

NOTHMAN, M. M., PRATT, J. H. and CALLOW, A. D. **Studies on urinary lipase. 2. Urinary lipase in man.** *Arch. Int. Med.*, 1955, **96,** 188–190. [Med. Dept., New England Med. Centre.]

In 100 healthy subjects lipase was detected in the urine in amounts varying from 0·1 to 0·75 unit per ml., average 0·35 (see Nothman *et al.*, *Arch. Int. Med.*, 1955, **95,** 224). Variations from day to day and during one day were small and lipase values were not significantly influenced by fasting or feeding.—F. C. Aitken.

514

RINDI, G. and PERRI, V. Influenza della castrazione e del trattamento con testosterone sull' attività di alcune transaminasi dei tessuti di ratto. [**Effect of castration and of treatment with testosterone on the activity of some transaminases in the tissues of rats.**] *Arch. Sci. biol., Bologna*, 1955, **39,** 343–351. [Ist. Fisiol. Umana, Univ. Pavia.]

515

CORSI, A. Osservazioni sulla localizzazione istochimica della fosfatasi alcalina nel fegato del ratto. [**Histochemical localisation of alkaline phosphatase in the liver of the rat.**] Osservazioni sulla fosfatasi alcalina nella cirrosi da tetracloruro di carbonio del ratto. [**Alkaline phosphatase in cirrhosis produced by carbon tetrachloride in the rat.**] *Arch. Sci. biol., Bologna*, 1955, **39,** 233–240; 241–246. [Ist. Patol. Gen., Univ. Modena.]

516

BONDI, A. and BIRK, Y. **Studies on the action of papain on protein feeds.** *Bull. Res. Counc. Israel*, 1954, **4**, 57–62. [Agric. Res. Stat., Rehovoth.]

The rate of liberation of COOH, NH_2 and α-amino groups was measured when fat-free samples of 4 feedingstuffs were digested for 24 hr. at *p*H 5·0 and 7·5 with papain, either unactivated or activated with HCN. With activated enzyme liberation of COOH and NH_2 was greater at *p*H 5·0 than at *p*H 7·5; with unactivated enzyme the opposite was, in general, true. The feeds, in descending order of the extent to which they were digested, were groundnut cake, soya bean cake, fishmeal and meatmeal. Digests by papain when treated with trichloroacetic acid showed the same difference with origin as was found for pancreatic digests (see Abst. 1779, Vol. 23). From calculations of the average number of amino-acids in the peptide molecules in the digests it is shown that at *p*H 5·0 activation was without effect; at *p*H 7·5 the average number of amino-acids was lower with the activated than with the unactivated enzyme.

It is concluded that at *p*H 7·5 activation of the enzyme causes breakdown to peptides of smaller molecules and that the findings support the view (Willstaetter and Grassmann, *Hoppe-Seyler's Ztschr.*, 1924, **138**, 184) that activated and unactivated papain are two different enzymes.

D. Harvey.

See also Absts. 612, 686, 827.

DIGESTION AND ABSORPTION

517

GREER, M. A. **Suggestive evidence of a primary "drinking center" in hypothalamus of the rat.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 59–62. [Nat. Cancer Inst., Bethesda, Md.]

In one rat in which electrodes were implanted in the hypothalamus immediately behind the level of the paraventricular nuclei, at the lateral edge of the dorso-median nuclei, stimulation caused violent drinking activity. Even when the water was replaced by 5 per cent. saline the rat drank vigorously during stimulation. At first, stimulation for 5 min. every half hour caused the rat to drink more than 400 ml. tap water daily, but by the fourth day the response was reduced. The rat was killed on the fifth day.—D. Duncan.

518

MÜHLEMANN, H. R. Der Speichel. [**Saliva.**] *Schweiz. med. Wochenschr.*, 1955, **85**, 435–439. [Univ. Zürich.]

A review.

519

JOHN, H. J. **Hunger.** *Amer. J. Digest. Dis.*, 1955, **22**, 197–200. [Cleveland, Ohio.]

520

STUNKARD, A. J., VAN ITALLIE, T. B. and REIS, B. B. **The mechanism of satiety: effect of glucagon on gastric hunger contractions in man.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 258–261. [Dept. Med., New York Hosp.]

Gastric motility was recorded in 7 healthy adults in the fasting state. In 16 experiments when glucagon was given intravenously in doses of from 0·125 to 4·0 mg., hunger contractions were abolished within 3 min. after the start of injection. The sensation of hunger disappeared or grew less. Saline had no such effect. After injection of glucagon the venous and capillary blood sugar rose rapidly to a peak in about half an hour. Falling blood sugar was accompanied by return of gastric hunger contractions and the sensation of hunger.—D. Duncan.

521

GREENBERG, L. A. and TURNER, J. M. **Effect of carbonated water on gastric acid secretion.** *New Engl. J. Med.*, 1955, **253**, 105–106. [Lab. Appl. Physiol., Yale Univ., New Haven, Conn.]

Ten healthy men in the post-absorptive state were given 400 ml. of a pectin test meal followed immediately on one occasion by 200 ml. water and on another by the same volume of carbonated water. At intervals the total stomach contents were removed, the volume was measured and, after samples had been taken for analysis by the technique of Hunt and Spurrell (Titles 2009, 2010, Vol. 21), the remainder was returned to the stomach The means for the amounts in mg. of HCl secreted in 15-min. periods after ingestion of the meal were with water 210, 216, 120 and 42 and with carbonated water 207, 132, 24 and 7.

The more rapid than normal emptying of the stomach which is caused by the carbonated water had the effect of reducing the mass of material eliciting secretion of acid. Carbonated water may, through this effect, be of use in counteracting retention of food and resulting hyperacidity in the stomach.—D. Harvey.

522

CAPUTO, A. Sulla composizione del succo gastrico. Caratterizzazione elettroforetica e separazione

di alcuni constituenti proteici. [**Composition of gastric juice. Electrophoretic characterisation and separation of some protein constituents.**] *Arch. Sci. biol., Bologna*, 1955, **39**, 424–440. [Ist. " Regina Elena ", Rome.]

In gastric juice of dogs there were at least 4 principal components shown by electrophoresis; at *p*H 7, 2 migrated towards the anode and 2 towards the cathode. Their isoelectric points were at *p*H 4·8, 5·2, 8·9 and 10·2. Lysozyme, pepsin and acid mucopolysaccharide were identified.—D. Duncan.

523

VAN LIERE, E. J. and NORTHUP, D. W. (with CANADA, W. H.) **Administration of Carboresin and gastric emptying in man.** *J. Appl. Physiol.*, 1955, **8**, 119–120. [Dept. Physiol., Sch. Med., Univ. W. Virginia, Morgantown.]

In 15 healthy students there was no significant mean effect of 16 g. Carbo-resin, a mixture of anion- and cation-exchange resins, on gastric emptying time after a test meal containing barium. In 3 individual subjects gastric emptying was significantly delayed.—D. Duncan.

524

NICKEL, R. and WILKENS, H. Zur Topographie des Rindermagens. [**Topography of the stomach of cattle.**] *Berl. Münch. tierärztl. Wochenschr.*, 1955, **68**, 264–270. [Anat. Inst., Tierärztl. Hochsch., Hanover.] English summary.

An illustrated article, with references.

525

BELL, F. R. and LAWN, A. M. **Localization of regions in the medulla oblongata of sheep associated with rumination.** *J. Physiol.*, 1955, **128**, 577–592. [Dept. Physiol., Royal Vet. Coll., London, N.W.1.]

The medulla oblongata of sheep was explored with a stereotaxic instrument to obtain responses in the reticulo-rumen and the oesophagus. Stimulation of the area 6 mm. oral and 2 mm. caudal to the obex in the lateral region of the medulla caused responses in the rumen, and a similar but less well defined area elicited responses in the oesophagus. Many of the areas stimulated, when studied histologically, were seen to be in the lateral reticular formation, although many were closely adjacent to the nucleus ambiguus.

No intramedullary decussation occurred; each vagus nerve appeared to be related only to its own side of the medulla in this area.—A. T. Phillipson.

526

DZIUK, H. E. and SELLERS, A. F. **Physiological studies of the vagal nerve supply to the bovine stomach. 1. Comparison of responses in milk-fed and roughage-fed calves, using a chronic intrathoracic vagal electrode technique.** *Amer. J. Vet. Res.*, 1955, **16**, 411–417. [Div. Vet. Physiol., Sch. Vet. Med., Univ. Minnesota, St. Paul.]

Permanent electrodes were applied to the thoracic dorsal and ventral vagal nerves of calves. The pressure-recording devices were placed in the rumen by passing a long catheter through the nose to the stomach. Patterns of motility were recorded from strain-gauge transducers. Calves fed on roughage had more regular and stronger contractions than those of milk-fed calves, and responses to vagal stimulation were greater. Histological examination of the vagal fibres *post mortem* showed no gross deterioration due to the presence of the electrodes.—A. T. Phillipson.

527

LENGEMANN, F. W. and ALLEN, N. N. **The development of rumen function in the dairy calf. 1. Some characteristics of the rumen contents of cattle of various ages.** *J. Dairy Sci.*, 1955, **38**, 651–656. [Dept. Dairy Husb., Univ. Wisconsin, Madison.]

The rumen contents of calves, 1, 2, 3, 6 and 12 months old were examined and compared with those of adult animals for the short-chain fatty acids present, the speed with which the contents would digest cotton thread, the gas produced from " Solka Floc " and the numbers of protozoa and bacteria present.

In the fatty acids the only appreciable difference was less acetic acid in the calves 1 month old and a larger proportion of acids designated the " succinic-lactic " group. Counts of protozoa and bacteria showed large variations; it is clear that protozoa were absent or present in very small numbers in the animals 1 month old.

A. T. Phillipson.

528

DOUGHERTY, R. W. and MEREDITH, C. D. **Cinefluorographic studies of the ruminant stomach and of eructation.** *Amer. J. Vet. Res.*, 1955, **16**, 96–100. [Dept. Physiol., New York State Vet. Coll., Cornell Univ., Ithaca.]

The movements of the oesophagus, reticulum and rumen were studied by cineradiography in sheep during the introduction of a mixture of CO_2 and methane into the rumen. A barium meal was given so that the organs were well outlined.

An area of the thoracic oesophagus about 1½ in. from the diaphragm appears to act as a sphincter. The reticulo-ruminal fold can effectively hold back the material in the rumen from flowing into the reticulum. Gas is pushed into the reticulum by contraction of the dorsal sac of the rumen. The sequence of events during eructation is described.

A. T. Phillipson.

529

GRAU, H. Zur Funktion der Vormägen, besonders des Netzmagens. der Wiederkäuer. [**The function of the fore-stomachs of ruminants, especially the reticulum.**] *Berl. Münch. tierärztl. Wochenschr.*, 1955, **68,** 271–275. [Tieranat. Inst., Univ. Munich.] English summary.

This is a discussion of the literature on the structure and movements of the fore-stomachs, with some original observations. The hypothesis is advanced that well digested food with a higher sp. gr. accumulates at the bottom of the reticulum and that at the beginning of the reticulum contraction the lighter material is returned to the rumen, whereas at the end of the contraction the heavier material is tipped into the omasum. The reticulum is thus given the function of a "separating-stomach".—D. Duncan.

530

PALOHEIMO, L., MÄKELÄ, A. and SALO, M. L. **Some quantitative data on the role of the ruminant proventriculi in the digestion and absorption of nitrogen-free organic matter.** *Maataloust. Aikakausk.*, 1955, **27,** 70–76. [Dept. Animal Husb., Univ. Helsinki.] Finnish summary.

The digestibility of N-free organic matter and N-free non-lignin organic matter was estimated in the contents of the fore-stomachs and in the whole digestive tract of 14 cows and 5 young bulls after slaughter, with lignin as reference material. The animals were fed on hay three times a day for 10 days before slaughter. The mean digestibility of the N-free non-lignin organic matter was 86 per cent., range 76 to 99, for the fore-stomachs and 92 per cent. for the whole tract. It is concluded that the carbohydrates of hay are digested mainly before the feed reaches the abomasum and the products are directly absorbed into the blood or eructated as gases.—A. T. Phillipson.

531

AMMERMAN, C. B. and THOMAS, W. E. **Relative pH values and buffering capacities of the ruminal ingesta of lambs as affected by various forages.** *Cornell Vet.*, 1955, **45,** 443–450. [Kentucky Agric. Exp. Stat., Lexington.]

The *p*H of the rumen contents of 3 sheep was measured by a glass electrode and calomel electrodes inserted directly into the rumen. On alfalfa, ladino and bluegrass pastures the ranges of values were similar, except that the readings obtained while the sheep grazed bluegrass were about 0·2 unit higher than those from the other 2 pastures. Nearly all values lay between 6·0 and 6·5. With hay from the pastures all values were above this range.

There was little difference between the buffering capacities of the rumen liquors with the different forages.—A. T. Phillipson.

532

CARROLL, E. J. and HUNGATE, R. E. **Formate dissimilation and methane production in bovine rumen contents.** *Arch. Biochem. Biophys.*, 1955, **56,** 525–536. [Dept. Bacteriol., State Coll. Washington, Pullman.]

From the production of CO_2 from formate labelled with ^{14}C by rumen organisms and the relation between formate breakdown and methane production it is concluded that methane is produced at a rate compatible with the assumption that the hydrogen of formate is used to reduce CO_2. The rate of reduction of CO_2 by hydrogen is greater than the rate of decomposition of formate in the rumen under normal conditions, so that no hydrogen accumulates. There is some evidence that other substrates also are concerned with methane production.—A. T. Phillipson.

533

SHORLAND, F. B., WEENINK, R. O. and JOHNS, A. T. **Effect of the rumen on dietary fat.** *Nature*, 1955, **175,** 1129–1130. [Fats Res. Lab., Wellington.]

Lipids present in the rumen contents of sheep contained much more saturated fatty acid, especially stearic, than is present in pasture lipids, indicating that feed fat can be hydrogenated in the rumen. This hydrogenation was demonstrated *in vitro* by incubation, under CO_2, of linolenic acid with rumen contents for 3 days at 37° C. Analysis of the lipids of the rumen contents before and after incubation with linolenic acid showed that the tri-unsaturated acid was reduced to conjugated diene and further to the mono-ene stage and finally to stearic acid. *Trans* fatty acids were also detected after incubation. These findings explain the relative constancy of composition of ruminant depot fat in spite of differences in the nature of the dietary lipids.—G. A. Garton.

534

PARSONS, A. R., NEUMANN, A. L., WHITEHAIR, C. K. and SAMPSON, J. **Isolated gut and rumen motility as affected by extracts from bloat producing forages.** *J. Animal Sci.*, 1955, **14,** 403–411. [Dept. Animal Sci., Univ. Illinois, Urbana.]

Extracts of clovers, with the exception of red clover, were found to inhibit motility in the isolated intestine of the rabbit. Rumen contents from normal animals had little or no effect, but a sample from a cow dying of bloat was inhibitory. An extract of ladino clover known to cause bloat inhibited eructation, but not rumen movement.

A. T. Phillipson.

535

KHALILOV, F. K sravnitel'noi morfologii kishechnika mlekopitàyushchikh v svyazi s kharakterom pitaniya. [**The comparative morphology of the intestine of mammals in relation to the character of the feed.**] *Zool. Zh.*, 1955, **34**, 415–426. [Dept. Vertebrate Zool., Kazakh State Univ.]

Insectivores and carnivores were found to have the shortest intestines among mammals, herbivores, especially rodents and hoofed animals, the longest. Insectivores have no caecum and the large intestine is little developed. In carnivores the caecum is either absent or little developed. Most carnivores have a short large intestine and a long small intestine, but in carnivores which eat plant food as well as meat, such as dogs and badgers, the large intestine is longer than in those which eat only meat. In rodents there is a well developed large intestine and a somewhat less well developed small intestine. Ruminants have the longest intestine of the hoofed animals, solid-hoofed animals have the shortest, with pigs occupying an intermediate position.

The microscopic structure of the mucous membrane also shows differences. The villi are well developed in insectivores and carnivores. It is concluded that during the evolution of mammals an increase in the absorption surface of the intestine developed by increase in the length of the intestine in hoofed animals and by differentiation of intestinal villi with a short intestine in carnivores. In hoofed animals the intestinal villi are shorter and broader. An inverse correlation exists between the height of the villi and the length of the intestine. Horses have a shorter intestine and higher villi (420 μ. in the jejunum) than sheep and cows. The villi are weakly developed in rodents and particularly so in hoofed animals.

Intestinal crypts, judged by the thickness of the layer and the density of spacing, are also better developed in insectivores and carnivores. In rodents and hoofed animals, particularly the latter, the crypts have no considerable depth and are spaced thinly. It is possible to establish an inverse ratio between the development of intestinal crypts and the length of the intestine.

The muscularis mucosae is better developed in insectivores, carnivores and hoofed animals than in rodents. The thickness of the circular muscular layer is greater than that of the longitudinal layer throughout the intestine in carnivores and hoofed animals. Rodents have an equal thickness of the muscular layer in the duodenum and jejunum, and from the ileum onwards the circular predominates. In insectivores the longitudinal layer is better developed in the duodenum, but from the jejunum onwards the circular layer is the thicker. In hoofed animals, the circular layer is thicker than the longitudinal, particularly in the duodenum and large intestine.

The intestinal muscles are least developed in rodents and most strongly in carnivores, so it is deduced that motility is more extensive in the first type and more intensive in the second. The powerful development of the muscularis mucosae in the small intestine of carnivores is related not only to the strengthening of movements but also perhaps to an increase in the power of absorption.

H. Scherbatoff.

536

FOMINA, L. S. Sekretzia kishechnykh fermentov izolerovannymi po Tiri i " denervirovannymi " otrezkami kishok u sobak v zavisimosti ot kolichestva belka v pishche. 1. Kolichestvo kishechnogo sekreta. [**Secretion of intestinal enzymes in intestinal segments isolated by the Thiry method, and in denervated segments, in the dog, in relation to amount of dietary protein. 1. Quantity of intestinal secretion.**] *Vop. Pitan.*, 1955, **14**, No. 3, 16–22. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

Four bitches each had a Thiry fistula and a denervated intestinal segment transplanted subcutaneously. One animal was used as a control, the others had a diet deficient in protein. Body-weight, plasma protein concentration and the total amount and percentage of solids in the intestinal secretions from each fistula were studied before and during the period on the deficient diet and at intervals during recovery.

The total amounts secreted by the denervated segments were much less than those from the Thiry loops; in both the amount of juice and percentage of solids fell gradually during protein depletion and rose during recovery.—D. W. Taylor.

537

OTA, S. and SHIBATA, M. **Studies on the mechanism for sugar absorption by rabbit intestine.** *Kyushu Mem. Med. Sci.*, 1954, **5**, 107–121. [Dept. Med. Chem., Fac. Med., Univ. Kyushu.]

A solution of glucose in phosphate buffer containing ^{32}P was injected into the duodenum or bile duct of young rabbits. Portal blood was collected 3 hr. later and a segment of intestine was taken for estimation of P fractions. The results suggested that while phosphorylation was involved in the absorption of glucose from the intestine, dephosphorylation occurred when the glucose was transferred to the portal blood. Little or no ^{32}P was found in the bile from rabbits given the mixture into the bile duct. Monoiodoacetic acid inhibited phosphorylation of glucose during intestinal absorption.

The rate of absorption of different sugars was studied *in vitro* by perfusion through segments of rabbit intestine. The rate of absorption varied

in the descending order galactose, glucose, fructose, ribose, xylose, arabinose. All except arabinose were phosphorylated during absorption, and the phosphorylation system was closely related to the respiratory system and was inhibited by 2 : 4-dinitrophenol, phloridzin or anaerobic conditions. It appeared that phosphorylation took place on the mucous surface of the cells and that residual P was retained in the intestinal mucosa for further phosphorylation. The phosphorylation of fructose differed in some way from that of glucose and was less affected by respiratory inhibitors. Addition of bile promoted exchange of P with glucose, but not with arabinose.—A. M. Copping.

538

FRIDHANDLER, L. and QUASTEL, J. H. **Absorption of sugars from isolated surviving intestine.** *Arch. Biochem. Biophys.*, 1955, **56,** 412–423. [Res. Inst., Montreal Gen. Hosp.]

The absorption of glucose, fructose, sorbose and sucrose from isolated loops of intestine was studied. Glucose appears as well as fructose on the serosal side of the loop when fructose is introduced into the lumen. 2 : 4-Dinitrophenol suppresses glucose formation, but does not reduce the rate of disappearance of fructose. Phloridzin suppresses glucose absorption, but not fructose absorption or the formation of glucose from fructose. The behaviour of fructose, sucrose and sorbose suggests that they are " passively " absorbed.

A. T. Phillipson.

539

FRIDHANDLER, L. and QUASTEL, J. H. **Absorption of amino acids from isolated surviving intestine.** *Arch. Biochem. Biophys.*, 1955, **56,** 424–440. [Res. Inst., Montreal Gen. Hosp.]

L-Isomers of histidine and alanine were absorbed from the isolated intestine more rapidly than the D-isomers. Oxygen lack and dinitrophenol both inhibit the absorption of DL-alanine and phenylalanine, but phloridzin does not. Deoxypyridoxine inhibits absorption of DL-alanine and also of glucose. L-Glutamine passes unchanged through the intestinal mucosa, but asparagine is converted to aspartic acid and ammonia. The expression " active " absorption is used to connote that absorption of the substance in question can be reduced by certain agents or by oxygen lack. [The possibility that inhibitors of intracellular enzymic systems may themselves alter permeability is not discussed.]

A. T. Phillipson.

540

NASSET, E. S., SCHWARTZ, P. and WEISS, H. V. **The digestion of proteins *in vivo*.** *J. Nutrition*, 1955, **56,** 83–94. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

Groups of 2, 3 or 4 mongrel dogs were fasted for 24 hr. before being given test meals of 80 per cent. protein, 10 per cent. sucrose and 10 per cent. lard or of 45 or 40 g. lard and 5 or 10 g. sucrose. Water was given to appetite. The animals were killed 1½ hr. after the test meals and the contents of the digestive tract were analysed for total N and N soluble in 70 per cent. ethanol, and 15 " free " amino-acids were estimated microbiologically.

In the small intestine all 15 amino-acids were present in approximately constant proportions after both protein and non-protein test meals, and whether the protein in the test meals was derived from zein or egg albumin. It is concluded that the qualitative amino-acid composition of intestinal contents is not greatly altered by changing from a protein-free to a protein-containing diet.

G. F. Garton.

541

FERNANDES, J., VAN DE KAMER, J. H. and WEIJERS, H. A. **The absorption of fats studied in a child with chylothorax.** *J. Clin. Invest.*, 1955, **34,** 1026–1036. [Paediat. Dept., Univ. Hosp., Leyden.]

See Abst. 3342, Vol. 24.

542

BORGSTRÖM, B. **Randomization of glyceride fatty acids during absorption from the small intestine of the rat.** *J. Biol. Chem.*, 1955, **214,** 671–675. [Dept. Physiol. Chem., Univ. Lund, Sweden.]

When palmitic acid labelled with ^{14}C was given in solution in olive oil to rats with thoracic duct cannulae, it was randomly distributed between the 1, 2 and 3 positions of triglycerides recovered from the lymph.—G. A. Garton.

543

ROHSE, W. G. and SEARLE, G. W. **Absorption of choline from intestinal loops in dogs.** *Amer. J. Physiol.*, 1955, **181,** 207–209. [Dept. Physiol., State Univ. Iowa, Iowa City.]

544

BUDOLFSEN, S. E. **The absorption of sodium chloride in the colon and the distal part of the small intestine.** *Acta physiol. scand.*, 1954, **32,** 148–162. [Dept. Physiol., Univ. Aarhus.]

The absorption of Na and Cl from segments of ileum and colon was studied in the rat. The amount of each ion absorbed increased with the concentration of the solution introduced over a range of 0·25 to 1·25 per cent. NaCl. Above this value absorption was depressed. Generally more Cl than Na was absorbed. Both ions were absorbed against concentration gradients in both organs.—A. T. Phillipson.

545

WRIGHT, E. **Site of phosphorus absorption in the sheep.** *Nature*, 1955, **176,** 351–352. [Wallaceville Animal Res. Stat., Private Bag, Wellington, N.Z.]

Sheep were allowed to graze until 4 hr. before they were anaesthetised. The part of the intestine under investigation was then tied off and ^{32}P was injected into it. Blood samples were taken at intervals from the left jugular vein.

Absorption from the rumen, omasum, duodenum, colon and caecum was of the same order. From the ileum absorption was 10 times greater, and from the abomasum 100 times greater. It was thought that the mechanism involved was one of simple exchange rather than of true absorption, except in the ileum and abomasum.—T. D. Bell.

546

SNOG-KJAER, A., PRANGE, I. and DAM, H. **On the formation of coprosterol in the intestine.** *Experientia*, 1955, **11,** 316. [Dept. Biochem. Nutrit., Polytech. Inst., Copenhagen.]

Certain anaerobic bacteria from human faeces were capable of effecting, *in vitro*, the hydrogenation of cholesterol to coprosterol; 80 to 90 per cent. of the cholesterol in colloidal suspensions of brain tissue was so reduced.—G. A. Garton.

See also Absts. 754, 959.

COMPOSITION OF BODY FLUIDS AND TISSUES

BLOOD

547

PASSARO, G. and PATANÈ, E. Il volume del sangue nella distrofia da latte vaccino. [**The blood volume in dystrophy due to cow's milk.**] *Arch. ital. Pediat. Puericolt.*, 1955, **17,** 324–334. [Ist. Clin. Pediat., Univ. Rome.] French, English and German summaries.

The subjects were 25 infants aged from 2½ to 20 months, all with typical cow's milk dystrophy. Plasma volume was estimated with polyvinylpyrrolidone as described in Abst. 2104, Vol. 25, and the results were compared with those given in that paper for normal infants.

When expressed as a percentage of bodyweight the plasma volume was within normal limits in 16 infants, but below that of normal infants of the same age in 9. The mean value was 48·4 ml. per kg. Haematocrits were between 22·3 and 33 per cent., and blood volumes between 52·5 and 84·4 ml. per kg. bodyweight; the mean blood volume was 67·7 ml. per kg., against 77·7 for the normal infants. Since the infants were all much below normal weight for age the absolute values for blood and plasma volume were also low.—D. Duncan.

548

MARKS, J., GAIRDNER, D. and ROSCOE, J. D. **Blood formation in infancy. 3. Cord blood.**

GAIRDNER, D., MARKS, J. and ROSCOE, J. D. (with POLLARD, M. J.). **4. The early anaemia of prematurity.** *Arch. Dis. Childhood*, 1955, **30,** 117–120; 203–211. [Maternity Hosp., Cambridge.]

For previous parts see Absts. 2247, Vol. 22 and 500, Vol. 23.

3. Blood from the umbilical vein was collected from 221 infants with birthweights above 2500 g. Hb was estimated as oxyhaemoglobin in a photoelectric colorimeter.

The mean value for Hb was 16·9 g. per 100 ml., 95 per cent. of the values being within the range 13·7 to 20·1 g. Average values are also given for red cell count, haematocrit, mean corpuscular Hb, mean corpuscular volume, reticulocytes and normoblasts. There was no relation between Hb level and foetal maturity. At 7 weeks of age infants born with low Hb showed values similar to those of infants born with high Hb.

4. Samples of venous blood for Hb and haematocrit estimations were taken at intervals from 31 premature infants of birthweight less than 1620 g. Blood volumes were computed from bodyweights and haematocrit values and the rate of decline of total Hb during the first few weeks of life was estimated.

Marrow samples were examined on 29 occasions at ages ranging from 26 to 99 days. These revealed no difference between premature and full-term infants.

The data presented suggest that the slow response of erythropoiesis to the stimulus of anaemia in infants is exaggerated by more rapid growth in the premature infant. Rapid growth also prolongs the anaemia once this has developed. Iron was given to 13 infants from about the second week and in a control group also of 13 infants it was withheld until Hb had fallen to 11 g., usually at about the sixth week. The remaining 5 infants were given Co and Fe from about the second week. In the group given Fe early the average Hb level between 60 and 100 days was significantly higher than in the controls. This treatment is recommended to mitigate the early anaemia of prematurity. Addition of Co caused a striking increase in erythropoiesis, usually sufficient to prevent development of anaemia, but because of

its toxic effect on the thyroid this treatment is not recommended.—F. C. Aitken.

549

SEIP, M. **The reticulocyte level, and the erythrocyte production judged from reticulocyte studies, in newborn infants during the first week of life.** *Acta paediat.*, 1955, **44,** 355–369. [Child. Hosp., Univ. Oslo.] French, German and Spanish summaries.

In healthy full-term infants the average reticulocyte count on the first day of life was 51·9 per thousand red cells, range 41·6 to 63·0, compared with 15·7, range 9·6 to 23·8, in normal adults. Values were higher in premature and lower in postmature infants. The reticulocyte count remained almost constant for 3 days after birth and in the next 2 to 3 days dropped rapidly to normal adult values. The formation of red cells and Hb at birth was 3 to 5 times as rapid as in healthy adults, depending on the basis of comparison. During the first 3 days after birth red cell production continued to be very rapid and then fell to normal adult values within 2 or 3 days. A study of newborn infants with prolonged asphyxia indicated that changes in reticulocyte count and rate of red cell formation in the first week of life are related to changes in oxygen supply after birth. Reasons for the 3-day lag before the changes occur are discussed.—F. C. Aitken.

550

LEICHSENRING, J. M., NORRIS, L. M., LAMISON, S. A. and HALBERT, M. L. **Blood cell values for healthy adolescents.** *Amer. J. Dis. Child.*, 1955, **90,** 159–163. [Sch. Home Econ., Univ. Minnesota, St. Paul.]

The subjects were rural young people, 110 boys and 130 girls aged from 12 to 21 years, who had been medically selected in 1947 or 1949 as 4-H Club health champions of their counties in Minnesota State. Hb was estimated in finger blood by the alkaline haematin method and red cell count by a photoelectric method. Red cell diameters and reticulocyte counts were ascertained. Means and standard deviations and ranges are tabulated for each year from 12 to 17 and for those of 18 and over.

For boys, mean Hb value rose from 13·0 $\pm$ 0·71 g. per 100 ml. at 12 to 15·1 $\pm$ 0·76 at 16, and red cell count from 4·24 $\pm$ 0·21 millions per c. mm. to 4·85 $\pm$ 0·36; these values are below those of Wiehl (Abst. 3148, Vol. 11) for boys from well-to-do families in New York City. For girls, mean Hb value was 13·0 $\pm$ 0·61 at 12, but fell to 12·7 $\pm$ 0·81 at 16 and rose again to 13·3 $\pm$ 0·48 at 18 and over; these values are above those found in an earlier study of Minnesota high school girls (Leichensring *et al.*, *Amer. J. Dis. Child.*, 1941, **62,** 262). Mean red cell count was 4·31 $\pm$ 0·17 at 12 and 4·19 $\pm$ 0·27 at 16, rising again to 4·34 $\pm$ 0·20 at 18 and over. Mean corpuscular Hb did not vary with age in either sex, nor did red cell diameter or reticulocyte percentage.—W. M. Deans.

551

WALKER, A. R. P. **Haemoglobin concentration and nutritional state in South African Bantu habituated to a very high iron intake.** *S. African J. Lab. Clin. Med.*, 1955, **1,** 36–44. [Human Biochem. Unit, S. African Inst. Med. Res., Johannesburg.]

Hb was estimated in the blood of 3 groups of men passed as medically fit for work in the mines and groups of male and female farm labourers, male and female malnourished hospital patients, pregnant and non-pregnant peri-urban women and healthy female nurses. Group mean Hb values were within or very little below normal limits. The occurrence of approximately normal Hb levels despite the strain of heavy intestinal parasitic infestation in some of the groups, of severe malnutrition in others and of pregnancy in one of the groups of women, is attributed to the Bantu's high intake of Fe, mostly from cooking utensils.

F. C. Aitken.

552

GOETZ, R. H. and BUDTZ-OLSEN, O. **Scientific safari—the circulation of the giraffe.** *S. African Med. J.*, 1955, **29,** 773–776. [Dept. Surg. Res., Univ. Cape Town.]

Data are given for the blood of a giraffe: red cells 11·95 million per c.mm., haematocrit 47 per cent. and Hb 17·8 g. per 100 ml. Viscosity of serum and its protein content, 4·3 g. per 100 ml., were comparable with findings for man. By a catheter 8 ft. long inserted to reach the bifurcation of the carotid artery, blood pressure was found to be 200 mm. Hg in the upright position and to fall to 175 mm. Hg when the head was lowered. No trace of arteriosclerosis was found in an aged bull giraffe.—D. Harvey.

553

ROSSI-FANELLI, A., CAVALLINI, D. and DE MARCO, C. **Amino-acid composition of human crystallized myoglobin and haemoglobin.** *Biochim. biophys. Acta*, 1955, **17,** 377–381. [Inst. Biochem., Univ. Rome.] French and German summaries.

Human myoglobin and Hb were quantitatively analysed for amino-acids by ion-exchange chromatography. Myoglobin contained more glutamic acid, lysine, glycine and methionine and less threonine, alanine, valine and arginine than Hb. *Iso*-leucine was absent from Hb and cystine from myoglobin. Hb had 621 amino-acid residues, myoglobin 151.—A. Hepburn.

554

DERRIEN, Y. and LAURENT, G. Différenciation par leur teneur en isoleucine des hemoglobines alcalinorésistantes de l'homme adulte et du nouveau-né. [**Differentiation by their content of *iso*leucine of alkali-resistant haemoglobins of adult man and newborn infant.**] *C.R. Acad. Sci.*, 1955, **241,** 450–452.

The alkali-resistant fractions of oxy- and carboxyhaemoglobin in normal adult blood and carboxyhaemoglobin in blood from the umbilical cord of newborn infants contained 3·25, 1·9 and 1·94 g. *iso*leucine per 100 g. Hb, respectively. Total adult carboxyhaemoglobin contained 0·34 g. *iso*leucine. The values suggested the existence of 2 types of alkali-resistant Hb in adult carboxyhaemoglobin.—A. Hepburn.

555

CHERNOFF, A. I. **The human hemoglobins in health and disease.** *New Engl. J. Med.*, 1955, **253,** 322–331; 365–374; 416–423. [Dept. Int. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

A review with 279 references.

556

CABANNES, R. and SERAIN, C. Étude de l'hémoglobine du dromadaire d'Afrique du Nord. [**The haemoglobin of the North African dromedary.**] *C.R. Soc. Biol.*, 1255, **149,** 1103–1105. (Lab. Clin. Med., Fac. Med., Algiers.)

557

STONE, C. M. (Jr.), RUMBALL, J. M. and HASSETT, C. P. **An evaluation of the serum iron in liver disease.** *Ann. Int. Med.*, 1955, **43,** 229–240. [Med. Serv., Veterans Admin. Hosp., Coral Gables, Fla.]

558

HOMOLKA, J. and MYDLIL, V. (with MOJŽIŠ, J. and HAASOVÁ, E.). **Blood proteins in infants from a quantitative and qualitative point of view.** *Ann. paediat.*, 1955, **185,** 129–141. [1. Child. Clin., Prague.] German and French summaries.

The percentages of albumin and α-, β- and γ-globulins and numerical expressions of the quantity of these fractions in infant blood were obtained by a combination of electrophoresis on paper and polarography before and after denaturation. Normal values are tabulated for umbilical blood and blood of infants of different ages.

F. C. Aitken.

559

HOLMES, E. G., STANIER, M. W. and THOMPSON, M. D. **The serum protein pattern of Africans in Uganda: relation to diet and malaria.** *Trans. Roy. Soc. Trop. Med. Hyg.*, 1955, **49,** 376–384.

The subjects, who were free from serious illness, were living in 3 contrasting areas: (1) around Kampala where malaria is hypo-endemic and diet almost completely vegetarian, (2) in Karamoja where malaria is seasonal and habits are pastoral with good supplies of milk and meat and (3) in Kigezi, where malaria is relatively rare and diet is again largely vegetarian but may have more protein than that in the Kampala area. Serum protein were estimated in 36, 40 and 21 adults in these areas and in 10 Europeans and 8 African students as control subjects. The mean values for all Africans differed from those for Europeans; in comparison with the first group, the second had higher total protein, albumin and γ-globulin and the third higher albumin and lower γ-globulin levels. Children also were examined in the districts; their numbers and average age in months were, Kampala 8, 44: Karamoja, 2, 52: Kigezi, 10, 29. In Karamoja the means for albumin and γ-globulin were both greater than those in Kampala and Kigezi. Haematological data are given for 343 Africans in Kampala, for 122 in Karamoja and for 49 African students as controls. The mean red cell count for the second was higher than that for the first and comparable with that for the controls, but the Hb level was the lowest of the 3 groups.

From the difference in findings for children and adults it is concluded that, while accurate dietary survey data are not available, no relation exists between levels of protein in diet and of albumin or γ-globulin in blood. It is suggested that the deviation of the pattern of blood proteins for Africans from that for Europeans may be the result of the seasonal infection with malaria which the populations experience.

Clinical data for the Karamoja and Kigezi populations are included in a small appendix.

D. Harvey.

560

YÜ-CHENG, M. **Levels of plasma protein fractions in normal Chinese adults.** *Chinese Med. J.*, 1954, **72,** 438–445. [Clin. Chem. Lab., Chinese Union Med. Coll., Peking.]

Three groups of healthy subjects aged from 18 to 55 years, 90 per cent. of them men, were studied from 1935 to 1937. In 36 well fed subjects the mean serum values in g. per 100 ml. were for total protein 6·490 $\pm$ 0·032 and for albumin 4·084 $\pm$ 0·055; the albumin : globulin ratio was 1·90 $\pm$ 0·05. In 108 less well but adequately fed subjects the corresponding figures were 6·714 $\pm$ 0·046, 4·063 $\pm$ 0·029 and 1·74 $\pm$ 0·03, and in 25 subjects on a mainly vegetarian diet the values were 6·287 $\pm$ 0·14, 3·618 $\pm$ 0·082 and 1·55 $\pm$ 0·05. The

albumin value fell with the amount of meat in the diet.—L. Wills.

561

BERNSTEIN, R. E. **The relation between plasma specific gravity or water content and plasma protein concentration in normal and abnormal bloods.** *S. African J. Med. Sci.*, 1954, **19,** 131–140. [Dept. Physiol., Med. Sch., Univ. Witwatersrand, Johannesburg.]

562

SCHULTZ, J., GRANNIS, G., KIMMEL, H. and SHAY, H. **Characterization of the electrophoretic components of the sera of dog, rat and man in terms of six amino acids.** *Arch. Biochem. Biophys.*, 1955, **57,** 174–186. [Samuel S. Fels Res. Inst., Sch. Med., Temple Univ., Philadelphia, Pa.]

563

SHMERLING, ZH. G. and USPENSKAYA, V. D. Ob embrional'nykh syvo-otochnykh belkakh krysy i krolika. [**The embryonal plasma proteins of rats and rabbits.**] *Biokhimiya*, 1955, **20,** 31–40. [Akad. Med. Nauk SSSR, Moscow.]

564

KNESSLOVÁ, V., KOSTKA, V., KEIL, B. and ŠORM, F. O bílkovinách XXXIII. O rozdílech v argininových peptidech některých serum-albuminů. [**On proteins. 33. Differences in the arginine peptides of some serum albumins.**] *Chem. listy*, 1955, **49,** No. 6, 913–920. [Dept. Biochem., Chem. Inst., ČAV, Prague.]

Fractions of arginine-containing peptides from hydrolysates of cattle, human, horse, duck and sheep serum albumins showed differences in structure.—A. Jančařík (Czechoslovakia).

565

LORENZINI, R., INNOCENTI, E. and MUCCI, A. L'indagine elettroforetica delle lipoproteine del siero nella pratica clinica. Revisione critica del protidogramma e del lipidogramma di soggetti adulti normali. [**Electrophoretic investigation of the lipoproteins of serum in clinical practice. Critical review of protidograms and lipidograms of normal adult subjects.**] *Acta gerontol.*, 1955, **5,** 3–20. [Ist. Clin. Med. Gen., Univ. Modena.] English and French summaries.

566

BROWN, R. K., DELALLA, L. S. and KAUFFMAN, D. L. **Serum lipoproteins: chemical and enzymatic studies.** *Clin. Chem.*, 1955, **1,** 83–92. [Div. Labs., New York State Dept. Health, Albany.]

567

ADLERSBERG, D., BOSSAK, E. T., SHER, I. H. and SOBOTKA, H. **Electrophoresis and monomolecular layer studies with serum lipoproteins.** *Clin. Chem.*, 1955, **1,** 18–33. [Dept. Chem., Mount Sinai Hosp., New York.]

568

MORRISON, L. M., STEVENS, M. and BERGMAN, H. C. **Precipitin test for serum lipoproteins in human coronary atherosclerosis.** *Amer. J. Digest. Dis.*, 1955, **22,** 234–236. [Med. Sch., Coll. Med. Evangelists, Los Angeles, Calif.]

569

OLIVER, M. F. and BOYD, G. S. **Serum lipoprotein patterns in coronary sclerosis and associated conditions.** *Brit. Heart J.*, 1955, **17,** 299–302. [Dept. Cardiol., Royal Infirmary, Edinburgh.]

570

GOTTFRIED, S. P., POPE, R. H., FRIEDMAN, N. H., AKERSON, I. B. and DI MAURO, S. **Serum beta-lipoproteins of normal, atherosclerotic, and lipemic individuals: changes in concentration, stability, and mobility upon incubation at 6·5° and 37·5°, as determined by paper electrophoresis.** *Clin. Chem.*, 1955, **1,** 253–263. [Dept. Biochem., Bridgeport Hosp., Bridgeport, Conn.]

The concentrations of β-lipoproteins in serum from 8 normal, 7 atherosclerotic and 8 lipaemic fasting human subjects fell equally when the serum was incubated at 6·5° or 37° C. for 24, 48 and 72 hr. The mobility of β-lipoproteins increased at 37° C., except when turbidity appeared, when mobility fell; turbidity appeared mostly after 48 hr. and was more common in atherosclerotic than in normal sera. As turbidity advanced a protein fraction, probably denatured protein, appeared, formed apparently at the expense of the β- and γ-globulins and later of the α-globulins, all of which decreased. Incubation at 6·5° C. had no effect on turbidity or mobility. No consistent change was found in concentration, stability or mobility of α-lipoproteins upon incubation.—A. Hepburn.

571

GAMBASSI, G. and MAGGI, V. Il quadro proteico nell'aterosclerosi sperimentale colesterolica: contributo all'interpretazione dell'effetto anti-ateromasico dell' ATP. [**The protein picture in experimental cholesterol atherosclerosis: a contribution to the interpretation of the effect of ATP against atheroma.**] *Acta gerontol.*, 1955, **5,** 260–216. [Ist. Clin. Med., Univ. Ferrara.] French and English summaries.

The rabbits received cholesterol, 0·5 g. daily for 140 days, and 3 groups received adenosine

triphosphate (ATP) as described in Abst. 562, Vol. 25. The serum proteins and lipoproteins were studied.

There was a significant difference in the electrophoretic distribution of albumin and α- and β-globulins between the controls and the group most effectively protected against atherosclerosis by ATP given subcutaneously. In the latter group the albumin fraction was greater and the globulins less. In this group also the serum and liver phosphatide contents were highest and those of neutral fats lowest. There was no significantly constant ratio between the protein and lipid fractions commonly thought to be atherogenic.

It is concluded that the protein fractions separated by electrophoresis do not correspond to the lipoprotein fractions of serum.—D. Duncan.

572

PASSARO, G. I mucoproteidi serica secondo Winzler nella patologia pediatrica. [**The serum mucoproteins according to Winzler in paediatric pathology.**] *Arch. ital. Pediat. Puericolt.*, 1955, **17,** 335–361. [Ist. Clin. Pediat., Univ. Rome.] French, English and German summaries.

Mucoproteins were estimated by the method of Winzler *et al.* (Title 3924, Vol. 18) in blood serum from 155 infants in the first year of life, before and usually during treatment of different disorders.

Increases in serum mucoproteins were found in rheumatic disease, bronchopneumonia, pneumonic miliary tuberculosis, tuberculous or purulent meningitis, encephalitis, Hodgkin's disease, acute lymphatic leucaemia, osteomyelitis, appendicitis, and glomerulonephritis with azotaemia. Values were reduced in lipoid nephrosis and in hypothyroidism, but normal in rheumatoid arthritis, congenital heart diseases, bronchiectasis, haemolytic anaemias, cow's milk dystrophy and other disorders.

It is concluded that increases in serum mucoproteins accompany inflammatory or proliferative processes, and that they are proportional to the severity of these.—D. Duncan.

573

JONES, R. J., COHEN, L. and CORBUS, H. **The serum lipid pattern in hyperthyroidism, hypothyroidism and coronary atherosclerosis.** *Amer. J. Med.*, 1955, **19,** 71–77. [Dept. Med., Univ. Chicago, Ill.]

Blood from 17 hypothyroid and 25 hyperthyroid patients was examined. In the first, mean values for total lipids, total cholesterol and phospholipins and for β-lipoprotein and the faster rising components were significantly higher than in the second group; the values for α-lipoprotein did not differ significantly. When patients with coronary heart disease were matched with hypothyroid patients for sex, age and cholesterol level in serum, the β-lipoprotein fraction was found to be significantly greater in the first of these groups. The mechanism of the changes which result in high levels of fat in blood is concluded not to be the same in these 2 diseases.—D. Harvey.

574

TELLERIA DIAZ, J. E. Influencia del lipocaico sobre la colesterolemia. [**Influence of lipocaic on blood cholesterol.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4,** 299–311.

Three groups of rabbits were fed on greenstuff, maize and water. Blood serum cholesterol was estimated before and 1, 2, 4, 8, 12, 16 and 24 hr. after intramuscular injection of lipocaic; 10 rabbits received 100 mg., 10 had 200 mg. and 5 had 400 mg. per kg. bodyweight.

The initial values for cholesterol lay between 16·5 and 52·8 mg. per 100 ml. serum, mean 34·65. In all the rabbits lipocaic caused a drop in serum cholesterol which was usually greatest 4 hr. after the injection and was usually followed by a rise to above the initial value. The mean fall, as a percentage of the initial value, was after 100 mg. lipocaic 24·2, after 200 mg. 35·3 and after 400 mg. 45·7. The initial value was regained within 16 hr. after the smallest dose and in 24 hr. after the others.

D. Duncan.

575

POOLE, J. C. F. **The effect of certain fatty acids on the coagulation of plasma *in vitro*.** *Brit. J. Exp. Pathol.*, 1955, **36,** 248–253. [Sir William Dunn Sch. Pathol., Univ. Oxford.]

The coagulation of recalcified citrated human plasma was accelerated by low concentrations of the Na salts of stearic, palmitic and oleic acids; the salts of acetic, butyric, valeric, caproic, caprylic, pelargonic, lauric, myristic, elaidic, linoleic and ricinoleic acids were without effect. It is concluded that, if such an effect occurs *in vivo*, the increase in concentration of free fatty acids in blood in rats after a fat meal (Abst. 3837, Vol. 25) would be more than sufficient to account for the increased coagulability of blood on such diets.

G. A. Garton.

576

HVIDSTEN, H., HOEKSTRA, W. G., GRUMMER, R. H. and PHILLIPS, P. H. **Unsaturated fatty acids of blood serum from pigs with and without parakeratosis.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 454–455. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Essential fatty acids were estimated spectrophotometrically in the serum of pigs with and without parakeratosis. No significant difference

was found in the content of linoleic, linolenic or arachidonic acid.—G. A. Garton.

577

ODIN, L. **Sialic acid in human serum protein and in meconium.** *Acta chem. scand.*, 1955, **9**, 862–864. [Inst. Med. Chem., Upsala.]

578

CHATAGNON, C. and CHATAGNON, P. L'acide neuraminique, constituant naturel des tissus et des liquides biologiques de l'homme et des animaux. [**Neuraminic acid, a natural constituent of the tissues and biological fluids of man and of animals.**] *Presse méd.*, 1955, **63**, 1195–1198. [Lab. Central Biol., Hôp. Maison-Blanche, Neuilly-sur-Marne, Seine-et-Oise.]

579

ÖSTERLUND, K. **A comparative investigation of the concentration of certain electrolytes in maternal and cord blood.** *Ann. Paediat. Fenn.*, 1954–55, **1**, Suppl. No. 4, pp. 87. [Child. Clin., Univ. Helsinki.]

Samples of maternal arterial and venous blood obtained before or after parturition and samples from the cord vessels of 120 infants were analysed.

Alkali reserve in maternal blood was significantly higher in venous than in arterial samples and that in cord blood was significantly higher in arterial than in venous samples. Maternal alkali reserve was highly significantly lower than that of the infant.

Plasma chloride level was lower in maternal venous than in arterial blood. Cell chlorides were significantly higher in maternal venous than in arterial blood. In cord blood plasma chloride level was lower in arterial than in venous blood and cell chlorides were significantly higher in arterial than in venous blood. Maternal values were lower than infant values, the difference being highly significant in cell chlorides.

A similar study of plasma and cell K revealed only one significant difference, the higher level of K in the plasma of cord compared with maternal blood. For Na the only significant difference was in the higher cell Na in infant than in maternal blood.

The results indicate that the newborn infant or the foetus is acidotic and that the acidosis is metabolic.—F. C. Aitken.

580

JANKE, B. and SCHARPFF, D. Klinische Untersuchungen über den Natrium-, Kalium- und Kalzium - Stoffwechsel. [**Clinical studies of sodium, potassium and calcium metabolism.**] *Deutsch. med. Wochenschr.*, 1953, **78**, 816–819 (conclusion). [Inn. Abt., Kreiskrankenhaus, Heidenheim.]

For earlier part see Title 4685, Vol. 23.

Normal values for blood Na, K and Ca in 100 carefully examined subjects were, in mg. per cent.: Na in 13, 260 to 295, in 59, 295 to 310, in 24, 310 to 330 and in 4, 330 to 350, mean 305; K in 25, 15·0 to 17·0, in 46, 17·0 to 18·0, in 29, 18·0 to 20·3, mean 17·6; Ca in 31, 7·0 to 8·5, in 49, 8·5 to 9·5, in 20, 9·5 to 11·5, mean 9·4. These values were got in the winter, between November and February. Further analyses showed that Na fell between February and June; both K and Ca rose without change in the ratio K : Ca, which was 1·8 throughout. Values are given also for K in patients with cardiac disease, liver disease, diabetes and hyperthyroidism and are discussed in relation to changes in the electrocardiogram.—I. Leitch.

581

NIEMIRO, R. Zależność zawartości wapnia surowicy krwi od stężenia białka. [**Dependence of the calcium concentration in blood serum on the protein content.**] *Acta biochim. polon.*, 1955, **2**, 213–221. [Inst. Chem. Physiol., Acad. Med., Gdansk.] English and Russian summaries.

582

CUADROS CH., C. Influencia del BAL sobre calcio y potasio sanguíneos. [**Influence of BAL on blood calcium and potassium.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 196–214.

The experiments were made on 4 groups of 8 rabbits weighing between 1600 and 2700 g., which received intramuscularly or intraperitoneally 2·5, 10, 20 or 40 mg. BAL per kg. bodyweight. The rabbits were fasted and blood samples were taken before and 2, 4, 6, 8, 10 and 12 hr. after the injection for estimation of serum Ca and K.

The basal values for Ca were from 13·34 to 16·56 mg. per 100 ml. serum, mean 15·29, and BAL produced maximum falls of from 8·17 to 8·64 per cent., without relation to the dose of BAL. The basal values for K were from 18·23 to 24·62 mg. per 100 ml., mean 20·94. BAL produced increases in serum K which varied with the dose from 6·27 per cent. after 2·5 mg. per kg. to 15·17 per cent. after 40 mg. per kg. The K : Ca ratio therefore rose with the dose of BAL.—D. Duncan.

583

SILVERMAN, S. H. and GARDNER, L. I. **Ultrafiltration studies on serum magnesium.** *New Engl. J. Med.*, 1954, **250**, 938–941. [Dept. Paediat., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

The mean values of serum total and ultrafiltrable Mg in 43 normal infants and children 3 months to 12 years old were 1·77 and 1·16 m. equiv. per litre. The range was narrow; the

values did not vary with age and were similar to adult values. The percentage of ultrafiltrable Mg was 65·3. Normal values were found in 7 children with nephrosis and in children with epilepsy, Legg-Perthes disease and infectious hepatitis. No increase in ultrafiltrable Mg was found in 5 congenital cretins and 2 children with juvenile hypothyroidism. Total serum Mg was high in 3 adults with chronic nephritis. It was high also in 2 children with chronic hypothermia and rheumatic heart disease immediately after death. It was low in 2 patients treated with massive doses of vitamin D.—A. Hepburn.

584

CARRANZA, C., C. R. Cupremia en estados normal y patológico. [**Blood copper in normal and pathological conditions.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 183–195.

Cu was estimated in plasma from 30 apparently healthy students in Lima and 60 anaemic patients with other disorders. The ranges and mean values and standard deviations, in μg. per cent., were for 15 healthy women aged 22 to 27 years 92 to 143, 114·6 and 12·18; for 15 healthy men aged 22 to 30 years 88 to 122, 105·3 and 8·06; for 10 tuberculous patients aged 16 to 62 years 194 to 320, 269 and 42·1; for 9 patients with glomerulonephritis 209 to 324, 262·1 and 31·5; and for 7 patients with arteriosclerosis 250 to 321, 281 and 28·4. The values were high in all the other patients, who had diverse diseases. There was a general inverse correlation between plasma Cu and haematocrit.—D. Duncan.

585

HAMMERSCHMIDT R., V. Cupremia en enfermedades del sistema nervioso. [**Blood copper in disorders of the nervous system.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 224–233.

Plasma Cu was estimated in 25 male and 20 female patients aged from 22 to 89 years, of whom 6 had a diagnosis of chorea, 6 athetosis, 15 post-encephalitic Parkinsonism and 18 Parkinson's syndrome. For these 4 groups the ranges, mean values and standard deviations, in μg. per 100 ml. plasma, were 172 to 205, 189 and 11·76; 123 to 257, 202 and 39·6; 164 to 257, 208 and 27·2; and 148 to 274, 214 and 30. It is concluded that plasma Cu is high in nervous disorders involving extrapyramidal lesions.—D. Duncan.

586

SZOT, Z. Zawartość anhydrazy węglanowej i cynku we krwi w stanach zdrowia in choroby. [**Content of carbonic anhydrase and zinc in the blood of healthy and diseased individuals.**] *Acta biochim. polon.*, 1955, **2**, 135–147. [Inst. Haematol., Warsaw.] English and Russian summaries.

See also Absts. 80, 86, 106, 284, 307, 314, 316, 472, 473, 623, 624, 652, 653, 668, 669, 683, 726, 727, 751, 835, 854, 856, 933, 949, 981, 984, 1106, 1359.

LYMPH, CEREBROSPINAL FLUID, ETC.

587

KEUP, W. and STEIGER, R. **Aminoacid elements of normal human aqueous fluid protein.** *Brit. J. Ophthalmol.*, 1955, **39**, 503–506. [Eye Clin., Univ. Zürich.]

588

MÜNICH, W. and OSWALD, A. Papierelektrophoretische Untersuchungen über des Verhalten verschiedener wasserlöslicher Organproteine des Kalbsauges. [**Paper-electrophoretic studies of the behaviour of different soluble proteins of the eye of the calf.**] *v. Graefes Arch. Ophthalmol.*, 1955, **156**, 547–550. [Augenklin., Univ. Würzburg.]

See also Abst. 86.

TISSUES

589

LETTERER, E., GEROK, W. and SCHNEIDER, G. Vergleichende Untersuchungen über den Amino-säurenbestand von Serum-Eiweiss, Lebereiweiss, Amyloid, Hyalin and Kollagen. [**Comparative studies of the amino-acid composition of serum protein, liver protein, amyloid, hyalin and collagen.**] *Virchows Arch.*, 1955, **327**, 327–342. [Pathol. Inst., Univ. Tübingen.]

Amyloid and hyalin from affected human organs *post mortem* and soluble liver protein from livers of freshly killed mice were subjected to paper chromatography. Soluble liver protein resembled serum α- and β-globulin and had the following composition (mean of 8 preparations); glycine, alanine, valine and the leucines 35·1, serine and threonine 11·3, cysteine and methionine 3·3, aspartic and glutamic acids 26·8, lysine and arginine 11·1, phenylalanine and tyrosine 6·1, proline 4·1 per cent., hydroxyproline traces only. Amyloid and hyalin had a composition intermediate between that of soluble liver protein and collagen, and are probably mixtures of proteins.—W. M. Deans.

590

SCHNEIDER, G. Studien zur Korrelation der Eiweisskörper des Blutplasmas und der Organe bei experimenteller Dysproteinämie. 1. Quantitative Bestimmungen des Stickstoff- und Eiweissgehaltes normaler Organe der weissen Maus. [**Studies of the relation between the proteins of plasma and organs in experimental disturbance of blood proteins. 1. Estimations**

of the nitrogen and protein contents of normal organs of the white mouse.] 2. Quantitative Änderungen des Eiweiss- und Stickstoffgehaltes von Leber, Milz und Nieren im Verlauf einer experimentell erzeugten Dysproteinämie. [**2. Changes in the protein and nitrogen contents of liver, spleen and kidneys in experimental disturbance of blood protein.**] *Virchows Arch.*, 1955, **327**, 343–353; 354–365. [Pathol. Inst., Univ. Tübingen.]

591

BADINAND, A., COUDERT, J., GATÉ, A. and CAJFINGER, M. Recherches des acides aminés dans la peau normale et dans quelques-unes de ses modifications pathologiques. [**Amino-acid in skin, normal and pathological.**] *Bull. Soc. Chim. biol.*, 1955, **37**, 619–622. [Fac. Méd. Pharm., Lyon.]

Samples from normal skin, young scars, keloid, sarcoma and epithelioma were partly defatted, hydrolysed and analysed for amino-acids by paper chromatography. Cystine, aspartic acid, glutamic acid, serine, glycine, threonine, alanine, histidine, lysine, arginine, methionine, hydroxyproline, proline, tyrosine, valine and leucine were found.

A. Hepburn.

592

NOBLE, N. L. and BOUCEK, R. J. **Lipids of the serum and connective tissue of the rat and rabbit.** *Circulation Res.*, 1955, **3**, 344–350. [Res. Lab., Miami Heart Inst., Sch. Med., Univ. Miami, Coral Gables, Fla.]

Rabbits and rats were maintained on stock diets and connective tissue specimens were removed at different times from 14 to 140 days after implantation of sponge. Lipids were isolated from the connective tissue and analysed for total and ester cholesterol, total fatty acids, and total and choline-containing phospholipins.

The concentration of total lipids in both rat and rabbit connective tissue was very high compared with the lipid content of other tissues; the total cholesterol concentration was especially high, the mean values being 3·08 g. and 1·77 g. per 100 g. dry weight, respectively, for rats and rabbits. The concentrations of neutral fat and cholesterol increased significantly with the age of the tissue. No significant correlation was found between lipid values in serum and connective tissue in either species.—G. A. Garton.

593

EVANS, J. D. and OPPENHEIMER, M. J. (with OLEKSYSHYN, N. and BAKER, J.) **Effect of bleeding on rabbit marrow polyunsaturated fatty acids.** *Amer. J. Physiol.*, 1955, **181**, 509–512. [Dept. Physiol., Sch. Med., Temple Univ., Philadelphia, Pa.]

Six rabbits were made anaemic by bleeding and 6 by bleeding followed by intraperitoneal reinjection of laked red cells. Marrow fats from the femur, tibia and humerus were analysed for polyunsaturated fatty acids by the alkali-isomerisation method.

In anaemia the proportions as well as the absolute amounts of linoleic and linolenic acids in marrow fat were low.—G. A. Garton.

594

PETERSEN, V. P. and SCHOU, M. **Intracellular distribution of brain phospholipides.** *Acta physiol. scand.*, 1955, **33**, 309–315. [1. Med. Univ. Clin., Kommunehosp., Aarhus.]

595

WILSON, A. O. **Electrolyte content of muscle samples obtained at surgical operations.** *Brit. J. Surg.*, 1955, **43**, 71–75. [Dept. Surg., Postgrad. Med. Sch., London.]

596

GOSS, H. and GREEN, M. M. **Copper in hair.** *Science*, 1955, **122**, 330–331. [Dept. Animal Husb., Univ. California, Davis.]

The copper content of white or light-coloured hair from rat, rabbit, guineapig, cat, dog, horse, sheep, cow and man was as great as, if not greater than, that of black hair. In the pig it was slightly less. Values ranged from 10 to 47 p.p.m. Cu in washed dry hair.—A. Hepburn.

See also Absts. 222, 322, 500, 553, 670, 780, 784, 796.

DUCTLESS GLANDS AND HORMONES

597

FRAILE OVEJERO, A. and LLUCH TRULL, M. Variaciones del peso de los órganos del ratón en ayunas; influencia de las cápsulas adrenales. [**Variations in weight of organs of the fasting mouse; influence of the adrenals.**] *Rev. española Fisiol.*, 1955, **11**, 57–62. [Lab. Fisiol. Animal, Fac. Farm., Univ. Barcelona.] English summary.

The mice, of both sexes, were from 100 to 500 days old and weighed initially from 12 to 31 g. They were fasted, with water only, until they died. The adrenals were removed after 24 hours' fasting from 18 males and 9 females. When the mice died, organs were weighed fresh and after drying.

The percentage of the initial weight lost before death, in males and females, was 25·7 and 31·7 in normal mice and 15·0 and 15·1 in those with

adrenals removed. Whereas in normal mice the percentage loss of liver and spleen was twice that of the whole body, in mice with adrenals removed the spleen lost no weight or even gained, though the liver lost. The heart and kidneys lost hardly any weight after adrenalectomy. [There is no mention of how long the mice survived.]

The results are compared with those obtained with rats (Abst. 670, Vol. 25).—D. Duncan.

598

WANG, C. I., SCHAEFER, L. E. and ADLERSBERG, D. **Experimental studies on the relations between adrenal cortex, plasma lipids, and atherosclerosis.** *Endocrinology*, 1955, **56,** 628–638. [Dept. Med., Mount Sinai Hosp., New York.]

In rabbits treated with cortisone or hydrocortisone the plasma became opaque and the plasma lipid fractions, especially neutral fat and total lipids, increased. The effects resembled those of dietary cholesterol and were additive with the latter, but when the hormones were given with a high-cholesterol diet there was less atherosclerosis than with the diet alone.

Changes in the dog were similar, but of smaller magnitude than in the rabbit.—D. Duncan.

599

AGNELLO, E. J., BLOOM, B. L. and LAUBACH, G. D. **A new class of biologically active corticoids.** *J. Amer. Chem. Soc.*, 1955, **77,** 4684–4685. [Res. Labs., Chas. Pfizer and Co., Inc., Brooklyn, N.Y.]

600

MONTES JUSTO, C. L. Influencia de algunas hormonas de la corteza suprarrenal sobre la potasemia del conejo. [**Influence of some adrenal cortical hormones on blood potassium in the rabbit.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4,** 274–283.

601

HERCILLA H., L. Influencia de algunas hormonas de la corteza suprarrenal sobre la sodemia del conejo. [**Influence of some adrenal cortical hormones on blood sodium in the rabbit.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4,** 234–244.

See also Absts. 380, 485, 487, 488, 491, 639, 707, 780.

602

KYLE, L. H. **Differentiation of hyperparathyroidism and the milk-alkali (Burnett) syndrome.** *New Engl. J. Med.*, 1954, **251,** 1035–1040. [Dept. Med., Sch. Med., Georgetown Univ., Washington, D.C.]

Two patients with a history of prolonged and excessive intakes of milk and alkali, one of them with a parathyroid adenoma, are cited to illustrate the difficulties of differential diagnosis.

F. C. Aitken.

603

EGER, W. Die Nebenschilddrüsen und ihre Beziehungen zu innersekretorischen Drüsen und Organsystemen innerhalb des Mineralstoffwechsels. [**The parathyroid glands and their relations with endocrine glands and organ systems in connection with mineral metabolism.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 73–94; 125. [Pathol. Inst., Univ. Göttingen.]

The author's own work and that of others is reviewed, with 117 references.

It is concluded that there is no parathyrotropic hormone and that the parathyroid is independent of other endocrine glands. The only organ with which it has a close metabolic link is the kidney. In kidney disorders the parathyroid becomes hyperactive; the mechanism by which the parathyroid is stimulated is still the subject of controversy. Conversely, parathyroid hormone affects the kidney, especially the excretion of phosphate. The parathyroid also affects the skeleton, but again the mechanism of the relation is not clear. In rats poisoned with uranium nitrate the kidneys were damaged, the parathyroids became enlarged and osteodystrophy developed, which could be prevented by treatment with vitamin D. Experimental rickets in rats was influenced by the parathyroid. Massive doses of Vigantol reduced the activity of the parathyroid. Vitamin A stimulated it. There is no sure evidence that the parathyroid produces more than one hormone.

D. Duncan.

604

KLINCK, G. H. **Thyroid hyperplasia in young children.** *J. Amer. Med. Assoc.*, 1955, **158,** 1347–1348. [Armed Forces Inst. Pathol., Washington, D.C.]

In this study of 10 young children and infants with thyroid enlargement, cobaltous chloride and ferrous sulphate had been given to 5 of the patients. Histological study of the enlarged thyroids failed to differentiate between those from the children who had and those who had not received Co and Fe. The goitrogenic activity of Co was not established, but as the number was small, further study of a larger series is recommended.—B. W. Simpson.

605

JAIMET, C. H. and THODE, H. G. **Thyroid function studies on children receiving cobalt therapy.** *J. Amer. Med. Assoc.*, 1955, **158,** 1353–1355. [Hamilton Coll., McMaster Univ., Hamilton, Ont.]

Clinical examinations and studies of thyroid function were made on 17 children aged 5 to 9

years. Uptake of ^{131}I, conversion ratio and saliva protein-bound iodine activity were measured 24 hr. after a tracer dose of 50 μC. ^{131}I had been given to all the children. On the next day, medication with a liquid cobalt-iron preparation was begun; 4 children received 1 mg. cobaltous chloride per kg. bodyweight, 5 received 2 mg., 4 received 4 mg. and 5 received 6 mg. per kg. bodyweight daily. Five and 10 weeks after treatment was begun, thyroid function was again tested.

None of the children developed hypothyroidism. It is suggested that the difference of opinion that has arisen about the effect on the thyroid gland of administration of Co may be due to the presence of toxic impurities in some commercial samples of cobaltous chloride. It is also considered possible that some diseases may alter the thyroid cells so as to render them permeable to Co.—B. W. Simpson.

606

HOLLY, R. G. **Studies on iron and cobalt metabolism.** *J. Amer. Med. Assoc.*, 1955, **158,** 1349–1352. [Dept. Obstet. Gynaecol., Univ. Nebraska Coll. Med., Omaha.]

From 60 to 90 mg. cobaltous chloride daily and an iron salt were given to 58 pregnant women. Another 20 pregnant women were given daily 75 to 100 mg. $CoCl_2$ without Fe and 94 received Fe alone. All supplements were given for at least 90 days before delivery; 55 normal pregnant women served as controls. There was no toxic effect of the Co and the thyroids were not enlarged. Examination failed to disclose thyroid enlargement in any of the children born to the mothers given Co.

In experiments on mice and rats $CoCl_2$ was injected intraperitoneally with and without $FeSO_4$. Erythropoiesis was stimulated but no thyroid enlargement or other abnormality was observed. Renal tubular necrosis was seen only in some animals given large doses of Co.—B. W. Simpson.

607

SCOTT, K. G. and REILLY, W. A. **Cobaltous chloride and iodine metabolism of normal and tumor-bearing rats.** *J. Amer. Med. Assoc.*, 1955, **158,** 1355–1357. [Dept. Radiol., Univ. California Sch. Med., San Francisco.]

Rats were divided into 5 groups of 5 each; 1 group was untreated, 2 groups were given cobaltous chloride and 2 were given cobaltous chloride and ferrous sulphate in their drinking water for 44 days. Some of the rats in the control group and 1 of each of the other groups were given a tumour implant 13 days before the experiment ended. A tracer dose of ^{131}I was given to all the rats 66 hr. before they were killed.

Haematopoiesis was stimulated and tumour growth was inhibited in the experimental groups, but there was no inhibition of uptake of ^{131}I by the thyroid, and synthesis and release of thyroxine were not affected by the Co. The daily intake was about 60 mg. per kg. bodyweight and this amount of Co had no appreciable effect on I metabolism within the 44 days.—B. W. Simpson.

608

HARE, E. H. and HAIGH, C. P. **Variations in the iodine avidity of the normal human thyroid as measured by the 24-hour ^{131}I uptake.** *Clin. Sci.*, 1955, **14,** 441–449. [Barrow Hosp., Bristol.]

The percentage uptake of ^{131}I by the thyroids of 28 euthyroid subjects in 24 hr. after a dose of 7 μC. of carrier-free ^{131}I was measured with a Geiger counter. The investigations were repeated on several occasions on each subject. The variations of uptake were considerable and the degree of variability was greater than the probable range of experimental error. Variability was not related to age, sex, menstruation, route of administration or the presence of chronic psychosis. A rising mean day temperature during the week before the test was often associated with lower uptake and vice versa. It is suggested that ^{132}I, with its shorter half-life of 2·3 hr., might be of more value than ^{131}I in an investigation such as this, because of the danger of ^{131}I being left from one test to another.

B. W. Simpson.

609

VAN MIDDLESWORTH, L. **Goiter production and prevention in rats.** *Science*, 1955, **121,** 871–873. [Dept. Physiol., Univ. Tennessee, Memphis.]

A commercial cereal, Cereal-G, contained from 0·015 to 0·035 μg. iodine per g. Its goitrogenic effect on rats was compared with that of the Remington diet (Abst. 645, Vol. 7), which contained 0·08 μg. I per g., and of diets containing Cereal-G with 13 per cent. sucrose and Cereal-G with 26 per cent. casein, which contained 0·03 and 0·05 μg. I per g., respectively. Groups of rats of 60 to 100 g. bodyweight were fed on these diets for from 6 weeks to 2 years. At different times rats on each diet were killed and their thyroids were compared.

Cereal-G produced goitres sooner than the Remington diet, but after 18 to 26 months the thyroids of rats on the Remington diet were as large as those of the rats given Cereal-G for 12 months. The Remington-fed rats were much heavier. The growth of the rats on Cereal-G was retarded. A diet containing sucrose and casein was much less goitrogenic than Cereal-G and casein, although both had the same I content. Addition of casein to Cereal-G reduced goitre formation and stimulated growth. The withdrawal of casein from this diet produced the largest goitres; one gland weighed 492 mg. But there was great variation in this group and when the data were

examined statistically there was no significant difference between the mean thyroid weight and that of the group given the Remington diet or Cereal-G for the longest period.

The addition of 1·5 μg. NaI daily to the Cereal-G diet almost prevented goitre and 3 μg. NaI daily resulted in thyroids of the same size as the controls.

Interpretations of the results are discussed.

B. W. Simpson.

610

ABELIN, I. Einfluss der Ernährungsart auf den Verlauf der experimentellen Hyperthyreose. [**Influence of diet on the course of experimental hyperthyroidism.**] *Klin. Wochenschr.*, 1955, **33**, 205–211. [Med. Chem. Inst., Univ. Berne.]

The importance of the protein, fat, carbohydrate, vitamin and mineral constituents of the diet in hyperthyroidism is discussed with reference also to energy intake. The content of cholesterol in the adrenal and of glycogen in the liver and muscle, and the basal metabolic rate, were measured in groups of rats having diets of natural foodstuffs and treated with thyroid preparations. Damage due to hyperthyroidism was ameliorated when the fat content of the diet was above 10 per cent. and when protein from milk, egg, fish, liver, kidney or lean meat was included. An adequate supply of all vitamins was essential and also a supply of minerals, especially Fe, Cu and Mn. From the results of these observations on rats some recommendations are made about diets suitable for patients with hyperthyroid conditions.

A. M. Copping.

611

MIGHORST, J. C. A. Het verband tussen de activiteit van de schildklier en de eiwitstofwisseling. [**Relation between thyroid gland activity and protein metabolism.**] *Versl. Landbouwk. Onderzoek.*, 1953, No. 59.1, pp. 86. English summary.

The discovery of antithyroid substances and the use of radio-active iodine have produced a great deal of work in the last 10 years, most of it on conventional lines and with little or no bearing on the question of how the thyroid accelerates metabolism. The deduction of Niemann and Redemann (*J. Amer. Chem. Soc.*, 1941, **63**, 1549) that thyroxine acts as a reducing agent has been neither confirmed nor denied. The tests described here showed that methylthiouracil, 50 mg. daily for 10 days, caused hypothyroidism in young cocks only if the protein content of the diet was adequate, N content over 1·9 per cent. The mean $d : n$ value (Lever, *Thesis*, Utrecht, 1950), *i.e.*, the ratio of the internal diameter (d) to the number (n) of cells in the wall of a follicle cut through the middle, is a measure of the metabolic rate; there is no relation to the amount of colloid in follicles. When casein is added to a low-protein diet to raise the protein content to 10 per cent., thyroid activity increases if thiouracil is given. Protein itself increases thyroid activity. Thiouracil reduces growth only if protein intake is adequate; on a low-protein diet birds given thiouracil may grow faster than those without.

Studies with thiouracil and thyroxine on growing mice also are reported.—I. Leitch.

612

ADEZATI, L., MISSALE, G. and TOSCA, L. Studi sul gozzo endemico. [**Studies on endemic goitre.**] 1. I coenzimi piridinici tiroidei. 1. [**Pyridine coenzymes of the thyroid gland.**] ADEZATI, L. and MISSALE, G. 2. L'attività proteolitica tiroidea. [**2. Proteolytic activity of the thyroid gland.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 991–992; 993–994. [Ist. Clin. Med., Univ. Genoa.]

1. Rats were kept for about 2 months in a region of endemic goitre, in close proximity to the houses of families with a high incidence of goitre. Others were maintained on the same diet in the home laboratory. In the normal and goitrous groups, respectively, the mean weight of the thyroid glands, in mg. per cent. of bodyweight, was 31·6 and 44·6. Pyridine coenzymes were estimated by the method of Robinson *et al.* (Abst. 4462, Vol. 17) in the thyroid glands, and expressed as mg. diphosphopyridine nucleotide per 100 g. fresh tissue. The mean value was for the normal rats 20·3 with range 18·3 to 24·1, and for the goitrous 14·3 with range 12·8 to 16·4.

2. Rats were made goitrous as just described by a sojourn in the commune of Bargagli, Appennino Ligure, and the proteolytic activity of the thyroid glands and of glands from normal rats was estimated from the amount of tyrosine liberated by homogenates of the gland in acetate buffer with edestin as substrate. The mean weight of the glands, in mg. per cent. of bodyweight, was 27·8 for normal rats and 40·7 for the goitrous rats. The mean amount of tyrosine liberated per 100 g. fresh tissue per hr. was for normal rats 181, with range 178 to 185, and for goitrous rats 152, with range 138 to 174.—E. M. Hume.

613

ROBBINS, J. and RALL, J. E. **Thyroxine-binding capacity of serum in normal man.** *J. Clin. Invest.*, 1955, **34**, 1324–1330. [Sloan Kettering Inst. Cancer Res., New York.]

Serum samples were taken after an overnight fast from 6 normal young adults, 1 patient with Graves' disease and 1 cretin who was being maintained on triiodothyronine. Dried synthetic thyroxine labelled with ^{131}I was added so as to produce a wide range of thyroxine concentrations in the

serum from each subject. The thyroxine-binding capacity of the serum protein was estimated. Each serum and thyroxine mixture was studied by zone electrophoresis in filter paper at *p*H 8·6 and the distribution of ^{131}I among the serum protein components was studied.

At the lower thyroxine concentrations the thyroxine-^{131}I was found to be associated with globulins. As the thyroxine content increased, thyroxine-^{131}I became more associated with albumin and less with α-globulin. All the added thyroxine was bound to protein, but the specific thyroxine-binding protein (TBP) had a limited capacity and excess thyroxine was bound to other serum proteins, notably albumin. TBP itself could not be isolated from the other α-globulins. The saturation of TBP by thyroxine occurred at serum thyroxine levels at least 2 or 3 times normal. In the serum from the cretin the concentration of thyroxine on α-globulin continued to increase throughout the range employed. None was found on albumin. In the hyperthyroid patient it was uncertain whether the values obtained differed from normal. Endogenous and added thyroxine seemed to be interchangeable.—B. W. Simpson.

614

ROBBINS, J. and RALL, J. E. **Effects of triiodothyronine and other thyroxine analogues on thyroxine-binding in human serum.** *J. Clin. Invest.*, 1955, **34,** 1331–1336. [Sloan Kettering Inst. Cancer Res., New York.]

Sera from 3 healthy young adults were obtained after overnight fasts and added to 14 analogues of thyroxine and L-thyroxine-^{131}I combined in different concentrations. The distribution of ^{131}I among the serum protein components was studied by electrophoresis.

At a high concentration of triiodothyronine, 5·6 μg. per ml., thyroxine-^{131}I was displaced from the α-globulin and became attached to albumin. The concentration required to produce this displacement was greater than that required by thyroxine. Of the other analogues tested only D-thyroxine had a binding intensity as great as that of L-thyroxine. The results obtained with D-thyroxine, which binds strongly to thyroid-binding protein but has little or no metabolic activity, and L-triiodothyronine, which binds relatively weakly but has strong metabolic effects, suggests that the molecular features responsible for binding to protein are different from those concerned with metabolic activity.

B. W. Simpson.

615

ROCHE, J., MICHEL, R., NUNEZ, J. and WOLF, W. Sur deux constituants hormonaux nouveaux du corps thyroïde : la 3 : 3′-diiodothyronine et la 3 : 3′ : 5′-triiodothyronine. [**On two new hormonal constituents of the thyroid gland: 3 : 3′-diiodothyronine and 3 : 3′ : 5′-triiodothyronine.**] *Biochim. biophys. Acta*, 1955, **18,** 149–150. [Lab. Biochem. Gén., Coll. de France, Paris.]

616

FREEDBURG, A. S., KURLAND, G. S. and HAMOLSKY, M. W. **Effect of *l*-tri-iodothyronine alone and combined with *l*-thyroxine in nonmyxedematous hypometabolism.** *New Engl. J. Med.*, 1955, **253,** 57–60. [Med. Res. Dept., Yamins Res. Labs., Beth Israel Hosp., Boston, Mass.]

617

COMMON, R. H., MAW, W. A. and LAYNE, D. S. **The effects of thiouracil and of thyroxine on certain biochemical responses of the immature pullet to combined treatment with estrogen and androgen.** *Canad. J. Biochem. Physiol.*, 1955, **33,** 667–676. [Fac. Agric., McGill Univ., Macdonald Coll., Que.]

618

TURCHETTO, E., INFANTE, R. and SECHI, A. M. Influenza della tiroxina sull'attività lipotropa del metionina. [**Effect of thyroxine on the lipotropic activity of methionine.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1251–1252. [Ist. Chim. Biol., Univ. Bologna.]

Six groups of 5 rats weighing about 180 g. were given a diet to produce fatty liver, including, per cent., casein 10, fats 27 and cholesterol 0·5. One group received 500 μg. thyroxine daily, and one had no addition. The other 4 groups all received 50 mg. methionine daily, alone or with 150 or 300 or 500 μg. thyroxine. The mean total lipid content of the liver in g. per 100 g. fresh tissue ranged from 12·8 to 14·1 in all the groups except those given methionine with the 2 largest doses of thyroxine, in which the values were 6·2 and 6·1. Large doses of thyroxine increased the lipotropic action of an amount of methionine otherwise insufficient.—E. M. Hume.

619

LELOUP, J. and LACHIVER, F. Influence de la teneur en iode du régime sur la biosynthèse des hormones thyroïdiennes. [**Effect of the iodine content of the diet on the biosynthesis of thyroid hormones.**] *C.R. Acad. Sci.*, 1955, **241,** 509–511.

Forty-eight adult rats of both sexes were maintained on a diet containing 10 μg. I per kg., with vegetables twice a week ; 6 adult rats were given the same diet, but drank a solution of KI containing 4 μg. I per ml. for the first 2 months and 20 μg. I per ml. for the third month. After intraperitoneal injections of 30 μC. carrier-free ^{131}I all the rats were killed in pairs 2, 6, 24 or 72 hr. after

injection. By radiochromatographic techniques the percentage of the dose of ^{131}I in total I, monoiodotyrosine, diiodotyrosine, thyroxine and triiodothyronine was estimated.

In the rats given little I the fixation of ^{131}I reached its maximum within 2 hr. after administration and then decreased rapidly. In the rats given KI, fixation of ^{131}I was extremely slow and was still rising at the end of 72 hr. The partition of ^{131}I among the amino-acids of the thyroid varied according to the I content of the diet. In rats given little I, labelled monoiodotyrosine was much more than diiodotyrosine at all the times studied. Labelled thyroxine and triiodothyronine appeared simultaneously within 2 hr., the second nearly always in excess of the first. In the rats given KI, labelled diiodotyrosine exceeded monoiodotyrosine. Synthesis of the hormones was slow; the sum of thyroxine and triiodothyronine was always lower than in the low-iodine group, and thyroxine was synthesised preferentially.

B. W. Simpson.

620

SCHWARZ, F. De physiologie van de schildklier. [**Physiology of the thyroid.**] *Nederland. Tijdschr. Geneesk.*, 1955, **99,** 2383–2391. [Stads Ziekenhuis, Utrecht.]

A review.

621

ROCHE, J. and MICHEL, R. **Nature, biosynthesis and metabolism of thyroid hormones.** *Physiol. Rev.*, 1955, **35,** 583–610. [Coll. de France, Paris.]

622

ROCHE, J. and MICHEL, R. Sur le métabolisme hépatique des hormones thyroïdiennes. [**Liver metabolism of thyroid hormones.**] *Arch. Sci. biol., Bologna*, 1955, **39,** 247–256. [Coll. de France, Paris.]

623

KATSH, S. and WINDSOR, E. **Unusual value for protein-bound iodine in the serum of the opossum.** *Science*, 1955, **121,** 897 – 898. [Kerckhoff Labs. Biol., California Inst. Technol., Pasadena.]

Blood serum from 3 monkeys, 4 rabbits, 15 rats, 5 hamsters, 3 chickens, 5 guineapigs, 3 stallions, 1 sheep and 3 opossums was analysed for protein-bound iodine (PBI) by the method of Barker *et al.* (Abst. 100, Vol. 21). All the animals were in the postprandial state and the season was summer. The serum of the opossum had the lowest PBI content, $0{\cdot}4 \pm 0{\cdot}2$ μg. per cent. The guineapig had the next lowest with $2{\cdot}5 \pm 0{\cdot}5$ and the monkey had the highest, $6{\cdot}0 \pm 0{\cdot}7$ μg. per cent. Previous workers had observed that the opossum has a low body temperature. The occurrence of low body temperature and low PBI in the same animal is discussed. It is suggested that there may be a low level of interaction between pituitary and thyroid, that the tissues are adapted to small amounts of thyroid hormone so that their efficiency is maintained, and that the oxidative metabolic and enzymic rates of the tissues of this marsupial are different from those of other animals.

B. W. Simpson.

See also Absts. 320, 454, 573, 826, 909.

624

VASQUEZ MENDOZA, I. Acción de la hormona adrenocorticotrópica sobre la lipidemia. [**Effect of adrenocorticotropic hormone on the blood lipids.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4,** 349–361.

Blood lipids were estimated in 5 groups each of 5 rabbits before and at intervals from 2 to 72 hr. after injection of commercial preparations of adrenocorticotropic hormone. Five males and 5 females received 1·66 mg. Cortrofina per kg. bodyweight intramuscularly and similar groups received 3·32 mg. per kg. The fifth group, of males, received 1·66 mg. ACTHAR per kg. bodyweight.

In all the rabbits there was a fall in blood lipids, greatest 6 hr. after the injection, followed at 24 hr. by a rise to above normal. The magnitude of the changes was independent of the dose or preparation given.—D. Duncan.

625

EMERSON, J. D. **Development of resistance to growth promoting action of anterior pituitary growth hormone.** *Amer. J. Physiol.*, 1955, **181,** 390–394. [Dept. Physiol., Med. Coll. Alabama, Birmingham.]

Subcutaneous injection, once daily for long periods, of purified or crude preparations of pituitary growth hormone of bovine origin into Norway rats produced first rapid growth, followed by reduced growth, then complete or near absence of growth. An increase in the amount of hormone produced renewed growth, followed by flattening of the growth curve at a higher level. The loss of growth response to a high dose of growth hormone did not involve the development of a response to the diabetogenic action of the hormone.

G. F. Garton.

See also Abst. 380.

626

GLASSER, S. R. and LEATHEM, J. H. **The influence of diet on the recovery of the rat adrenal from stilbestrol induced stress.** *Endocrinology*, 1955, **56,** 420–428. [Dept. Zool., Rutgers Univ., New Brunswick, N.J.]

Rats received for 21 days injections of diethylstilboestrol in oil and the effects of protein-free and 18 per cent. casein diets were compared during and after this period.

On both diets stilboestrol produced adrenal hypertrophy and reduced the content of neutral fat (as shown by Sudan staining) and cholesterol esters, but hypertrophy was less on the protein-free diet. Recovery was slow on the protein-free diet.—J. V. Evans.

627

CASTELLANI, L. and BERTOLA, G. Ormoni e metabolismo purinico. [**Hormones and purine metabolism.**] 3. Testosterone ed eliminazione dei cataboliti purinici nel ratto a dieta aproteica con solo apporto di glicina. [**3. Testosterone and the elimination of purine catabolites in rats having a diet without protein and with glycine only.**] Influenza della follicolina sull'escrezione urinaria dei cataboliti purinici in ratti tenuti a dieta aproteica con solo apporto di glicina. [**Effect of folliculin on the urinary excretion of purine metabolites in rats maintained on a diet without protein and with glycine only.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 1207–1208; 1345–1346. [Ist. Clin. Med., Univ. Genoa.]

Ten rats weighing from 150 to 200 g. received a diet of potato starch, palmitic acid and Osborne and Mendel salt mixture, with adequate vitamins. Uric acid and allantoin were estimated in 24-hr. urine before and after a dose of glycine by mouth. After a pause, 5 mg. testosterone propionate per kg. bodyweight was given and the test was repeated. The amounts of uric acid and allantoin in the urine were greater after glycine, but the increase was less with testosterone than without.

In a similar experiment 10 mg. oestradiol benzoate per kg. bodyweight was injected instead of testosterone propionate. The amount of uric acid and of allantoin was greater after administration of glycine, slightly greater after oestradiol and greatest after both.—E. M. Hume.

628

LAYNE, D. S. and COMMON, R. H. **Some effects of testosterone propionate on the immature pullet.** *Canad. J. Biochem. Physiol.*, 1955, **33**, 517–522. [Fac. Agric., McGill Univ., Macdonald Coll., Que.]

See also Absts. 287, 333, 432, 865, 978.

ENERGY EXCHANGE AND SPECIFIC DYNAMIC ACTION

629

BANERJEE, S. and SEN, R. **Determination of the surface area of the body of Indians.** *J. Appl. Physiol.*, 1955, **7**, 585–588. [Dept. Physiol., Presidency Coll., Calcutta.]

The Du Bois formulae for the calculation of body surface area, either from height and weight or from linear measurements of different parts of the body, were based on measurements of surface area of 9 subjects. The present authors have made careful measurements of surface area on 15 men selected from the students and staff of the Department of Physiology at the Presidency College, Calcutta. The results were consistently higher than the values predicted from either the weight : height formula or the linear formula of Du Bois, and it is concluded that the formulae require modification for use on Indian adults, whose physique differs slightly from that of Americans. New constants have accordingly been calculated for all the Du Bois equations, but it is suggested that the amended weight : height formula should be used rather than the amended linear formula.—I. McDonald.

630

EDHOLM, O. G., FLETCHER, J. G., WIDDOWSON, E. M. and MCCANCE, R. A. **The energy expenditure and food intake of individual men.** *Brit. J. Nutrition*, 1955, **9**, 286–300. [Div. Human Physiol., Nat. Inst. Med. Res., London.]

In continuation of earlier work (see Abst. 5092, Vol. 24) more intensive study was made for 14 days under similar conditions of 12 cadets for whom mean measurements were, age, 19 years 5½ months, weight 68 kg., height 178 cm. and surface area 1·84 sq. m. Diet surveys were by weighing food and plate waste. Diaries were kept and energy exchange measurements were made for many of the activities.

The average daily intakes, which did not differ greatly from the earlier findings, were 3432 Cal., 99 g. protein, 123 g. fat, 488 g. carbohydrate, 1·14 g. Ca and 21·0 mg. Fe. The means for the cost in Cal. per min. of the different activities were, lying 1·48, sitting 1·60, standing 1·82, marching at 3·4 miles per hr. 6·03, running " at the double " 11·67, stair-climbing 10·30, dressing 4·00, and during kit cleaning, ironing 4·20, polishing 2·40 and rifle cleaning 2·70. Data are given also for sporting activities. The difference in the efficiency with which any two individuals might perform the same task was great.

Each subject's daily intake and expenditure of energy is tabulated. Although the means for all

subjects for daily intakes and expenditures of energy agreed closely, 3432 and 3416 Cal., respectively, intakes differed widely between individuals and from day to day for the same individual. When intake and expenditure data for the same day were plotted the scatter was wide, but a relation existed between expenditure of energy on a single day and the intake on the second day later.

D. Harvey.

631

TURNER, D. **The energy cost of some industrial operations.** *Brit. J. Indust. Med.*, 1955, **12,** 237–239. [Nuffield Dept. Occupat. Health, Univ. Manchester.]

Two systems were used to assess the arduousness of 48 industrial operations in 3 factories and 2 government training centres. In the first, a subjective assessment was made by the system of job-analysis; in the second, energy exchange was measured on 287 occasions during work. Operations were grouped in 3 classes as heavy and very heavy, moderate or light by the subjective method and, in the same categories, from the metabolism data at rates 135 to 220 Cal. or more, 90 to 134 Cal., or up to 90 Cal. per sq. m. surface area per hr. Agreement between the two groupings was good and, for practical purposes, it is claimed that for placing workers in occupations suitable to their conditions of health and age, a simple survey by the first method of the jobs common to a particular area would provide adequate information.

D. Harvey.

632

BUSKIRK, E., TAYLOR, H. L. and SIMONSON, E. **Relationships between obesity and the pulse rate at rest and during work in young and older men.** *Internat. Ztschr. angew. Physiol. Arbeitsphysiol.*, 1955, **16,** 83–89. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

633

RIVOLIER, J. Froid et altitude dans leurs rapports avec l'alimentation. [**Cold and altitude; their relation to nutrition.**] *Ann. Nutrit. Alimentation*, 1955, **9,** 135–177.

A review.

634

IRVING, L., KROG, H. and MONSON, M. **The metabolism of some Alaskan animals in winter and summer.** *Physiol. Zoöl.*, 1955, **28,** 173–185. [Arctic Health Res. Centre, Pub. Health Serv., Dept. Health, Educat. Welfare, Anchorage, Alaska.]

The metabolism of Arctic red fox, Alaska red squirrel, porcupine, brent goose (*Branta bernicla orientalis*) and northwestern crow was studied with an open-circuit apparatus at temperatures ranging from 30° to — 50° C. The basal metabolic rate did not appear to vary with the season, but the extent of insulation by fur or feathers was important in regulating heat. The extent of insulation was the same in summer and winter in the birds and in the squirrel. The fox and the porcupine grew thicker fur in winter.—A. M. Copping.

635

GELINEO, M. S. Température d'adaptation et consommation d'oxygène chez le rat blanc. [**Adaptation temperature and oxygen consumption in the white rat.**] *C.R. Acad. Sci.*, 1955, **241,** 637–639.

Rats aged 3 months, born and reared at between 10° and 12° C., consumed more oxygen at both 30° and 3° C. than did rats born and reared at thermal neutrality, 26° to 28° C. This was true for 10 months of the year, but not in March and April.

D. Duncan.

636

BARTLETT, R. G. (Jr.), BOHR, V. C. and INMAN, W. I. **Relationship of oxygen consumption to body temperature in the restrained rat.** *Canad. J. Biochem. Physiol.*, 1955, **33,** 654–657. [Dept. Physiol., Coll. Med. Evangelists, Loma Linda, Calif.]

637

MINETT, F. C. **Experiments on body-cooling and body-overheating in buffaloes, sheep and goats in India.** *J. Comp. Pathol.*, 1955, **65,** 197–219. [Indian Vet. Res. Inst., Izatnagar.]

Experiments are reported with sheep, buffaloes and goats in which the effects of clipping, body size and coat colour, exposure to sunlight, air currents and cool showers, and drinking or wetting the body during exposure to sunlight on rectal temperature and respiration rate were studied.

In clipped sheep undergoing the same exposure to sunlight as unclipped, rectal temperatures did not rise so high at first, but after 18 days the rise was the same as in the unclipped sheep. Effect of coat colour and body size was not clearly demonstrated with sheep.

Buffaloes and goats, when exposed to sunlight, showed greater rises in temperature when behind a screen than when exposed to the breeze. In another test with buffaloes 3 groups were exposed to the sun either without water, or allowed to drink every 2 hr., or with their coats wetted every 2 hr., and 1 was kept in the shade. The air temperature in the shade was as high as it was in the sun. Drinking or wetting did not prevent the animals from reaching the same maximum temperatures as the untreated animals exposed to the sun, though there was a temporary drop in temperature at each wetting. The animals in the shade had consistently lower temperatures than those in the sun. Respiration rates were also

higher in the sun, and were temporarily reduced by wetting. Small buffaloes in each group had higher temperatures than large buffaloes.

Goats were cooled by artificial showers and later exposed to sunlight. Smaller goats showed greater temperature changes than larger. The rise caused by sunlight was greater in black goats than in white. The fall in temperature when they were cooled by showers was not affected by the colour of the coat.—T. D. Bell.

638

BLIGH, J. **Comparison of rectal and deep body temperature in the calf.** *Nature*, 1955, **176**, 402–403. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

It was considered that the temperature of blood leaving the left side of the heart was a good indication of deep body temperature. The technique for measuring this temperature in calves is described. Ayrshire bull calves 4 to 6 months old were kept in climatic chambers up to 6 hr. at 20°, 30° and 40° C. with low humidity and at 35° and 40° C. with high humidity. Deep body temperatures and rectal temperatures were measured every 5 min.

Under any but the most adverse conditions the rectal temperature, though slightly higher than the deep body temperature, accurately reflected the changes in it, and could be used satisfactorily in environmental studies.—T. D. Bell.

639

ABELIN, I. and GOLDSTEIN, M. Über die Mitbeteiligung des Adrenalin und seiner Derivate an der spezifisch-dynamischen Eiweisswirkung beim Menschen. [**The part played by adrenaline and its derivatives in the specific dynamic action of protein in man.**] *Biochem. Ztschr.*, 1955, **327**, 72–84. [Med. Chem. Inst., Univ. Berne.] English summary.

The subjects were 4 students aged from 23 to 26 years. On the day of experiment the first morning urine was discarded, but urine passed in the 3 hr. after a light breakfast was collected and analysed. The subjects then took a meal of grilled lean meat and urine was again collected for 9 hr. Adrenaline and noradrenaline, free and bound to sulphate or glucuronate, were estimated as well as urea.

Free adrenaline was often absent before and sometimes after the meat meal, but reached a peak either in the first or the second 3 hr. The mean concentration before the meal was 0·9 μg. [presumably per 100 ml.]. There was always free noradrenaline; the mean initial concentration was 36·7 μg. The increase was relatively less after the meal. The behaviour of bound adrenaline and noradrenaline resembled that of the free forms.

It is suggested that increased production of adrenaline may be concerned in the specific dynamic action of proteins.—D. Duncan.

See also Absts. 309, 428, 623, 723, 756, 862, 864, 943, 1083.

CARBOHYDRATES

640

STETTEN, D. and TOPPER, Y. J. **The metabolism of carbohydrates. A review.** *Amer. J. Med.*, 1955, **19**, 96–110. [Nat. Inst. Arthritis and Metabol. Dis., Nat. Insts. Health, Bethesda, Md.]

641

HORECKER, B. L. and MEHLER, A. H. **Carbohydrate metabolism.** *Annu. Rev. Biochem.*, 1955, **24**, 207–274. [Nat. Inst. Arthritis and Metabol. Dis., Nat. Insts. Health, Bethesda, Md.]

642

GOTO, Y. **Significance of the two-dose glucose tolerance test. Criticism of the Staub effect.** *Metabolism*, 1955, **4**, 323–332. [Med. Clin., Sch. Med., Tohoku Univ., Sendai, Japan.]

Patients with severe or mild diabetes or without diabetes and a healthy adult were the subjects of single and double oral glucose tolerance tests. A theoretical double blood sugar curve was constructed after the single test by subtracting the fasting value from the values found $\frac{1}{2}$, 1, $1\frac{1}{2}$ and 2 hr. after the dose and then adding the differences to the values recorded $2\frac{1}{2}$, 3, $3\frac{1}{2}$ and 4 hr. after the dose. This calculated double curve was then compared with one recorded after a double test. The calculated and measured curves were usually so similar that the Staub effect is thought to be without significance. The lower peak sometimes seen after the second dose is ascribed to the hypoglycaemia resulting from the first.—D. Duncan.

643

HOLEMANS, K. and MARTIN, H. Glycémie et tolérance au glucose chez les indigènes du Kwango. [**Blood sugar and glucose tolerance in natives of the Kwango.**] *Ann. Soc. belg. Méd. trop.*, 1955, **35**, 35–38. [Lab. Nutrit., Hôp. Feshi, Belgian Congo.]

In 152 adult men and women from a rural district of the Kwango the mean fasting blood sugar was 85·2 $\pm$ 21·1 mg. per 100 ml. Sugar tolerance tests with 50 g. glucose in 20 subjects

showed a mean maximum rise of 42·6 mg. per 100 ml., and the blood sugar returned to normal in 2 hr. The findings do not differ significantly from average findings for Europeans.—L. Wills.

644

PEDEN, J. C. (Jr.), RILEY, J. S., BOND, L. and ELMAN, R. **Blood sugar levels following intravenous infusion of glucose and fructose in adults.** *Metabolism*, 1955, **4**, 318–322. [Surg. Metabol. Div., Homer G. Phillips Hosp., St. Louis, Mo.]

Six normal adults received in 90 min. an intravenous infusion of 1000 ml. of 10 per cent. glucose in water, and next day a similar infusion of fructose. Six others received the fructose before the glucose. Total reducing sugar in blood was estimated before and for 3 hr. after the infusion.

At the end of infusion blood sugar was significantly higher after glucose than after fructose, means 215·0 and 152·5 mg. per cent., respectively, but 1, 2 and 3 hr. later the values were higher after fructose in most subjects. Only in the 3 oldest subjects, aged from 44 to 58 years, were blood sugar values above 62 mg. per cent. an hour after the end of glucose infusion, and higher than after fructose. There was always a considerable drop in blood sugar, on the average to 19·3 mg. per cent. below fasting values, after glucose, but never after fructose. One subject developed clinical manifestations of hypoglycaemia after glucose.

The clinical value of fructose infusion is discussed.

D. Duncan.

645

PATZSCHKE, K. Über die Wirkung der Fructose auf die Konzentration der Glucose im Blute stoffwechsel-gesunder Menschen :—Versuch einer biochemischer Deutung. [**Action of fructose on the concentration of glucose in the blood of metabolically sound people. Search for a biochemical interpretation.**] *Klin. Wochenschr.*, 1955, **33**, 390–397. [Physiol. Chem. Inst., Westfälische Wilhelms-Univ., Münster.]

646

ORSINI, M. and MORRICONE, A. Comportamento della glicemia dinamica alimentare dopo carico di differenti zuccheri prima e dopo somministrazione prolungata di lattosio. [**Behaviour of blood sugar curves after oral doses of different sugars before and after prolonged administration of lactose.**] *Arch. ital. Pediat. Puericolt*, 1955, **17**, 298–323. [Clin. Pediat., Univ. Rome.] French, English and German summaries.

The subjects were 17 normal children and 1 with diabetes, all between 3 and 12 years old. Blood sugar curves were studied after single test doses of glucose, galactose, fructose and lactose given by mouth, and these tests were repeated after 20 days in which all sugar was eliminated from the diet except 20 g. lactose twice daily. All test doses were of 2 g. sugar per kg. bodyweight, given after a fast of 8 hr., and with at least a week between successive tests.

In the healthy children all the sugars gave on the average much lower blood sugar peaks or none, and earlier and greater falls to below the initial level, after the lactose period than before it. After the lactose period one child responded to the lactose test with an immediate fall in blood sugar and clinical signs of hypoglycaemia. After the lactose period the diabetic child had a higher blood sugar peak after a glucose test, followed by a greater hypoglycaemic reaction. To galactose and lactose tests the responses were much like those of the normal children in shape, although the blood sugar was generally higher and the hypoglycaemic reaction greater.

It is concluded that continuous administration of lactose increases sugar tolerance. The diabetic child was given lactose for longer than the others and left the clinic on a lower maintenance dose of insulin than before.—D. Duncan.

647

SAUERWEIN, E. Über den Einfluss von Zucker und Honig auf die vegetative Tonuslage des gesunden Menschen. [**Effect of sugar and of honey on the vegetative tone of healthy persons.** *Deutsch. med. Wochenschr.*, 1955, **80**, 968–970. [Sportphysiol. Abt., Sporthochsch., Cologne.]

Systolic blood pressure was continuously recorded in healthy subjects of both sexes subjected to stimulation of the labyrinth by rotation (10 turns in 20 sec.) before and after intravenous injection of from 10 to 25 ml. of a 20 or 40 per cent. solution of honey, or 20 ml. of a 14 per cent. solution of a mixture of mono- and disaccharides or the same of dextrose. The reaction was reversed by honey in 9 out of 27 subjects, always from cholinergic (*i.e.*, rise in systolic blood pressure) to adrenergic, and in 11 others the change was in the same direction but did not amount to a reversal; in 6, however, an adrenergic reaction was weakened or a cholinergic strengthened; in 1, honey had no effect. The sugar mixture, on the other hand, suppressed or diminished blood pressure changes in 14 of 25 subjects. With dextrose the results were inconclusive.

The results are discussed; it is considered that the change in vegetative tone produced by honey injections resembles that produced by physical training, and it is suggested that this may have had something to do with the improved performance of rats in a swimming test reported by Krämer (*Ztschr. klin. Med.*, 1950, **146**, 543). The

sugar mixture, on the other hand, is regarded as providing a non-specific stimulus.—W. M. Deans.

648

CONSTAM, G. R. and SCHMID, H. Ist der Genuss von Honig Zuckerkranken zuträglich? [**Can diabetics tolerate honey?**] *Schweiz. med. Wochenschr.*, 1955, **85,** 282–283. [Diabetikerberatungstelle, Med. Poliklin., Univ. Zürich.]

Some reports have suggested that honey does not affect the blood sugar. When 40 g. honey was eaten at breakfast by a normal subject there was a greater rise in blood sugar in the 90 min. after the meal than with a similar breakfast and no honey. In 3 of 4 diabetic subjects tested after breakfast, 30 or 40 g. honey caused higher blood sugar and glycosuria. It is recommended that diabetics should regard honey as sugar, and that expectorant mixtures for diabetics should not contain honey.—A. M. Copping.

649

GOLDSCHMIDT, S., BURKERT, H., GLOXHUBER, C., GRAMSS, M., GRAMSS, R., and ANDERS, C. Über die Wirkung von Honig- und Zuckerlösungen auf den Blutzuckerspiegel von Kaninchen bei intravenöser Dauerinfusion. [**Effect of honey and sugar solutions on the blood sugar of rabbits after continuous intravenous infusion.**] *Hoppe-Seyler's Ztschr.*, 1955, **300,** 201–210. [Org. Chem. Inst., Tech. Hochsch., Munich.]

Rabbits narcotised with urethane received intravenous infusions of solutions of glucose, invert sugar, honey or inactivated honey in which the acetylcholine was destroyed.

Honey containing 2·5 μg. acetylcholine per g., infused at 4 mg. per kg. bodyweight per min., caused a steep fall in blood sugar. Invert sugar raised the blood sugar, but inactivated honey produced only a slight and transient increase followed by a fall. A similar slight increase and a greater fall were produced by fructose, and fructose at 10 mg. per kg. per min. accompanied by acetylcholine and choline reproduced the sharp fall caused by honey at 4 mg. per kg. per min. Honey or fructose alone at 10 mg. per kg. per min. caused a rise instead of a fall in blood sugar.

It is concluded that acetylcholine reduces the blood sugar value, but large infusions of honey flood the blood with sugar to an extent which masks the effect of acetylcholine.—D. Duncan.

650

CARSON, M. J. and KOCH, R. **Clinical studies with glucagon in children.** *J. Pediat.*, 1955, **47,** 161–170. [Dept. Paediat., Sch. Med., Univ. S. California, Los Angeles.]

In 16 normal children the increase in blood sugar in response to glucagon, 20 μg. per kg., ranged from 22 to 68, average 54 mg. per cent. after 30 min. Responses of this magnitude were obtained in 4 children with spontaneous hypoglycaemia, in only 3 of 8 with liver disease and in 3 of 6 with glycogen storage disease. In normal children doubling the dose of glucagon did not increase the response, but simultaneous administration of adrenaline both increased and prolonged it. When given with insulin, glucagon counteracted the hypoglycaemic effect.—F. C. Aitken.

651

BEASER, S. B. **Diabetes mellitus.** *New Engl. J. Med.*, 1954, **251,** 698–705; 737–743. [Harvard Med. Sch., Boston, Mass.]

A review with 213 references.

652

KOLB, F. O., DE LALLA, O. F. and GOFMAN, J. W. **The hyperlipemias in disorders of carbohydrate metabolism: serial lipoprotein studies in diabetic acidosis with xanthomatosis and in glycogen storage disease.** *Metabolism*, 1955, **4,** 310–317. [Metabol. Unit, Univ. California Sch. Med., San Francisco.]

Lipoproteins were studied with the ultracentrifuge for 2½ years in a 37-year-old acromegalic woman with uncontrolled diabetes and xanthomata and in 2 young men with glycogen storage disease complicated by a high level of uric acid in the blood and by gout. In the acromegalic woman, large amounts of Sf 20 to 100 and Sf 100 to 400 lipoproteins were found; control of the diabetes improved lipoprotein transport. The serum lipoprotein pattern was similar in glycogen storage disease to that in diabetic acidosis, and it is suggested that high blood sugar itself is not a cause of the disordered lipoprotein transport, but that defective utilisation of carbohydrates may be involved.—G. A. Garton.

653

MORI REVOREDO, V. Correlación gluco-lipídica en la diabetes. [**Correlation between blood sugar and lipids in diabetes.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4,** 284–291.

Blood sugar and lipids were estimated on from 1 to 6 occasions in 21 patients of both sexes, with diabetes of different grades of severity.

According to Mata (*Crón. Méd., Lima*, 1948, **45,** 113), the " equilibrium " value for blood fat should be 5 times the blood sugar in mg. per 100 ml. On this basis there was no lipid deficit in mild diabetes, but in more severely affected patients the lipid deficit increased with the blood sugar.

D. Duncan.

654

BAXTER, C. F., KLEIBER, M. and BLACK, A. L. **Glucose metabolism in the lactating dairy cow.**

Biochim. biophys. Acta, 1955, **17**, 354–361. [Dept. Animal Husb., Univ. California, Davis.] French and German summaries.

A Jersey cow 6 years old, weighing 457 kg. and producing 10 kg. milk daily, received by intravenous injection 2·9 mC. glucose uniformly labelled with ^{14}C. Respired air was collected for measurement of $^{14}CO_2$, and in 2 days after the injection 11 blood samples were taken for estimation of blood and plasma glucose and haematocrit. Plasma volume was estimated with Evans Blue. Plasma and milk glucose were isolated as glucosazones for estimation of specific activity.

The total body glucose pool was calculated to be 62·4 g. and the turnover from this pool 70·4 g. per hr. These may be maximum values. The cow's plasma volume was 20·3 litres and the total plasma glucose content was 12·2 g.

In 48 hr. nearly all the ^{14}C injected had left the cow's body, 56·9 per cent. in the main organic constituents of milk and 40·3 per cent. in respired CO_2. Urine, faeces, rumen gases and minor constituents of milk probably contained most of the other 2·8 per cent. It is calculated that only from 8·8 to 11·5 per cent. of the total CO_2 respired came from oxidation of glucose.

It is concluded that in the energy metabolism of the cow glucose is of less importance than it is in the non-ruminant species which have been studied.

D. Duncan.

655

FÁBRY, P. Vliv složeni potravy na denní rytmické kolísání glycidovych reserv. [**The influence of diet on the daily rhythm of carbohydrate reserves.**] *Čsl. fysiol.*, 1955, **4**, No. 1, 1–6. [Dept. Physiol., Res. Inst. Human Nutrit., Prague.]

Rats on a diet without carbohydrate showed an increase of liver glycogen 14 to 16 hr. after food. The blood sugar in these animals varied inversely with liver glycogen.—A. Jančařík (Czechoslovakia).

656

FÁBRY, P. Studie o adaptaci přeměny látkové. [**Studies on the adaptation of metabolism.**] *Čsl. fysiol.*, 1955, **4**, No. 1, 7–9. [Dept. Physiol., Res. Inst. Human Nutrit., Prague.]

Rats on a normal mixed diet were accustomed to long-term and graduated fasting. They formed more glycogen in the liver than control animals. After 16 hr. of fasting they liberated the same quantity of liver glycogen as control rats.

M. Prokšová (Czechoslovakia).

657

LASZT, L. Analyse von Leberglykogenen normaler und diabetischer Ratten mit der Ultrazentrifuge. [**Analysis of the liver glycogens of normal and diabetic rats by the ultracentrifuge.**] *Biochem. Ztschr.*, 1955, **327**, 32–38. [Physiol. Inst., Univ. Fribourg, Switzerland.]

An earlier finding (*Experientia*, 1954, **10**, 302) that the liver glycogen of diabetic rats differed from the normal prompted further investigation with the ultracentrifuge. The sedimentation diagram of liver glycogen from normal rats fasted for 24 hr. had a single peak; that from similar rats given a mixed feed 3½ hr. before liver was taken had a second peak, indicating the presence of a second glycogen of greater molecular weight. The glycogens could be separated by fractional precipitation with glacial acetic acid. There was no second peak in the sedimentation diagrams from fasted or fed diabetic rats, which differed little, but there was evidence of a small residual fraction, the nature of which is not clear.—W. M. Deans.

658

LEONARD, H. B., BERRY, M. E. and SCHUCK, C. **Effect of alloxan in rats fed cornstarch-, sucrose-, and lactose-diets.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 708–710. [Dept. Foods Nutrit., Purdue Univ., Lafayette, Ind.]

Groups of 3 to 5 rats were given, to appetite, diets of casein 18, salt mixture 4, Crisco 10, cod liver oil 5, dried brewer's yeast 10 and carbohydrate 53 per cent., the carbohydrate consisting of maize starch, sucrose or lactose, for 14 to 20 days. They were then starved for 48 hr. and injected with 175 mg. and, later, 150 mg. per kg. bodyweight of a 2½ per cent. solution of alloxan monohydrate. The rats on the maize starch and sucrose diets grew at a normal rate before the injection and were healthy and vigorous, but the rats on the lactose diet were retarded in growth and poorly nourished, so a fourth group of rats was given the maize starch diet at the restricted level of 5 to 7 g. daily for 2 weeks before the alloxan, in an attempt to produce a low nutritional state comparable to that of the rats on the lactose diet.

The highest susceptibility to the diabetogenic effects of alloxan occurred among the rats given the maize starch diets to appetite; susceptibility was slightly less among the rats on the sucrose diet and was lowest among the rats on the lactose diet. The restriction of intake of the maize starch diet reduced susceptibility; 4 out of 12 rats became diabetic, compared with 16 out of 19 given maize starch to appetite, 9 out of 12 given sucrose and 3 out of 12 given lactose.—G. F. Garton.

659

SEEBERG, V. P., MCQUARRIE, E. B. and SECOR, C. C. **Metabolism of intravenously-infused sorbitol.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 303–305. [Res. Div., Cutter Labs., Berkeley, Calif.]

Rabbits received sorbitol in 10 per cent. solution by intravenous infusion at the rate of 1 g. per kg. bodyweight hourly for 1½ hr. Blood samples were taken from the femoral artery. Control rabbits received saline.

During infusion of sorbitol there was a prompt rise in blood fructose, which reached about 50 mg. per 100 ml. at the end of the infusion and thereafter fell rapidly. There was no significant change in blood glucose during the first hour of infusion, but an erratic rise then began and continued for some time after the infusion ended. It is concluded that there was secondary conversion of fructose to glucose. Even when sorbitol was given at the slower rate of 0·33 g. per kg. per hr., some sorbitol was recovered from the urine.

D. Duncan.

660

PETERSEN, J. C., STRIPE, M. C. and HIMWICH, W. A. **Metabolic effects of *l*-glutamic acid and of glycine.** *Amer. J. Physiol.*, 1955, **181,** 519–522. [Thudichum Psychiat. Res. Lab., Galesburg State Res. Hosp., Ill.]

Subcutaneous injection of sodium glutamate or glycine at *p*H 7·0, at 2 g. per kg. bodyweight, produced very high blood sugar values in rabbits. Pyruvic acid values fell in the blood of rabbits given glutamate, and α-ketoglutarate rose. Glutamate protected rabbits against the fall in blood sugar caused by insulin, without producing high blood sugar. Glycine had no protective effect. Liver glycogen was decreased by glutamate or glycine, whatever the blood sugar level.

A. Hepburn.

661

GAYER, J. and KLINGMÜLLER, V. Untersuchungen über den Stoffwechsel der L(+)-Glutaminsäure. 3. Wirkungen von L(+)-Glutaminsäuregaben auf den Kohlenhydratstoffwechsel. [**Experiments on the metabolism of L(+)-glutamic acid. 3. Effect of L(+)-glutamic acid intake on carbohydrate metabolism.**] *Hoppe-Seyler's Ztschr.*, 1955, **301,** 269–284. [Physiol. Chem. Inst., Univ. Hamburg.] English summary.

Blood sugar curves were studied in 6 rabbits after test doses of glucose by mouth, alone and with glutamic acid. The glutamic acid reduced the rise in blood sugar. In 4 adult human subjects no such effect was found. Glutamic acid also reduced the fall in blood sugar after insulin in rabbits and prevented insulin shock so long as it was given 30 min. before the insulin, but not when it was given 60 min. before. In alloxan-diabetic rabbits glutamic acid given intravenously caused a large rise in blood sugar, but this was prevented by the adrenaline antagonist Hydergin.

In rats given glutamate intraperitoneally and killed 2 hr. after the third injection the liver glycogen was significantly below that of control rats given saline. This was not prevented by Hydergin, which caused a fall in blood sugar, or by removal of the adrenals.

In rats deprived of pyridoxine the injection of glutamate did not significantly affect liver glycogen.

It is concluded that mobilisation of liver glycogen by glutamic acid depends on an intact transaminase system, but not on adrenaline.

D. Duncan.

662

VARILLAS CASTRO, M. C. Influencia del beta-glicerofosfato sódico sobre la glucemia normal del conejo. [**Influence of sodium β-glycerophosphate on normal blood sugar in the rabbit.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4,** 344–348.

Ten rabbits of both sexes, fed on a mixed ration, received after a fast of 12 hr. a subcutaneous injection of 0·5 g. sodium β-glycerophosphate per kg. bodyweight. There was a transient rise in blood sugar, followed by a fall which persisted until the experiment ended, 5 hr. after the injection.

D. Duncan.

663

DE BASTIANI, G. and GRANATA, L. Effetti della contemporanea somministrazione di tiroxina e glucosio nel ratto albino. [**Effects of simultaneous administration of thyroxine and glucose to white rats.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 1170–1173. [Ist. Fisiol., Univ. Padua.]

664

MENDOZA CH., C. Acción de la histamina sobre la piruvicemia del conejo. [**Effect of histamine on the blood pyruvic acid of the rabbit.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4,** 268–273.

665

FOURNIER, P., DUPUIS, Y., SUSBIELLE, H., ALLEZ, M. and TARDY, N. Influence de la nature des glucides du régime sur l'utilisation du calcium. [**Effect of the nature of the dietary sugars on calcium utilisation.**] *J. Physiol., Paris*, 1955, **47,** 339–350. [Lab. Physiol. Nutrit., Centre Nat. Recherche Sci., 16, Rue de l'Estrapade, Paris.]

See Abst. 2213, Vol. 25.

666

FOURNIER, P., DUPUIS, Y., SUSBIELLE, H., ALLEZ, M. and TARDY, N. Mode d'action des glucides de structure sur l'utilisation du calcium. [**Mode of action of structural carbohydrates on calcium utilisation.**] *J. Physiol., Paris*, 1955, **47,** 351–362. [Lab. Physiol. Nutrit., Centre Nat. Recherche Sci., 16, Rue de l'Estrapade, Paris.]

Contents of the caecum or the large intestine of rats were cultured in meat broth in a study of the fermentation of glucose and other carbohydrates.

Glucose, maltose and sucrose, the " energetic " carbohydrates, and also lactose, were readily fermented by intestinal bacteria. Galactose, D-xylose and L-arabinose were fairly well utilised, D-arabinose but poorly and L-xylose not at all. Even intestinal contents from a rat adapted to a diet containing L-xylose did not attack this sugar.

Despite their resistance to bacterial attack, both L-xylose and D-arabinose are well utilised by rats and extremely active in increasing the utilisation of Ca (see Abst. 2213, Vol. 25). It is concluded that their effects are metabolic and are not mediated by the intestinal flora.—D. Duncan.

667

FOURNIER, P., DUPUIS, Y. and SUSBIELLE, H. Les propriétés structurales du mannose. [**Structural properties of mannose.**] *C.R. Soc. Biol.*, 1955, **149**, 645–648. [Lab. Physiol. Nutrit., Hautes-Études, Paris.]

The effect of 6 or 12 per cent. mannose on utilisation of Ca by young rats was compared with the effects of starch or of 12 per cent. fructose or lactose, by the method described in Abst. 745, Vol. 25.

Mannose at both levels favoured the utilisation of Ca and at 12 per cent. it was much more effective than lactose ; the coefficient of utilisation of Ca was 21 per cent. with starch, 36 per cent. with lactose and 48·5 per cent. with mannose. Mannose is therefore classed as a " structural " carbohydrate (see Absts. 2213, 5195, Vol. 25).—D. Duncan.

668

TERRAZOS C., J. A. Variaciones de la fosforemia por acción de la insulina. [**Variations in blood phosphorus caused by insulin.**] *An. Fac. Farm. Bioquim., Lima*, 1953, **4**, 312–321.

Two groups of 8 rabbits were fed for 8 days before the experiment mainly on alfalfa. The rabbits, which weighed from 1500 to 2500 g., received subcutaneously either 1 or 4 units of insulin per kg. bodyweight ; the larger dose produced coma in each rabbit, and dextrose was given intravenously when necessary. Blood serum inorganic P was estimated before and for 7 or 24 hr. after the injection of insulin. The normal value was usually regained within 7 hr.

The initial serum inorganic P values lay between 2·99 and 4·99, mean 4·13 mg. per 100 ml. The concentration fell after insulin, usually being lowest 3 hr. after the injection. There was no relation between the magnitude of the fall and the dose of insulin. The initial and lowest mean values in the 2 groups were with the smaller dose 4·06 and 2·11, and with the larger 4·20 and 2·05 mg. per 100 ml.—D. Duncan.

669

SETCHELL, B. P. and MCCLYMONT, G. L. **Blood inorganic phosphorus and serum potassium in insulin hypoglycaemia in the sheep.** *Austral. J. Agric. Res.*, 1955, **6**, 589–594. [Nutrit. Res. Lab., Vet. Res. Stat., Glenfield, N.S.W.]

Eighteen ewes, non-pregnant or in early pregnancy, were given water but no food for 5 days. Six then received insulin, 10 units per kg. bodyweight subcutaneously, 6 the same dose intravenously, and 6 no insulin. Blood glucose and inorganic P and serum K were estimated before and for 60 hr. after the injections.

Blood glucose fell after insulin given by either route ; a secondary rise occurred more than 24 hr. after intravenous insulin and had subsided within 40 hr. After subcutaneous insulin the initial fall persisted longer ; 4 sheep died after 24 hr. and only 1 of the remainder showed the secondary rise.

Serum K in both groups given insulin fell with the fall in blood sugar and recovered more quickly in the intravenous than in the subcutaneous group. Inorganic P also fell with the blood sugar in both groups, but it remained low until after blood sugar and K had risen. All the falls were slower than in man.—D. Duncan.

670

CASTRO, V., TERRANOVA, T. and FEO, F. Sulle modificazioni biochimiche indotte dalla insulina. 1. Consumo di ossigeno da parte di omogenati di organi, in presenza di substrati diversi. [**Biochemical changes caused by insulin. 1. Oxygeen onsumption by homogenates of organs in the presence of different substrates.**]

CASTRO, V. and TERRANOVA, T. 2. Comportamento degli aminoacidi liberi negli organi. [**2. Behaviour of the free amino-acids in the organs.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 906–909 ; 909–911. [Ist. Fisiol., Univ. Palermo.]

1. Injections of 4 I.U. insulin were given to 12 rats weighing from 120 to 140 g., which had fasted for 24 hr. After 90 min. they were killed and oxygen consumption was measured in homogenates from liver, lungs, kidneys, spleen, brain and muscle, and in homogenates from tissues of 12 similar rats not given insulin. Oxygen consumption was measured in presence of *dl*-alanine, or Na succinate, or glucose, or with no addition. With no addition or with *dl*-alanine, oxygen consumption was greater for all the tissues of rats given insulin. With succinate, oxygen consumption was greater in the kidneys and spleen of rats given

insulin, and less in the other tissues. With glucose, oxygen consumption was greater in the liver, kidneys and muscle of rats given insulin and less in the other tissues.

2. Thirteen free amino-acids were estimated by paper chromatography in the heart and the same 6 tissues of 2 groups of rats given and not given insulin as just described. In general, the content of each amino-acid was greater in the tissues of the animals given insulin. This was true for every amino-acid tested in brain and muscle, and for all except aspartic acid in liver, but in the other tissues there was no regular difference.

E. M. Hume.

671

VALLANCE-OWEN, J., HURLOCK, B. and PLEASE, N. W. **Plasma-insulin activity in diabetes mellitus measured by the rat diaphragm technique.** *Lancet*, 1955, **269**, 583–587. [Post-grad. Med. Sch., London.]

672

OKAMOTO, K. **Experimental pathology of diabetes mellitus (Report 2).** *Tohoku J. Exp. Med.*, 1955, **61**, Suppl. 3, pp. 116. [Dept. Pathol., Sch. Med., Tohoku Univ.]

See also Absts. 283, 412, 489, 537, 687, 710, 746, 804, 812–14, 818, 860.

PROTEINS AND PROTEIN DERIVATIVES

673

BERG, C. P. **Utilization of proteins.** *J. Agric. Food Chem.*, 1955, **3**, 575–581. [Dept. Biochem., State Univ. Iowa.]

674

EHRENSVÄRD, G. **Metabolism of amino acids and proteins.** *Annu. Rev. Biochem.*, 1955, **24**, 275–310. [Dept. Physiol. Chem., Wenner-Gren Inst., Univ. Stockholm.]

675

ALLISON, J. B. **Biological evaluation of proteins.** *Physiol. Rev.*, 1955, **35**, 664–700. [Bur. Biol. Res., New Brunswick, N.J.]

676

BERFENSTAM, R., JAGENBURG, R. and MELLANDER, O. **Protein hydrolysis in the stomachs of premature and full-term infants.** *Acta paediat.*, 1955, **44**, 348–354. [Dept. Med. Biochem., Univ. Gothenburg.] French, German and Spanish summaries.

Samples of pasteurised fat-free human milk or skimmed cow's milk were introduced into the stomachs of premature and full-term infants and the degree of digestion was estimated as percentage of amino-N in total N. In 28 experiments on 17 children at ages ranging from 6 to 44 days there was little digestion of human milk protein and good digestion of cow's milk protein. There was no correlation between degree of hydrolysis of cow's milk protein and weight of infant at birth or at time of the test.—F. C. Aitken.

677

MURTHY, H. B. N., REDDY, S. K., SWAMINATHAN, M. and SUBRAHMANYAN, V. **The metabolism of nitrogen, calcium and phosphorus in under-nourished children. 1. Adaptation to low intake of calories, protein, calcium and phosphorus.**

SUR, G., REDDY, S. K., SWAMINATHAN, M. and SUBRAHMANYAN, V. **2. The effect of supplementary groundnut-milk curds on the metabolism of nitrogen, calcium and phosphorus.** *Brit. J. Nutrition*, 1955, **9**, 203–209; 210–215. [Central Food Technol. Res. Inst., Mysore, India.]

1. The 5 subjects were girls aged from 7 to 9 years, living in an orphanage. During the experiment they ate the usual poor rice diet and their average energy intake was 1010 Cal., 40 per cent. more than the computed basal metabolism. Mean daily N intake and retention were 3·0 and 0·28 g., respectively, and all subjects were in positive balance. Corresponding values for Ca were 200 and 23 mg., with 1 subject in negative balance, and for P 567 and 62 mg., with 1 subject in negative balance.

2. The subjects of study were 6 comparable pairs of girls aged from 8 to 11 years. One of each pair received a daily supplement of 12 oz. groundnut milk curds to the basal poor rice diet. In the unsupplemented and supplemented groups mean daily intakes of total N were 3·60 and 5·16 g. and mean retentions of N were 0·28 and 0·73 g., respectively. Corresponding values were Ca intake 382 and 676 mg., Ca retention 73 and 233 mg., P intake 546 and 766 mg., P retention 57 and 116 mg. The increases in retention of N and P with the supplement were significant.—F. C. Aitken.

678

SHARPENAK, A. E. and EREMIN, G. P. Vliyanie rezhima pitaniya na ispol'zovanie belkov organizmom. [**The influence of feeding regimen on protein utilisation by the organism.**] *Vop. Pitan.*, 1955, **14**, No. 4, 7–12. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

In human subjects and dogs the effects on protein utilisation of the number of meals over which a constant amount of food was equally divided, and the effect of giving the bulk of the food in the morning, during the day, or in the evening were studied.

All alterations in feeding regimen caused a temporary fall in protein utilisation. Utilisation was best when food was given 4 times daily. In dogs, giving 60 per cent. of the food in the evening caused a decrease in protein utilisation.

D. W. Taylor.

679

BRANDT, J. L., CASTLEMAN, L., RUSKIN, H. D., GREENWALD, J. and KELLY, J. J. (Jr.) (with JONES, A.) **The effect of oral protein and glucose feeding on splanchnic blood flow and oxygen utilization in normal and cirrhotic subjects.** *J. Clin. Invest.*, 1955, **34,** 1017–1025. [Dept. Med., Coll. Med., State Univ. New York.]

The subjects were 14 convalescent patients considered to have normal liver function and 26 with cirrhosis, of whom 21 had a history of alcoholism and 5 one of acute hepatitis in earlier years. Splanchnic blood flow was estimated with bromosulphalein by a method described, and oxygen consumption was calculated from oxygen concentrations in artery and hepatic vein. Estimations were made before and after fluid meals containing either 60 g. protein or 100 g. glucose.

In normal and cirrhotic subjects the protein meal produced increases in splanchnic blood flow, arterio-venous oxygen difference and splanchnic oxygen consumption, but the changes were somewhat less in the cirrhotic subjects. Glucose produced little change in these values. Under fasting conditions the livers of icteric, cirrhotic subjects extracted much less oxygen per unit of blood than the livers of normal or of non-icteric, cirrhotic subjects, but there was a sharp increase in oxygen extraction after a protein meal. In 8 cirrhotic subjects amino-N concentration in peripheral blood and in the hepatic vein after the protein meal were higher than those in 2 normal subjects.

D. Duncan.

680

PHANSALKAR, S. V. and PATWARDHAN, V. N. **Utilization of animal and vegetable proteins: urinary nitrogen excretion in absorptive and early post-absorptive phases.** *Indian J. Med. Res.*, 1955, **43,** 265–276. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

Four healthy men were given test meals containing protein from an animal or a vegetable source and urine samples were collected hourly for estimation of N. Twelve observations were made on 7 healthy men given similar animal or vegetable protein meals; urine N and blood sugar were estimated immediately after and 1 and 1½ hr. after the meal and then every hour for 7½ hr. As sago formed the only source of carbohydrate in the animal-protein meals, 2 healthy men were given test meals in which the carbohydrate was derived from either sago or wheat starch; blood sugar was estimated.

From 11 to 35 per cent. more N was excreted within 8 hr. after the animal-protein test meal than after the vegetable protein, although the intake of protein, fat and energy was the same. Urine volume was directly correlated with urine N; a larger volume of urine was excreted after the animal- than after the vegetable-protein meals. After animal protein, blood sugar rose and fell more quickly than after vegetable protein, although the heights of the peaks were identical.

G. F. Garton.

681

CHITRE, R. G., NADKARNI, D. S. and MONTEIRO, L. **The effect of protein nutrition on the "urea clearance" in human subjects.** *J. Postgrad. Med., Bombay,* 1955, **1,** 79–96. [Indian Counc. Med. Res. Nutrit. Res. Unit, Seth G.S. Med. Coll., Bombay 12.]

Urea clearance was studied in 100 clinically healthy Indians, 97 men and 3 women, 47 on mixed diet and 53 strict vegetarians. Their ages were from 20 to 38, mean 24 years. Both standard clearance, for 42 subjects, and maximum clearance values, for 58, were lower than those reported for American subjects. The mean values were 36·6 ± 2·80 and 45·6 ± 3·64 ml. per min. [according to the summary, but the tables say 38·4 and 49·0].

From these subjects 10 vegetarians and 10 non-vegetarians were chosen and their protein intakes were calculated from standard tables. The means were 37·25 and 47·7 g. daily. After 3 urea clearance tests on their normal diet their protein intake was raised to 80 to 84 g. daily for a month; the tests were repeated then and again 2 months after return to normal diet.

In both groups when the protein intake was raised the urea clearance rose to values comparable with those reported for Americans. Of the N compounds in blood and urine, only urine urea was increased on the high protein intake. There was no difference between animal and vegetable protein diets in these respects.—D. Duncan.

682

PLOUGH, I. C., FORSYTH, B. T., TESCHAN, P. E. and SBOROV, V. M. **Studies of nitrogen balance in acute viral hepatitis.** *Amer. J. Med. Sci.*, 1955, **230,** 182–189. [Dept. Metabol., Med. Div., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington 12.] Interlingua summary.

Balance of N was studied in 5 patients with viral hepatitis, who had a diet of fixed N content. The extent of liver impairment was measured by serial estimations of bilirubin in serum. No correlation was found between the measurements. It was concluded that in patients with liver disease any beneficial effect of protein results from its eliminating a deficiency already in existence.

D. Harvey.

683

MARGEN, S. and TARVER, H. **Studies in human plasma protein formation. 2. Fate of transfused internally S^{35}-labeled plasma protein and albumin, compared with I^{131}-labeled albumin, and plasma protein endogenously synthesized from S^{35}-labeled amino-acid precursors.** *Amer. J. Med.*, 1955, **19,** 286–287. *Proc.* [Dept. Physiol. Chem., Med. Sch., Univ. California, Berkeley.]

684

VOLWILER, W., GOLDSWORTHY, P. D., MACMARTIN, M. P., WOOD, P. A., MACKAY, I. R. and FREMONT-SMITH, K. **Biosynthetic determination with radioactive sulphur of turn-over rates of various plasma proteins in normal and cirrhotic man.** *J. Clin. Invest.*, 1955, **34,** 1126–1146. [Dept. Med., Univ. Washington, Seattle.]

Turnover times for total serum proteins, albumin, β_1-lipoprotein, fibrinogen and γ-globulins were measured in normal and cirrhotic human subjects after ^{35}S-labelled cystine given by mouth or infusion of ^{35}S-labelled normal plasma. Transfused labelled plasma protein yielded shorter apparent turnover times than those after oral administration of labelled amino-acid. Fibrinogen and β_1-lipoprotein were much more rapid in turnover of the S label than were albumin, γ-globulins or total serum proteins. After transfusion of labelled plasma, apparent half-life values in the normal subject for fibrinogen and β_1-lipoprotein were on the average 3·5 days, compared with a median of 21·5 days for albumin and 25 days for γ-globulins.

G. F. Garton.

685

GEIGER, E., EL RAWI, I. and THOMAS, H. V. **Experiments with intermittent feeding of protein to rats.** *J. Nutrition*, 1955, **56,** 273–284. [Dept. Pharmacol., Med. Sch., Univ. S. California, Los Angeles.]

Rats of one group received 5·9 g. of a complete diet daily; a second group received 4 g. of a fat- and protein-free diet for 5 days and for 3 days 9·1 g. of another complete diet; the total food intake in 8 days was the same in both groups. In a second experiment a similar plan was followed using different diets, so that the daily diets of both groups contained equal amounts of carbohydrate and fat, but protein was given intermittently. In the third experiment, on both adult and young rats, the control group received a 12 per cent. casein diet and the experimental group received alternately 4 and 18 per cent. In the first 2 experiments weighed amounts of diet were eaten by the rats and bodyweights were ascertained weekly; in the third the animals received food to appetite and the quantities eaten as well as bodyweights were recorded daily.

In the experiments with low-energy diets growth was slower when feeding was intermittent, although the total protein intake was the same. When food was given to appetite growth was better in the control than in the experimental group. Brief protein restriction did not create a protein hunger which would increase the protein intake when protein-rich diets became available. The experiments indicate that growth and maintenance are best when protein intake is related to the growth and maintenance requirements of the body.

G. F. Garton.

686

POLEZHAEVA-SHIFMAN, A. S. Vliyanie temperatury vneshnei sredy i razlichnykh kolichestv belka v pishche na ves tela i nekotorye pokazateli obmena veshchestv pecheni v svyazi s problemoi optimal'nogo soderzhaniya belka v ratzione. [**Effect of external environmental temperature and of different amounts of protein in food on bodyweight, and some indications of the metabolism of liver tissue in relation to the problem of optimum content of protein in the diet.**] *Biokhimiya*, 1955. **20,** 57–65. [Minist. Zdravookhran. USSR, Kiev.]

Rats were given a synthetic diet with 20 per cent. casein for 7 or 8 days, starved for 48 hr., then divided into groups which were given different amounts of casein in the diet and were studied at 30° C., 1° to 8° C. and room temperature. After 4 days the animals were killed and bodyweight, liver N and glutathione and xanthine oxidase activity of the liver were recorded.

At high temperatures a diet containing 20 per cent. casein was best, but at low temperatures 40 per cent. casein was more satisfactory. The value of xanthine oxidase estimations in such studies is stressed.—D. W. Taylor.

687

THOMSON, W. S. T. and MUNRO, H. N. **The relationship of carbohydrate metabolism to protein metabolism. 4. The effect of substituting fat for dietary carbohydrate.** *J. Nutrition*, 1955, **56,** 139–150. [Dept. Biochem., Univ. Glasgow.]

See Abst. 726, Vol. 24.

The output of N in the urine of young rats increased for a few days after the isocaloric substitution of olive oil for glucose in the diet. When

fat was included at the expense of glucose in protein-containing diets a much greater increase in urine N occurred than after a similar exchange in diets devoid of protein. The change in N balance which resulted from the isocaloric replacement of glucose by olive oil was of the same order whether the oil was given with the protein of the diet or apart from it. It is suggested that the effect is caused by the removal of carbohydrate from the protein-containing diet and not by an adverse effect of fat and protein together. A linear relation was found between the amount of carbohydrate given along with protein and the N balance of the animal.—G. A. Garton.

688

TOROPOVA, G. P. Obmen belka v organakh i tkanyakh belykh krys razlichnogo vozrasta. [**Protein turnover in organs and tissues of white rats of different ages.**] *Vop. Pitan.*, 1955, **14,** No. 4, 12–14.

Male rats weighing 50 and 350 g. were given by subcutaneous injection methionine labelled with ^{35}S. They were killed from 30 min. to 48 hr. after the injection and kidney, liver, blood and muscle were analysed.

The absolute uptake of ^{35}S was greatest for kidney tissue and less for liver, blood and muscle in that order. The amounts were greater for young than for adult animals in kidney and muscle, similar in blood and less in liver. The rates of uptake of ^{35}S in both growing and adult rats were high in kidney, liver and blood and reached a peak in 3 to 4 hr. The rate was considerably less in muscle. Subsequent decline in radio-activity was greater for growing than for adult animals in all tissues except muscle.—D. W. Taylor.

689

MAURER, W. and MÜLLER, E. R. Albumine als Vorstufe von Globulinen im normalen Organismus der Ratte. [**Albumin as precursor of globulin in the normal organism of the rat.**] *Biochem. Ztschr.*, 1955, **326,** 474–483. [Klin. Med., Univ. Cologne.]

Torula yeast was grown in a medium containing sulphate labelled with ^{35}S, and the yeast proteins contained amino-acids labelled with sulphur. Rats were given about 100 mg. yeast containing 22 to 25 mC. ^{35}S and 10 hr. later blood was obtained, from which labelled albumin was isolated electrophoretically. Most of the ^{35}S was in cystine, less in methionine. Four rats received injections of labelled albumin, 80, 36, 36 and 4 mg., respectively, and the distribution of ^{35}S in their serum proteins was studied by electrophoresis after 4 and 25 days.

Labelled globulin was found in the serum, and on the fourth day the mean ratio of labelled albumin : labelled globulin was $8{\cdot}4 \pm 0{\cdot}6$ and was independent of the quantity of labelled albumin injected. All the globulin fractions were labelled.

Similar results were obtained when rabbits were given labelled rabbit albumin.

The implications of the results, which suggest that serum albumin is an immediate precursor of globulin, are discussed.—D. Duncan.

690

YOUNG, D. R. and COOK, S. F. **Effect of environmental temperature and dietary protein on urinary nitrogen excretion of rats.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 482–484. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Three groups of 8 male rats were fed to appetite for 3 weeks before and throughout the experiment on a diet of bleached flour 82, Crisco 6·35, sodium caseinate 5·3, salt mixture 4·25, water-soluble vitamins 1·06 and oil-soluble vitamins 1·06 per cent.; 14 kg. of the diet was supplemented with 1 g. α-tocopherol and 6·5 g. choline. The rats were continuously exposed to environmental temperatures of 4° C. ± 0·2, 23° C. ± 1 and 35° C. ± 0·8 for 50 days; measurements of food intake, urine N excretion and bodyweight were made every third day from the tenth to the fiftieth day.

Food intake, total urine N and urea, allantoin and creatine were inversely proportional to the environmental temperature. Excretion of uric acid, ammonia and amino-acids, and creatinine bore no apparent relation to the environmental temperature.—G. F. Garton.

691

KOLFF, W. J. and PAGE, I. H. **Influence of protein diets on development of renoprival hypertension in dogs.** *Amer. J. Physiol.*, 1955, **181,** 580–584. [Res. Div., Cleveland Clin. Found., Cleveland, Ohio.]

The kidneys were removed from 33 dogs under anaesthesia. Some dogs were then overhydrated by filling the peritoneal cavity with 100 ml. per kg. bodyweight daily of an electrolyte solution resembling extracellular fluid. Others were treated with intermittent peritoneal lavage. Some were force-fed with a salt-free diet containing 4 to 6 g. casein per kg. bodyweight daily, vegetable oil and sugar. Others were force-fed with casein, oil and sugar and also received parenterally 16 ml. normal saline solution per kg. bodyweight daily during the first days after nephrectomy; peritoneal lavage was performed 3 or 4 days after nephrectomy. Two dogs were force-fed with dialysed dog chow, groundnut oil and glucose and were maintained for 15 days by peritoneal lavage without overhydration; dogs which vomited were not kept on the diet and were used as controls, and other

controls had peritoneal lavage but were not fed. Sodium levels in plasma or in the equilibrated rinsing fluid were closely followed; none of the dogs showed low blood Na. Serum K levels were all within or close to the normal range.

High blood pressure after nephrectomy was augmented by overhydration, but neither its occurrence nor its severity was altered by daily peritoneal lavage. The high-protein diet caused only a slight increase in severity of high blood pressure, much less than overhydration. The high-protein diets increased the number and severity of medial arteriolar necroses and of focal myocardial necroses compared with lesions in unfed nephrectomised dogs.—G. F. Garton.

692

ELVEHJEM, C. A. and HARPER, A. E. **Importance of amino-acid balance in nutrition.** *J. Amer. Med. Assoc.*, 1955, **158,** 655. [Univ. Wisconsin, Madison.]

693

DOOLAN, P. D., HARPER, H. A., HUTCHIN, M. E. and SHREEVE, W. W. **Renal clearance of eighteen individual amino acids in human subjects.** *J. Clin. Invest.*, 1955, **34,** 1247–1255. [Metabol. Res. Facility, U.S. Naval Hosp., Oakland, Calif.]

The renal clearances of 18 amino-acids were measured with inulin in 3 normal adult males during fasting and during the infusion of a mixture of amino-acids. Although the amounts of amino-acids re-absorbed and excreted increased during continuous infusion, less than 4 per cent. of that administered was excreted. Histidine, serine, glycine and threonine were less completely re-absorbed than the others.—A. Hepburn.

694

SCHREIER, K. and KARCH, H. L. Über den Einfluss von chirurgischen Eingriffen auf den Aminosäurenstoffwechsel. (Mit einer Untersuchung der Phenylhydrazinpositiven Corticoide im Urin.) [**The effect of surgical procedures on amino-acid metabolism. (With a study of the phenylhydrazine-positive corticoids in urine.)**] *Langenbecks Arch. klin. Chirurg.*, 1954–55, **280,** 516–535. [Kinderklin., Univ. Heidelberg.]

The 19 patients were from 21 to 72 years old and were operated on for a variety of reasons. Urine amino-N was estimated in all of them before and after operation, total urine N in 10 and serum amino-acids in 5. The excretion of 11 amino-acids was estimated.

In every patient the daily excretion of total and amino-N rose sharply after operation, reaching a peak after 3 or 4 days. The serum amino-acids were usually lower 3 or 4 hr. after operation than before, though in 4 patients out of 5 *iso*leucine and leucine values rose. The increase in amino-N excretion held for all the 11 amino-acids tested and was of the same relative order of magnitude for all, the mean ranging from 243 per cent. for valine to 315 per cent. for leucine. The mean excretion of corticoids rose from about 150 to 330 μg. daily, and the protein loss is attributed to an " alarm reaction " in Selye's sense.—D. Duncan.

695

ROSE, W. C., COON, M. J., LOCKHART, H. B. and LAMBERT, G. F. **The amino acid requirements of man. 11. The threonine and methionine requirements.** *J. Biol. Chem.*, 1955, **215,** 101–110. [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

For part 9 see Abst. 5243, Vol. 25.

The minimum daily amounts of threonine required to maintain N balance in 3 young men on a purified diet were 0·6 and 1·0 g. of the racemic acid and 0·5 g. L-threonine, respectively. D-Threonine had no effect on N balance. A daily intake of 0·5 g. L-threonine was tentatively taken as the minimum requirement of man and 1·0 g. as safe. A daily intake of 2 g. or less DL-threonine maintained positive N balance in 26 young men, of whom 4 received 1·2 g. and 16 received 1·6 g.

Six young men required minimum daily amounts of 0·8, 0·9, 0·9, 0·9, 1·0 and 1·1 g. DL-methionine for N balance. D-Methionine was as effective as L-methionine. A daily intake of 1·1 g. methionine was tentatively taken as the minimum requirement of man and 2·2 g. as safe. A daily intake of 2·2 g. or less maintained positive N balance in 20 subjects, 17 of whom received 2·0 g. or less.—A. Hepburn.

696

LANGNER, R. R. and BERG, C. P. **Metabolism of D-tryptophan in the normal human subject.** *J. Biol. Chem.*, 1955, **214,** 699–707. [Biochem. Lab., State Univ. Iowa, Iowa City.]

D-Tryptophan ingested by normal adults was shown by paper chromatography to be excreted in the urine, along with appreciable amounts of D-kynurenine and traces of indolepyruvic acid and acetyltryptophan. The addition of iodine produced a reddish-purple precipitate. DL-Tryptophan dissolved in urine or water gave this reaction.

A. Hepburn.

697

ASTRUP, P., GØTZSCHE, H., IBSEN, B. and MUNKVAD, I. **Investigations into glutamic acid metabolism in schizophrenics.** *J. Mental Sci.*, 1955, **101,** 366–369. [Psychiat. Dept., Rigshosp., Univ. Copenhagen.]

698

STRECKER, H. J. and MELA, P. **The interconversion of glutamic acid and proline.** *Biochim. biophys. Acta,* 1955, **17,** 580–581. [Dept. Biochem., Coll. Phys. Surg., Columbia Univ., New York.]

699

HARPER, A. E., WINJE, M. E., BENTON, D. A. and ELVEHJEM, C. A. **Effect of amino acid supplements on growth and fat deposition in the livers of rats fed polished rice.** *J. Nutrition,* 1955, **56,** 187–198. [Dept. Biochem., Univ. Wisconsin, Madison.]

Rats grew better on a diet containing 90 per cent. rice, providing only 5·9 per cent. protein, than with 7·4 or 7·3 per cent. protein from maize or wheat. Only rats fed on the rice diet had an accumulation of liver fat after 2 weeks and this was much less when casein or other proteins replaced part of the rice. With 0·24 per cent. DL-threonine, 0·4 per cent. L-lysine prevented the accumulation of liver fat, but 0·2 per cent. did not, although it produced better growth. Other amino-acids did not affect fat deposition and did not improve growth when added with lysine and threonine. Only a mixture of all the essential amino-acids gave a further growth response.—A. Hepburn.

700

HENRIQUES, O. B., HENRIQUES, S. B. and NEUBERGER, A. **Quantitative aspects of glycine metabolism in the rabbit.** *Biochem. J.,* 1955, **60,** 409–424. [Nat. Inst. Med. Res., London, N.W.7.]

The radio-activity of plasma glycine fell sharply during the first 30 min. and slowly from 6 to 18 hr. after the intravenous injection of α-^{14}C-glycine into rabbits. The replacement of all the liver glycine by plasma glycine was estimated to take 15 to 20 min. and was thought to depend on the rate of blood flow. The replacement of muscle glycine took 20 to 25 hr. and the slow equilibration was caused by slow blood flow in muscle and partial permeability. Glutathione had renewal times of 10 to 12 hr. in the liver and 20 hr. in muscle. A rapid conversion of glycine to serine was indicated, and the muscle cell appeared to be more permeable to serine.

It was calculated that about 1·9 g. protein per kg. bodyweight was synthesised daily in the liver. Of this 40 per cent. was related to plasma proteins and the rest to liver proteins.—A. Hepburn.

701

WIXOM, R. L., PIPKIN, G. E. and DAY, P. L. **Interrelationship of serine and glycine for chick growth.** *J. Nutrition,* 1955, **56,** 409–422. [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

Glycine, but not extra N in the form of diammonium citrate or alanine, increased the growth rate of 2-week-old chicks fed on a diet containing casein and deficient in glycine. The need for glycine was less in 4-week-old chicks. DL-Serine also improved growth rate. The results suggested a relation between serine and glycine, of which one is required for the young growing chick.

A. Hepburn.

702

HARPER, A. E., BENTON, D. A. and ELVEHJEM, C. A. **L-Leucine, an isoleucine antagonist in the rat.** *Arch. Biochem. Biophys.,* 1955, **57,** 1–12. [Dept. Biochem., Univ. Wisconsin, Madison.]

The experimental groups were each of 6 rats weighing between 40 and 50 or between 200 and 250 g. The diets contained, per cent., salt mixture 4, maize oil 5, casein 9 or 18 or bloodmeal 18 and sucrose to 100. Diets with 9 per cent. casein contained also 0·1 per cent. DL-tryptophan and 0·3 per cent. DL-methionine, and those with 18 per cent. casein or sucrose contained 0·2 per cent. DL-methionine. All diets contained added vitamin B_1, riboflavin, nicotinic acid, calcium pantothenate, pyridoxine, biotin, folic acid, vitamin B_{12}, inositol and choline chloride, and halibut oil with added vitamins E and K was given weekly. Amino-acid supplements were added at the expense of sucrose.

When the diet contained 9 per cent. casein, but not with 18 per cent., 1·5 or 3·0 per cent. leucine retarded growth. DL-Leucine was less effective than L-leucine. The effect was decreased by simultaneous addition of 0·5 per cent. DL-*iso*leucine, but not by tryptophan, threonine, valine or a mixture of these 3 with histidine, lysine and phenylalanine. The effect of 1·0 per cent. L-leucine was completely overcome by 0·5 per cent. DL-*iso*leucine, but with more leucine, *iso*leucine was never completely effective, and 0·2 per cent. was as good as 0·8 per cent. With 18 per cent. bloodmeal, which is deficient in *iso*leucine, 2·0 per cent. L-leucine depressed growth except when 2·0 per cent. DL-*iso*leucine was also added.

It is suggested that in the rat, excess leucine is an antimetabolite for *iso*leucine and increases the requirement of the latter.—D. Duncan.

703

BENTON, D. A., HARPER, A. E. and ELVEHJEM, C. A. **Effect of isoleucine supplementation on the growth of rats fed zein or corn diets.** *Arch. Biochem. Biophys.,* 1955, **57,** 13–19. [Dept. Biochem., Univ. Wisconsin, Madison.]

The work described in the preceding Abst. was followed by 6 similar experiments with a total of 25 groups of rats. In the first set of 3 experiments,

10 groups were given diets with zein, 2 with 15 and 8 with 24 per cent., and with one of 3 mixtures containing 7, 8 or 9 amino-acids ; 1 group of rats had 20 per cent. casein with a supplement of DL-methionine. In the second set of 3 experiments, 14 groups were given diets containing about 90 per cent. maize, which for some groups had been extracted with alcohol or Skellysolve B, and all received a simpler mixture of amino-acids, usually only L-lysine, DL-tryptophan, DL-threonine and DL-valine. To these diets further additions of *iso*leucine or leucine were made and in 2 the amounts balanced those in the quantities of zein removed by the alcohol. Records were made of weight gains, and the mean values for 6 in each group are used for comparison.

In both sets of experiments *iso*leucine was found to be a limiting amino-acid. In the group getting 24 per cent. zein, phenylalanine also had that effect. It is suggested that the amino-acids in zein were poorly utilised, since, with alcohol-extracted maize, *iso*leucine equivalent to that in the zein which had been removed improved the rate of growth much more than did zein itself. Leucine in corresponding amount did not depress the rate of growth of the rats.—D. Harvey.

704

KINNORY, D. S., TAKEDA, Y. and GREENBERG, D. M. **Metabolism of DL-α-aminobutyrate-3-^{14}C and DL-norleucine-3-^{14}C.** *Biochim. biophys. Acta*, 1955, **17**, 561–564. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.] French and German summaries.

705

MATSUO, Y. and GREENBERG, D. M. **Metabolic formation of homoserine and α-aminobutyric acid from methionine.** *J. Biol. Chem.*, 1955, **215**, 547–554. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

Radio-active homoserine and α-aminobutyric acid were isolated in small quantities from tissues of mice after injection of DL-methionine-2-^{14}C.

A. Hepburn.

706

SIME, J. T., and JOHNSON, B. C. **Metabolism of methionine-C^{14}H$_3$ in the chick. 2. Distribution of C^{14} in the urinary uric acid molecule.** *J. Biol. Chem.*, 1955, **215**, 41–44. [Div. Animal Nutrit., Dept. Animal Sci., Univ. Illinois, Urbana.]

Three chickens received for the first 5 weeks of life an adequate diet containing, per cent., maize 55·78, soya bean meal (50 per cent. protein) 34, bonemeal 3·0, limestone 1·0, salt 0·5, vitamin A and D oil 0·05, $MnSO_4$ 0·05, alfalfa 1·0, DL-methionine 0·1, Aurofac 1·0, riboflavin concentrate 0·02 and distiller's solubles 4·0, with nicotinic acid 1 g. and choline 24 g. per 100 lb. At 5 weeks of age an operation was performed on each bird which allowed separate collection of urine and faeces for 36 hr. Eight hours after operation each chick received intraperitoneally 42 mg. methionine-$^{14}CH_3$ and urine was then collected for 36 hr. The uric acid was purified and degraded.

The uric acid recovered contained 9·3 per cent. of the ^{14}C activity injected, and of this 55·9 per cent. was in C atom 2 and 36·5 per cent. in C atom 8, and another 6·7 per cent. was in C atoms 4 and 5. It is concluded that the methyl group of methionine serves as a source of " active 1-carbon compound " for uric acid formation.—D. Duncan.

707

ASCHKENASY, A. Suppression par le surrénalectomie de la protection du foie par la méthionine contre les effets du régime hypoprotidique. [**Suppression by adrenalectomy of the protection of the liver by methionine against the effects of a diet low in protein.**] *C.R. Soc. Biol.*, 1955, **149**, 663–666. [Hôp. Pitié, Paris.]

A methionine supplement prolonged the survival of adrenalectomised rats on a diet containing 2 per cent. protein, but they did not live as long as intact rats on the same diet. In intact rats on the basal 2 per cent. casein diet the liver weight decreased less than the bodyweight in 35 days, but with methionine the liver was significantly heavier both absolutely and relatively. After adrenalectomy the liver weight was absolutely and relatively less and methionine did not affect it.

D. Duncan.

708

ERICSON, L. E., WILLIAMS, J. N. (Jr.) and ELVEHJEM, C. A. **Enzymatic cleavage of S-adenosylhomocysteine and the transfer of labile methyl groups.** *Acta chem. scand.*, 1955, **9**, 859–860. [Dept. Biochem., Univ. Wisconsin, Madison.]

709

EDEN, E. and HARRISON, D. D. **Studies in carbon tetrachloride poisoning. 3. The possible rôle of sulphur amino acids in detoxication.** *Austral. J. Exp. Biol. Med. Sci.*, 1955, **33**, 85–89. [Dept. Biochem., Univ. Sydney.]

Adult and young rats, some of the latter previously kept on a diet deficient in S amino-acids, received intraperitoneal injections of CCl_4. Glutathione in the livers was increased 24 hr. after the injections, particularly in the young rats receiving an adequate diet. Liver extracts from control or treated rats when incubated with cysteine or glutathione lost sulphydryl groups, which were further decreased by chloral hydrate. No direct evidence for the detoxication of CCl_4 by glutathione *in vivo* was obtained.—A. Hepburn.

710

JORDE, W. O. Untersuchungen über den Kreatinstoffwechsel. [**Studies on creatine metabolism.**] *Ztschr. ges. exp. Med.*, 1955, **126**, 145–202. [1. Med. Klin., Univ. Munich.]

Rabbits received a diet of roots, oats, wheat, bread and water. After a week some served as controls, others received a single intramuscular injection of 4 or 7 mg. allyl formate per 100 g. bodyweight, or 3 daily injections of 0·05 or 0·07 ml. CCl_4 per kg. bodyweight. Subgroups of those given allyl formate or CCl_4 received also, beginning 2 days before the toxin, daily injections of 1·5 ml. per kg. bodyweight of 2·5 per cent. solution of creatine or choline. Rabbits given the largest doses of toxin died in 3 or 4 days, the rest were killed after 7 or 21 days. Creatine, creatinine and glycogen were estimated in skeletal muscle, liver and kidney.

The rabbits given the smaller doses of toxin showed histologically only slight liver damage, but in those which died damage was severe. In the first week the creatine contents of liver and kidney fell significantly; that of muscle rose after CCl_4, but not after allyl formate. After 3 weeks allyl formate produced an increase in muscle creatine, by which time rabbits given CCl_4 had normal muscle creatine and rising levels in liver and kidney. Choline was without effect, except that after 3 weeks rabbits given allyl formate and choline had normal muscle creatine. Creatine reduced the creatine content of all 3 tissues after 3 weeks in rabbits given allyl formate, after 1 week in those given CCl_4. It is concluded that experimental liver damage reduces creatine formation in the liver, partly compensated by increased formation in extrahepatic tissues.

Glycogen formation in the muscle was reduced at first, and the glycogen contents of liver and kidney were briefly increased. There was no relation between glycogen and creatine contents of muscle, and creatine and choline injections were without effect.

The effects of injections of 1 g. creatine alone or with vitamin C or of calcium creatine phosphate were studied in 9 normal human subjects and 15 patients with epidemic hepatitis. All the subjects had normal serum creatine and creatinine levels, and injected creatine or calcium creatine phosphate was quickly removed from the blood. Elimination of creatine and creatinine in the urine in the first 2 hr. after injection was less in patients with hepatitis than in the normal subjects. In both groups simultaneous injection of 500 mg. vitamin C increased creatine retention. It is concluded that exogenous creatine can be utilised and can be transformed into creatinine both enzymically and non-enzymically. Creatine metabolism depends on the activity of intermediary carbohydrate metabolism and the supply of creatine precursors in the muscle.

Pyroracemic acid in fasting and at rest was not always found in the blood, but at other times healthy subjects had more than 1·06 mg. per cent. The ratio of pyroracemic to lactic acid in the blood was not constant. The injection of creatine increased blood pyroracemic acid, but not lactic acid. It was concluded that intravenous creatine affected anaerobic carbohydrate metabolism in the tissues.

Parenteral creatine improved Quick's prothrombin time both in the rabbits with experimental liver damage and in the patients with hepatitis.

D. Duncan.

711

POULSEN, H. **Uric acid in blood and urine of infants.** *Acta physiol. scand.*, 1955, **33**, 372–377. [Dept. Obstet., Rigshosp., Univ. Copenhagen.]

712

SCHMIDT-NIELSEN, B. **Urea excretion in white rats and kangaroo rats as influenced by excitement and by diet.** *Amer. J. Physiol.*, 1955, **181**, 131–139. [Dept. Zool., Duke Univ., Durham, N.C.]

713

SPISNI, D. and CAPPA, V. Alimentazione e contenuto di composti indossilici nell'urina di bovini. [**Diet and the amount of indoxyl compounds in the urine of cattle.**] Presenza di indolo nel contenuto del rumine di bovini. [**Presence of indole in the rumen contents of cattle.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 1417–1418; 1418–1419. [Ist. Anat. Fisiol., Fac. Agrar., Univ. Cattolica del Sacro Cuore, Milan-Piacenza.]

Indoxyl substances were estimated in the urine of 78 cattle of different breed, age and origin, some of them pregnant, fed on different hay crops. When the proportion of grasses in the hay was high, the amount of indoxyl substances in the urine was relatively low, and it increased when the proportion of leguminous plants was high. The amount excreted ranged from 0·01 to 0·3 g. per 100 ml. urine.

Indole was always present in rumen contents of 15 cattle just after slaughter; the amount ranged from 0·09 to 3 mg. per litre.—E. M. Hume.

See also Absts. 386, 397, 401, 404, 409, 418, 445, 479, 508, 510, 590, 611, 627, 660, 661, 741, 744, 779, 817–19, 861, 918, 919, 969, 998, 1140, 1151, 1152, 1159, 1222.

FATS AND OTHER LIPIDS

714

LYNEN, F. **Lipide metabolism.** *Annu. Rev. Biochem.*, 1955, **24,** 653–688. [Inst. Zellchem., Max-Planck-Inst., Munich.]

715

ZILVERSMIT, D. B. **Metabolism of complex lipides.** *Annu. Rev. Biochem.*, 1955, **24,** 157–180. [Div. Physiol., Univ. Tennessee, Memphis.]

716

DEUEL, H. J. (Jr.) **Fat as a required nutrient of the diet.** *Federation Proc.*, 1955, **14,** 639–649. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California, Los Angeles.]

A review.

717

REISER, R. **Recent studies of fat digestion and absorption.** *Clin. Chem.*, 1955, **1,** 93–104. [Dept. Biochem., Texas Agric. Exp. Stat., College Station.]

A review.

718

KINSELL, L. W. and MICHAELS, G. D. **Hormonal-nutritional - lipid relationships.** *Federation Proc.*, 1955, **14,** 661–666. [Inst. Metabol. Res., Highland Alameda County Hosp., Oakland, Calif.]

719

SAHASRABUDHE, M. R. **Digestibility and absorption of hydrogenated blended fats.** *J. Sci. Indust. Res.*, 1954, **13B,** 131–133. [Central Food Technol. Res. Inst., Mysore.]

The fats used were vanaspati, m.p. 37° C., and vanaspati blended with 10, 15 and 25 per cent. of hydrogenated fats of m.p. 41°, 45° and 51° C. Test meals of 3/4 oz. fat. and 1½ oz. bread were given to 6 young girls who had not eaten for 13 hr. Chylomicron counts were made after 1 hr. and then every ½ hr. for 10 hr. Digestibility studies were made on the same subjects; faecal excretion was measured during the last 4 days of 9 days when 20 g. fat was given daily.

Though no significant difference in digestibility was found, chylomicron counts after vanaspati fell to about fasting level in 7 hr., but with the blends the interval was 8 to 10 hr.—G. A. Garton.

720

ROSS, C. A. C. **Fat absorption studies in the diagnosis and treatment of pancreatic fibrosis.** *Arch. Dis. Childhood*, 1955, **30,** 316–321. [Dept. Paediat. Child Health, Univ. Birmingham.]

The subjects were 22 children aged 2 weeks to 5 years, with pancreatic fibrosis, and 18 children under 5 years, with coeliac disease. Estimation of lipase and trypsin in duodenal juice of 17 children with pancreatic fibrosis showed absence of trypsin in all but 2. At a subsequent estimation these 2 also showed no trypsin. Small amounts of lipase were found in 7. In children with coeliac disease, lipase and trypsin values were within the normal range. Fat absorption was studied in 14 children with pancreatic fibrosis. In the 8 children over 1 year of age absorption was less than 60 per cent., in 3 children under 1 year it was less than 60 and in the other 3 under 1 year 72, 80 and 81. Sixteen of the children with coeliac disease absorbed between 70 and 90 per cent. of fat, the other 2 between 50 and 60 per cent. After treatment of coeliac disease with a diet free from wheat gluten, all absorbed over 90 per cent. of fat. Treatment of 11 children with pancreatic fibrosis with pancreatin increased fat absorption from an average of 50 per cent. to 72·8 per cent. The maximum chylomicron increase after a standard fat meal was under 50 in 21 children with pancreatic fibrosis and under 25 in 18. In 18 children with coeliac disease only 3 had a maximum increment below 50. Four of them had increments of over 150. After diet treatment 10 had a maximum increment of over 150. In 4 subjects with pancreatic fibrosis the average maximum increment was increased from 7 to 151 by pancreatin treatment.—F. C. Aitken.

721

BLOMSTRAND, R. **A study on the intestinal absorption of fat in normal adults and in non-tropical sprue with carbon-labelled oleic acid and palmitic acid.** *Acta med. scand.*, 1955, **152,** 129–138. [Dept. Med., Univ. Lund.]

The faecal lipids of 2 normal subjects and of one with non-tropical sprue were analysed before, after and during 3 days on a diet containing oleic and palmitic acid labelled with ^{13}C; for 3 days before and 3 days afterwards the diet contained 40 g. olive oil daily as almost the only fat.

Both normal subjects absorbed 99·4 per cent. of the labelled acids; about 1 g. faecal fatty acids daily was of endogenous origin. In the patient with sprue, 76·5 per cent. of the labelled acids was absorbed and about 3 g. faecal fatty acids daily was of dietary origin; when the faecal fatty acids were separated into saturated and unsaturated acids and the isotope concentration of each group was estimated, it appeared that some unabsorbed oleic acid had been hydrogenated.—G. A. Garton.

722

THIELE, O. W. Lipoidbilanzuntersuchungen bei einem Fall von einheimischer Sprue. [**Fat balance studies in a case of non-tropical sprue.**] *Klin. Wochenschr.*, 1955, **33,** 421–426. [Med. Nervenklin., Justus Liebig Hochsch., Giessen.]

723

MANN, G. V., TEEL, K., HAYES, O., MCNALLY, A. and BRUNO, D. **Exercise in the disposition of dietary calories: regulation of serum lipoprotein and cholesterol levels in human subjects.** *New Engl. J. Med.*, 1955, **253,** 349–355. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Four healthy young male students were subjects of a 10-week experiment. In the first week, the control period, food was allowed to appetite and the students followed their usual activities and maintained their bodyweight at a nearly constant level. For the 4 subjects average daily intake of energy ranged from 2788 to 3093 Cal. and of fat from 155 to 175 g. In the second period, lasting 4 weeks, energy intake was doubled while fat intake remained the same, and the subjects were required to do strenuous exercise to maintain bodyweight within 5 lb. of the mean value for the control period. In the next 3 weeks high energy intake was maintained and energy expenditure was reduced to that of the control period, so that subjects gained weight. In the final 2 weeks the subjects were restricted in energy intake and exercised to lose fat deposited in the previous period. During the experiment body volume was estimated and body composition computed ; blood samples were analysed weekly for lipoproteins and lipids ; urine samples were collected weekly for measurement of excretion of creatinine. Three subjects completed the experiment.

Doubling the energy intake did not raise the levels of serum lipoproteins and cholesterol so long as surplus energy was expended in heat and muscular work. Deposition of adipose tissue caused the serum lipids to increase in 2 of 3 subjects.

The findings are discussed in relation to atherosclerosis in American men.—F. C. Aitken.

724

BEVERIDGE, J. M. R., CONNELL, W. F., MAYER, G. A., FIRSTBROOK, J. B. and DEWOLFE, M. S. **The effects of certain vegetable and animal fats on the plasma lipids of humans.** *J. Nutrition*, 1955, **56,** 311–320. [Dept. Biochem., Fac. Med., Queen's Univ., Kingston, Ont.]

Free and total cholesterol and phospholipins were estimated in the plasma of 5 apparently healthy men aged from 33 to 41 years, during a period when they consumed alternately their customary diets and diets of known composition. The latter included differing proportions of skimmed milk powder, maize oil or margarine or butter and dextrinmaltose, supplemented as required with small amounts of cholesterol.

When the subjects ate diets which included vegetable fat as 28·4 or 58·5 per cent. of the total energy, with or without supplementary cholesterol, plasma lipid values were lower than when a mixed diet was eaten. When butter supplied 58·5 per cent. of the energy intake, plasma lipid values rose temporarily, then fell.—G. A. Garton.

725

HATCH, F. T., ABELL, L. L. and KENDALL, F. E. **Effects of restriction of dietary fat and cholesterol upon serum lipids and lipoproteins in patients with hypertension.** *Amer. J. Med.*, 1955, **19,** 48–60. [Res. Serv., First (Columbia Univ.) Div., Goldwater Mem. Hosp., New York.]

Forty-four patients with severe essential hypertension were given a low-salt diet of normal fat content for 4 to 18 weeks, followed by the Kempner rice diet for 4 to 20 weeks. Ten of the patients then had the rice diet supplemented by protein and fat in the form of low-Na milk and a protein-carbohydrate powder ; 10 patients received a special low-Na diet of greater palatability than the rice diet and 6 additional patients were studied on this diet without a preliminary period on the rice diet. Serum was analysed for free and total cholesterol, lipid P and neutral fat at intervals throughout the study. Fasting blood samples were used for estimation of the Sf 12–20 and Sf 20–100 lipoprotein fractions by means of the ultracentrifuge.

Restriction of dietary fat and elimination of cholesterol did not reduce the serum lipid or lipoprotein level below the normal range in any patient. Drastic restriction of fat and cholesterol produced variable effects on the serum lipid patterns of the patients. Serum cholesterol esters usually declined when the fat intake was below 40 g. daily, but free cholesterol and lipid P showed no consistent change ; one-fifth of the patients on such restricted diet exhibited lipaemia, due chiefly to serum neutral fat. Dietary restriction did not significantly alter the concentration of the Sf 12–20 lipoprotein fraction, but produced substantial increases in the Sf 20–100 fraction. Restriction of fat rather than restriction of cholesterol was responsible for the changes in serum cholesterol and other lipids.—G. F. Garton.

726

HAMMOND, E. G. and LUNDBERG, W. O. **The effect of low-fat diet and atherosclerosis on the polyunsaturated fatty acids of human blood plasma.** *Arch. Biochem. Biophys.*, 1955, **57,**

517–519. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

The total fatty acid content of plasma from atherosclerotic patients, from Guatemalan natives who eat a low-fat diet and from a blood bank was estimated ; the polyunsaturated acids containing 2, 3, 4, 5 and 6 double bonds were estimated by a micro alkali-isomerisation technique.

In spite of the low intake of fat the Guatemalan samples had a greater amount of trienoic acids, expressed as a percentage of total fatty acids, than the blood bank plasma, and on the same basis the amounts of penta- and hexaenoic acids were probably also greater. On the basis of mg. acid per unit volume of plasma only the trienoic and hexaenoic acid contents of the Guatemalan were higher than in blood bank plasma.

In the plasma from atherosclerotic subjects the level of total fatty acids was considerably higher than that in blood bank plasma. Expressed as a percentage of total fatty acids, the atherosclerotic subjects had lower plasma levels of dienoic and tetraenoic acids and a higher level of trienoic acids than blood bank plasma. Expressed as mg. fatty acid per unit volume of plasma the amounts of dienoic and tetraenoic acids were not different from those in bank plasma, but the amounts of trienoic and hexaenoic and probably of pentaenoic acids were higher in the plasma of the atherosclerotic subjects.

It is suggested that a relation may exist between atherosclerosis and changes in the plasma content of polyunsaturated fatty acids.—G. A. Garton.

727

KEYS, A., ANDERSON, J. T., FIDANZA, F., KEYS, M. H. and SWAHN, B. **Effects of diet on blood lipids in man: particularly cholesterol and lipoproteins.** *Clin. Chem.*, 1955, **1**, 34–52. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

Serum from healthy men was analysed for total cholesterol and for lipoproteins; α- and β-lipoprotein fractions were further analysed for lipids and cholesterol. The groups of men included subjects in different occupations in the United States, Italy, Sweden, Spain, South Africa and England. The effects of different diets were studied in schizophrenic patients who were metabolically " normal ".

A direct relation existed between the proportion of fat in the diet and the concentrations of serum total cholesterol and of serum β-lipoproteins ; the effect of diet tended to be greater in middle-aged than in younger men. The mean level of serum cholesterol was 25 to 50 per cent. higher in men in whose diet 40 per cent. of the energy value was supplied by fat than in men on diets in which fat contributed 20 per cent. or less of the total energy.

Changing the proportion of fat in the diet led to changes in the serum cholesterol values. Little is known, as yet, of the mechanism by which food fat influences the composition of blood lipids.

G. A. Garton.

728

SCHETTLER, G. and JOBST, H. Die Bedeutung alimentärer Fettbelastungen für die Diagnose der Arteriosklerose. [**Significance of alimentary fat tests for the diagnosis of arteriosclerosis.**] *Deutsch. med. Wochenschr.*, 1955, **80**, 1077–1081. [Med. Klin., Univ. Marburg a.d. Lahn.] English and Spanish summaries.

Serum lipids and chylomicron curves were followed before and for 5 hr. after a meal containing 0·5 g. butter per kg. bodyweight in 10 young normal persons aged from 22 to 39 years, in 10 older normal persons aged from 42 to 67 years and in 10 patients aged from 41 to 71 years with arteriosclerosis and coronary thrombosis.

There was no significant difference between the fasting values for number of chylomicrons, total number and percentage of large chylomicrons, turbidity, phospholipins, free cholesterol and cholesterol esters for the younger and the older normal groups ; the neutral fat (total esters of the fatty acids) was higher in the older group, but the result was doubtfully significant. After the fat meal the values for total chylomicrons, large chlyomicrons and absolute turbidity as well as that for neutral fat were significantly higher in the older group than in the younger.

A comparison of the values in the arteriosclerotic group with those in the young controls showed that the fasting values for turbidity, neutral fat and cholesterol and cholesterol esters were significantly raised in the arteriosclerotic group and that after the fat meal the values for total chylomicrons, large chylomicrons, absolute turbidity and especially neutral fat were also significantly raised in this group. However, in comparison with the older normals who showed the same trend in their blood findings as the arteriosclerotics, there was a significantly greater rise in the arteriosclerotics in both the fasting value and value after the fat meal for neutral fat and in the fasting value for the percentage of large chylomicrons and for free cholesterol. The fat meal did not alter the blood level of cholesterol, cholesterol esters or phospholipins in any of the groups. The discrepancy between turbidity value and neutral fat values was thought to result from the presence of neutral fat particles too small to be resolved by the dark ground microscope in arteriosclerotic serum. It is suggested that estimations of neutral fat combined with chylomicron curves and turbidity estimations may be of value in the diagnosis of arteriosclerosis.—L. Wills.

729

KUO, P. T. and JOYNER, C. R. (Jr.) **Angina pectoris induced by fat ingestion in patients with coronary artery disease: ballistocardiographic and electrocardiographic findings.** *J. Amer. Med. Assoc.*, 1955, **158,** 1008–1013. [Edward B. Robinette Found., Med. Clin., Hosp. Univ. Pennsylvania, Philadelphia.]

730

MOSER, H. W. and EMERSON, K. (Jr.) **Estimation of the phospholipid phosphorus turnover time in man: studies in normal individuals, in patients with the nephrotic syndrome and in other types of hyperlipemia.** *J. Clin. Invest.*, 1955, **34,** 1286–1296. [Dept. Med., Harvard Med. Sch., Boston, Mass.]

The specific activity of plasma lipoid P and urine phosphate was studied in 6 normal subjects and in 8 hyperlipaemic patients after intravenous injection of 1·0 to 2·2 μC. $^{32}PO_4$ per kg. bodyweight.

The turnover time of phospholipoid P contained in plasma plus liver was calculated as 60 to 95 hr. in the normal subjects. In the hyperlipaemic subjects suffering from nephrosis and in 1 with untreated hypothyroidism the specific activity of plasma lipoid P relative to that of urine phosphate increased more slowly than in normal subjects; in a hyperlipaemic patient with biliary cirrhosis it increased at almost the normal rate. The values for a patient with familial hypercholesterolaemia and *xanthoma tendinosum* were intermediate. It is suggested that in nephrotic patients there was a delay in the attainment of isotopic equilibrium between liver and plasma phospholipins.

G. A. Garton.

731

SIMMONDS, W. J. **The intestinal absorption of fat, fatty acid and fat soluble dye into thoracic duct lymph in unanaesthetized rats.** *Austral. J. Exp. Biol. Med. Sci.*, 1955, **33,** 25–32. [Kanematsu Mem. Inst. Pathol., Sydney Hosp.]

Unanaesthetised fasting rats with cannulae in their thoracic lymph ducts were given 0·5 ml. olive oil or oleic acid containing dissolved Sudan IV. Lymph flow was measured half-hourly and fat and dye concentrations were estimated from 0 to 1, 1 to 3, 3 to 6 and 6 to 10 hr. later.

Dye recovered from the lymph was usually 15 to 20 per cent., fat from 70 to 80 per cent. of that given. The recovery pattern was not the same for both lipids; dye and fat recovery rose more rapidly to a higher maximum value and fell more rapidly after olive oil than after oleic acid.

The results are discussed in relation to Frazer's hypothesis of fat absorption (Abst. 582, Vol. 25).

G. A. Garton.

732

SIMMONDS, W. J. **Some observations on the increase in thoracic duct lymph flow during intestinal absorption of fat in unanaesthetized rats.** *Austral. J. Exp. Biol. Med. Sci.*, 1955, **33,** 305–313. [Kanematsu Mem. Inst. Pathol., Sydney Hosp.]

In experiments similar to those described in the preceeding Abst., the rate of flow and composition of thoracic duct lymph were studied after 1 to 4 g. powdered skimmed milk, 1 g. powdered full cream milk or 0·5 ml. olive oil, oleic acid or tributyrin was given to unanaesthetised rats.

No significant change in the composition or rate of flow of lymph was found after skimmed milk, but lipid, alone or in mixed food, caused a considerable increase in lymph flow. Since lymph flow increased concurrently with increasing lymph fat recoveries after full cream milk, olive oil or oleic acid, it is suggested that absorption rather than digestion determines the rate of flow. Tributyrin did not appear in the lymph, but its administration was followed by an increase in lymph flow and a decline in the amount of lymph protein.

G. A. Garton.

733

KADYKOV, B. I. and SHASTIN, R. N. O printzipe vychisleniya koefitzienta usvoeniya zhira. [**Principles involved in calculating the coefficient of assimilation of fat.**] *Vop. Pitan.*, 1955, **14,** No. 4, 14–17. [Sanit.-Gig. Inst., Leningrad.]

In rats given diets containing different amounts of fat or none there was a fairly constant amount of faecal fat, about 15 mg. daily, which had its origin in the intestinal wall and was excreted even on the fat-free diet. This must be taken into account in calculating the coefficient of absorption of dietary fat.—D. W. Taylor.

734

SCHRADE, W., BIEGLER, R. and BECKER, G. Über die Beteiligung der Lunge am Fettstoffwechsel. [**Role of the lung in fat metabolism.**] *Ztschr. ges. exp. Med.*, 1955, **126,** 125–140. [1. Med. Klin., Frankfurt a.M.]

Rats received a meal of 1 to 3 ml. olive oil. At different intervals afterwards they were anaesthetised and perfused through the right ventricle with physiological saline until the lungs were completely free of blood. Lung tissue was then analysed for fat. Control rats not given oil had lungs with a mean total fat content of 20·5 per cent. on a dry matter basis. In 26 rats killed 8 hr. after the fat meal the lung fat was 42·7 per cent. After longer intervals it sank again, approaching the initial value at 24 hr.

In a second series of 10 fasted rats and 10 given oil as before, the fat contents of liver, kidneys and

spleen as well as lung were estimated 8 hr. after the meal. The fat content of the lung in the control and fat-fed groups was 18·8 and 44·8 per cent. of dry matter, an absolute difference of 53·7 mg. In liver the fat contents were 18·6 and 24·2 per cent., absolute difference 64·2 mg. In kidney and spleen there was no significant difference. The iodine value, the phosphatide fraction and especially the non-phosphatide fraction of lung fat were all increased after the fat meal.

In rats given 3 fat meals 4 hr. apart and killed 4 hr. after the last, the lung fat was only 21·17 mg. more than in fasted rats, whereas the liver fat had increased by 104·7 mg.

From the qualitative changes in lung fat it is concluded that the lungs are actively concerned in fat metabolism.—D. Duncan.

735

VARTIAINEN, I. and TELKKÄ, A. **Effect of high fat diet on the pancreatic islets of rat.** *Ann. Med. int. Fenn.*, 1955, **44,** 79–88. [2 Med. Clin., Univ. Helsinki.]

Two groups of rats were maintained for a year on a purified diet containing 15 per cent. casein and 5 or 80 per cent. fat with vitamin supplements. There was no significant difference between the groups in weight, glucose tolerance, water intake or size of thyroid. With the high-fat diet the weight of the liver was lower and the weight of the adrenal was higher, with hypertrophy of the adrenal cortex; the islets of Langerhans made up only 0·9 per cent. of the pancreatic tissue, but with the low-fat diet the islet tissue constituted 2·6 per cent. No change in glucose tolerance occurred until a considerable part of the pancreas had been removed.—A. M. Copping.

736

NIEMAN, C. **Influence of dietary fat on incidence of alloxan diabetes in growing rats.** *Amer. J. Physiol.*, 1955, **181,** 183–186. [Netherlands Inst. Nutrit., Amsterdam.]

Groups of weanling rats were fed on diets containing 10 or 20 per cent. of butterfat or groundnut oil and were made diabetic by injection of alloxan. As judged by growth rate, growth per g. food eaten, incidence of diabetes and mortality rate, butterfat afforded more protection from the effects of alloxan than did groundnut oil; it is suggested that its protective value may be associated with the content of short-chain fatty acids, greater saturation of the fat as a whole, or both.—G. A. Garton.

737

FAVARGER, P. and GERLACH, J. Recherches sur la synthèse des graisses à partir d'acétate ou de glucose. 1. Vitesse d'incorporation de l'acétate dans les acides gras de la souris amaigrie. [**Synthesis of fats from acetate or glucose. 1. Rate of incorporation of acetate into the fatty acids of the starved mouse.**] 2. Les rôles respectifs du foie, du tissue adipeux et de certains autres tissus dans la lipogenèse chez la souris. [**2. Respective roles of liver, adipose tissue and certain other tissues in lipogenesis in the mouse.**] *Helv. physiol. pharm. Acta*, 1955, **13,** 91–95; 96–105. [Inst. Chim. Physiol., Univ. Geneva.]

1. Starving mice were given an intraperitoneal or subcutaneous injection of 2·5 or 5·0 μC. acetate-1-^{14}C and were killed 3, 12 or 30 min. later. Fatty acids were isolated from organs and from the carcases and assayed for ^{14}C activity. The speed of incorporation of acetate into fatty acids in the different tissues examined was too great to allow comparison of rates of lipogenesis.

2. Acetate-1-^{14}C or glucose uniformly labelled with ^{14}C was injected into the caudal vein of starving mice. The animals were killed after 3, 12 or 30 min. and the fatty acids of tissues were assayed for ^{14}C activity. The specific activity of the fatty acids isolated from intercapsular fatty tissue, lung and intestine was greater than that of liver fatty acids, and it is concluded that the role of the liver in lipogenesis has been overestimated in the past.—G. A. Garton.

738

BATES, M. W., ZOMZELY, C. and MAYER, J. **Fat metabolism in three forms of experimental obesity. 4. 'Instantaneous' rates of lipogenesis *in vivo*.** *Amer. J. Physiol.*, 1955, **181,** 187–190. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

See also Abst. 5292, Vol. 25.

Groups of fed and fasting mice with hereditary obesity and diabetes or rendered obese by injection of goldthioglucose and of rats rendered obese by hypothalamic section were given intraperitoneal injections of ^{14}C-carboxyl-labelled acetate. The animals were killed 30 min. later and the extent of incorporation of ^{14}C into liver and carcase lipids was studied.

Between 60 and 70 per cent. of the incorporated ^{14}C was found in adipose tissue in control mice and 80 per cent. in control rats. In the fasting state the incorporation of ^{14}C-acetate was depressed in liver more than in peripheral tissue, indicating that fat formation in the liver is more dependent on feeding than it is in other parts of the body.

When they were fed to appetite the 3 types of obese animals, particularly the hypothalamic rats, deposited more liver and carcase fat than did their controls. Fasting obese-diabetic mice synthesised more fat than did their controls, but the

goldthioglucose mice and the hypothalamic rats did not.

The differences in fat synthesis are discussed in relation to the etiology of obesity.—G. A. Garton.

739

YOUNG, D. R. and COOK, S. F. **Body lipids in small mammals following prolonged exposures to high and low temperatures.** *Amer. J. Physiol.*, 1955, **181,** 72–74. [Dept. Physiol., Univ. California, Berkeley.]

The total lipid content of 3 groups of young male mice was estimated after they had been kept for 30 to 36 days at 4°, 24° (control) and 35° C., respectively; all received the same diet to appetite. The mice at 4° C. ate more than the controls, but deposited less body fat. The mice at 35° C. ate less than the controls but deposited similar amounts of body fat.

Similar results were obtained with groups of male and female rats kept under the same conditions as the mice for 150 and 130 days, respectively. The lipids were extracted separately from skin and carcase. The melting-point of carcase lipids showed a tendency to rise with environmental temperature but skin lipids showed about the same melting-point at all environmental temperatures.

G. A. Garton.

740

WILHELMJ, C. M., GUNDERSON, D. E., SHUPUT, D. and MCCARTHY, H. H. (with GREEN, G. B.) **The effect of diet on the blood pressure and heart rate of normal dogs. Animal fat.** *Amer. J. Digest. Dis.*, 1955, **22,** 219–227. [Dept. Physiol., Sch. Med., Creighton Univ., Omaha, Nebr.]

Dogs, 3 male and 3 female, were used. During 2 years they were given high-fat diets for 13 to 42 days on 2 to 6 occasions, each time after a prolonged fast. In the high-fat diets 50 per cent. or more of the energy was from beef fat or butter. Throughout the experiment blood pressure was estimated on 6 days weekly; total white blood cell and eosinophil counts were recorded daily. Liver function tests with bromosulphthalein were made frequently.

Four of the dogs showed gradual physiological changes. The fall in blood pressure normally associated with fasting was replaced in the fasting period either by failure of the blood pressure to fall or by a progressive increase. Blood pressure while the animals were on the high-fat diet was usually normal or low, though occasionally high. After several periods of high-fat diet the blood pressure of animals given a balanced high-energy diet was abnormally high; there was also pronounced and persistent eosinopenia. Three of the dogs were made to work on a treadmill or exposed to cold after several periods on the high-fat diet, but no exaggerated blood pressure change resulted.—G. A. Garton.

741

BEST, C. H., HARTROFT, W. S., LUCAS, C. C. and RIDOUT, J. H. **Effects of dietary protein, lipotropic factors, and re-alimentation on total hepatic lipids and their distribution.** *Brit. Med. J.*, 1955, i, 1439–1444. [Banting and Best Dept. Med. Res., Univ. Toronto.]

In 5 experiments on 300 rats, diets were given usually to appetite for 3 weeks; the rats were then killed and the livers were removed for histological examination and analysed for total lipids. In the first experiment 4 groups each of 6 rats were given diets containing 3, 6, 9 or 18 per cent. protein as casein, the total methionine being kept constant at 0·54 per cent.; in the second experiment the total methionine was again kept constant at 0·54 per cent. for 5 groups of 8 rats which received a diet with either fibrin or soya bean protein or mixtures of these. In the third experiment groups of 10 rats were given 3 per cent. casein without or with 0·45 per cent. DL-methionine, or a high-protein diet containing less than half as much methionine as in 18 per cent. casein; these diets were given alone or supplemented with 0·5 per cent. choline chloride. In the fourth experiment the effect was studied of a diet containing only 2 per cent. soya bean protein plus 1 per cent. groundnut protein, given for 85 days. In the fifth experiment 40 rats were given the 3 per cent. casein diet supplemented with methionine to make it equivalent in that respect to the 18 per cent. casein diet, both diets containing 0·5 per cent. choline chloride; pairs of rats were killed after 2, 4, 8 and 16 days and the remaining 32 were transferred to the 18 per cent. casein diet; groups of 8 rats were then killed after 3, 7, 14 and 21 days. Another 25 rats were given "master fox chow"; during the first 16 days they were pair-fed with those on the low-protein diet; 5 rats were then killed, the remainder were allowed the chow to appetite and groups of 5 were killed after 3, 7, 14 and 21 days.

Inadequate supply of protein resulted in the rapid appearance of stainable fat in periportal regions of the liver, without the massive accumulation of hepatic lipids seen in choline deficiency; in rats on diets containing a moderate amount of fat and 9 per cent. or less of protein supplementary choline did not completely prevent the accumulation of fat in periportal regions of the liver. The transference of rats from the low- to the adequate-protein diet produced a dramatic appearance of a transient fatty liver, the fat appearing in periportal regions only; during the 3 weeks on the adequate protein intake the hepatic lipids returned to normal. The rats on the commercial chow diet did not develop fatty livers.—G. F. Garton.

742

WILGRAM, G. F. and HARTROFT, W. S. **Pathogenesis of fatty and sclerotic lesions in the cardiovascular system of choline-deficient rats.** *Brit. J. Exp. Pathol.*, 1955, **36,** 298–305. [Banting and Best Dept. Med. Res., Univ. Toronto.]

For details of the diets and experimental procedures see Absts. 3240, Vol. 23 ; 822, 839, Vol. 25. The choline-deficient rats had coronary arterial lipoidosis, gross aortic sclerosis and myocardial necrosis in both acute and chronic form. When the diet was supplemented with choline no comparable lesion was seen. The initiation of the cardiovascular lesions was accompanied by deposition of stainable fat, which appeared within a few days in heart muscle cells that subsequently became necrotic. Intimal fat in coronary arteries preceded endothelial hypoplasia and narrowing of the lumen. Fat deposits in the aorta were followed by the development of intimal plaques and calcification and necrosis of the underlying media. The walls of coronary arteries, aortas and cardiac muscle fibres showed a positive haemosiderin reaction. When cholesterol was added to the choline-deficient diet the pathological effects of choline deficiency were aggravated, though serum cholesterol values were not altered.—G. A. Garton.

743

HARTROFT, W. S. **Effects of various types of lipids in experimental hypolipotropic diets.** *Federation Proc.*, 1955, **14,** 655–660. [Dept. Pathol., Med. Sch., Washington Univ., St. Louis, Mo.]

744

BENTON, D. A., HARPER, A. E., WINJE, M. E. and ELVEHJEM, C. A. **Compounds other than threonine that affect fat deposition in the livers of rats fed low protein diets.** *J. Biol. Chem.*, 1955, **214,** 677–684. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

For earlier related papers see Absts. 3211, 3213, Vol. 23 ; 710, Vol. 24 ; 819, Vol. 25. Groups of male weanling rats were fed on a low-protein diet containing choline and methionine, to which were added single amino-acids and other substances containing N.

Leucine, glutamic acid, aspartic acid and benzoic acid prevented excess deposition of fat in liver. Equimolar amounts of glycine, serine and glutamic acid caused reductions of the same order in the amount of liver fat which accumulated, though an equivalent supplement of choline was more effective. Ammonium citrate, ammonium acetate and urea did not reduce liver fat.

G. A. Garton.

745

WEITZEL, G., SCHÖN, H., GEY, F. and KALBE, H. Stoffwechselversuche mit Fettsäuren mittlerer Kettenlänge. 1. Fettsäuren mittlerer Kettenlänge im Hautstoffwechsel. [**Metabolism experiments with fatty acids of intermediate chain length. 1. Fatty acids of intermediate chain length in skin metabolism.**]

GEY, F., SCHÖN, H., KALBE, H. and WEITZEL, G. 2. Mittlere Fettsäuren im Hautstoffwechsel bei cholinarmer Kost. [**2. Intermediate fatty acids in skin metabolism on a low-choline diet.**]

SCHÖN, H., GEY, F., STRECKER, F. J. and WEITZEL, G. 3. Futterungsversuche mit Laurinsäureestern. [**3. Feeding experiments with lauric acid esters.**] *Hoppe-Seyler's Ztschr.*, 1955, **301,** 118–131 ; 132–142 ; 143–155. [Med. Forschungsanst., Max-Planck-Gesellsch., Göttingen.]

1. See Abst. 3836, Vol. 25.

2. The methods were similar to those described in part 1. The low-choline basal diet contained, per cent., ethanol-extracted casein 8, gelatine 12, cellulose powder 5, wheat germ oil 1, cod liver oil 1, vitamin mixture (containing vitamin B_1, riboflavin, pyridoxine, Ca pantothenate and nicotinic acid) 1 and salt mixture 4, with from 10 to 40 per cent. of the glycerides or fat to be studied, and sucrose to 100.

When the mixture of C_8, C_{10} and C_{12} triglycerides formed 37 or 40 per cent. of the diet the rats lost weight, but at no concentration did it produce fatty livers, though lard or olive oil did. The amount and composition of fatty acids in the skin and subcutaneous tissue were similar to those found when the diet contained choline. It was concluded that choline has no lipotropic effect on the fat metabolism of the skin.

3. The methods and diets were those described above, but the stock or choline-free experimental diets included 10 or 35 per cent. lauric acid ethyl ester, or 10 per cent. of this ester plus 30 per cent. trilaurin, or 35 per cent. lauric acid methyl ester.

With small amounts of the triglyceride or the esters the total fatty acids of skin and subcutaneous tissue, especially the latter, contained up to 7 per cent. lauric acid. The choline content of the diet did not affect this deposition. With large amounts of esters, 35 to 40 per cent. of the diet, and the low-choline diet, only 5 out of 53 rats died, but these 5 and many of the survivors were found to have damaged hearts.—D. Duncan.

746

LOSSOW, W. J. and CHAIKOFF, I. L. **Carbohydrate sparing of fatty acid oxidation. 1. The relation of fatty acid chain length to the degree of sparing. 2. The mechanism by which carbohydrate spares the oxidation of palmitic acid.** *Arch. Biochem. Biophys.*, 1955, **57,** 23–40.

[Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

1. Fasted and carbohydrate-fed rats were injected intravenously with ^{14}C-carboxyl-labelled fatty acids of the even series C_8 to C_{16} and the triglycerides of ^{14}C-carboxyl-labelled palmitic and capric acids. The respired CO_2 was collected for 24 hr. and examined for radio-activity; specific activity : time curves were derived for each animal.

Oxidation of the fatty acids to CO_2 was less in the carbohydrate-fed than in the starving rats and this sparing action was more pronounced with the longer-chain acids. The sparing action lasted several hours, to be followed by a second rise in specific activity of respiratory CO_2.

2. To study further the sparing action of carbohydrate on fatty acid oxidation, palmitic acid-1-^{14}C was injected into fasting and carbohydrate-fed rats which were killed 5 hr. later. Triglycerides were isolated from the liver and carcase lipids and the ^{14}C content of the carboxyl carbon atom and the decarboxylated portions of the 16- and 18-carbon atom fatty acids was estimated; the liver and carcase, after extraction of lipids, were extracted with 10 per cent. trichloroacetic acid and the extracts were combined with aqueous extracts obtained in the course of extraction of the lipids. This combination of aqueous solutions was examined for ^{14}C. It was concluded that carbohydrate spared oxidation of palmitic acid by restricting breakdown of the molecule, rather than by promotion of synthesis from acetyl-S-coenzyme A, the known breakdown product of long-chain fatty acids.—G. A. Garton.

747

PRIVETT, O. S., PUSCH, F. J. and HOLMAN, R. T. **Polyethenoid fatty acid metabolism. 8. Non-potency of *cis*-9, *trans*-12-linoleate as essential fatty acid.** *Arch. Biochem. Biophys.*, 1955, **57**, 156–162. [Hormel Inst., Univ. Minnesota, Austin.]

For part 7 see Abst. 4820, Vol. 24.

Forty male rats were fed for 10 months from weaning on a fat-free diet, on which they showed the skin signs of essential fatty acid deficiency. They were then divided into 8 groups of 5 and were given the fat-free diet for 1 month, but supplemented with (1) 3 per cent. urea, (2) 0·4 per cent. ethyl linoleate, (3) 4·0 per cent. ethyl linoleate, (4) 0·4 per cent. ethyl *cis*-9, *trans*-12-linoleate and 3·6 per cent. urea, (5) 4·0 per cent. ethyl *cis*-9, *trans*-12-linoleate, (6) 3·6 per cent. ethyl linolenate, (7) 3·6 per cent. ethyl linolenate and 0·4 per cent. ethyl linoleate and (8) 3·6 per cent. ethyl linolenate and 0·4 per cent. ethyl *cis*-9, *trans*-12-linoleate. All the substances added to diets 2 to 8 were in the form of urea-inclusion compounds (see Abst. 2286, Vol. 25). At the end of the experiment the rats were killed and total carcase fat was analysed for polyunsaturated fatty acids by the alkali-isomerisation technique; representative fat samples were examined in an infrared spectrophotometer for the presence of *trans*-acids.

Ethyl *cis*-9, *trans*-12-linoleate could not replace essential fatty acids, as judged by its effect on water intake, growth or skin condition. The *cis-trans* isomer was unable to promote the utilisation of linolenate, as judged by skin signs and water intake, but rats given linolenate plus the *cis-trans* isomer of linoleate gained more weight than those given either supplement singly. All the rats given linolenate produced body fat of high pentaenoic and hexaenoic fatty acid and low tetraenoic fatty acid content. *Trans* double bonds derived from the *cis-trans* linoleate were found in body fat. Linoleate must therefore be of the *cis-cis* configuration, as it occurs naturally, to possess complete biological activity as an "essential" fatty acid.—G. A. Garton.

748

PEIFER, J. J. and HOLMAN, R. T. **Essential fatty acids, diabetes, and cholesterol.** *Arch. Biochem. Biophys.*, 1955, **57**, 520–521. [Hormel Inst., Univ. Minnesota, Austin.]

Male weanling rats were given a diet deficient in essential fatty acids (Abst. 2286, Vol. 25) and 4 days later were made diabetic by injection of alloxan. The animals were then divided into 4 groups, one of which continued to receive the deficient diet, while the others received supplements of 1 per cent. maize oil esters, or 1 per cent. cholesterol, or both. To ensure that diabetes was maintained a second injection of alloxan was given a fortnight after the first. After 31 days the change in weight and the condition of the skin were recorded.

The diabetic animals were rapidly depleted of essential fatty acids; the rate of growth and the appearance of the skin at 31 days were similar to those usually found after 3 months of depletion. Cholesterol did not appear to influence the development of essential fatty acid deficiency in diabetic rats.

Deficiency of essential fatty acids in the diabetic rat and deficiency intensified by dietary cholesterol in non-diabetic rats are similar, and it is suggested that atherosclerosis may be a manifestation of deficiency of essential fatty acids or faulty metabolism of these acids.—G. A. Garton.

749

JOHNSON, R. B. **The effects of the administration of acetic, propionic, and *n*-butyric acids upon the blood glucose and ketone body levels of goats.** *Cornell Vet.*, 1955, **45**, 273–290. [Live

Stock Sanit. Serv. Lab., Univ. Maryland, College Park.]

Acetic, propionic and *n*-butyric acid alone or in combination were given to goats by vein or into the rumen. Acetic and *n*-butyric acid formed ketone bodies, but this action was counteracted by propionic acid. Propionic acid raised blood glucose. The experimental method did not allow fine observations on blood glucose, but it was clear that acetic and *n*-butyric acid did not raise it as much as propionic acid.—T. D. Bell.

750

HALDEN, W. Cholesterin und Ernährung. [**Cholesterol and nutrition.**] *Lebensmittel u. Ernährung*, 1955, **8,** No. 7, 6–7. [Univ. Graz.]

751

WILKINSON, C. F. (Jr.), BOYLE, E., JACKSON, R. S. and BENJAMIN, M. R. **Effect of varying the intake of dietary fat and the ingestion of sitosterol on lipid and lipoprotein fractions of human serum.** *Metabolism*, 1955, **4,** 302–309. [Dept. Med., Post-Grad. Med. Sch., Univ. New York.]

Seven hospital patients were used in this study; 4 had angina pectoris, 2 had *xanthoma tuberosum* and/or *tendinosa* (1 of these also had angina) and the last was a child with nephrosis. Blood lipids were estimated and serum was analysed by the ultracentrifuge at intervals. The patients were successively given 4 different diets; (1) a mixture of foodstuffs yielding less than 0·25 g. fat daily, (2) an isocaloric mixture of the same N content, but containing 49 g. coconut oil daily, (3) the coconut oil diet with 30 to 60 ml. of an emulsion containing $16\frac{2}{3}$ per cent. sitosterols and (4) food of the patient's own choice, with more than 30 ml. daily of the sitosterol emulsion.

The low-fat diet initially depressed serum total cholesterol in all 7 patients; this trend was arrested or reversed during the second week of fat restriction. The serum cholesterol was not affected in 35 weeks by the addition of sitosterols to the high-fat diet or to free-choice diets. Considerable individual variation in lipoprotein values occurred and no single component could be directly compared with total serum cholesterol in all patients, though the beta$_1$(— S 28–44) fraction seemed to follow the cholesterol more than any other lipid component.—G. A. Garton.

752

BARBER, J. M. and GRANT, A. P. **The serum cholesterol and other lipids after administration of sitosterol.** *Brit. Heart. J.*, 1955, **17,** 296–298. [Ards and Bangor Hosps., Belfast.]

Twenty-six human subjects with coronary artery disease all had initial serum cholesterol values of 230 mg. per 100 ml. or more. β-Sitosterol, 9 g. daily, was given in the form of palatable biscuits and weekly or fortnightly estimations of serum total cholesterol, lipoid P, total lipids and neutral fats were made.

The administration of β-sitosterol brought about a fall in serum total cholesterol which was suggestive, but not significant. In a note added after completion of the paper it is stated that a rapid and consistent fall in serum cholesterol occurred in 6 other patients given 18 g. sitosterol daily.

G. A. Garton.

753

BEST, M. M., DUNCAN, C. H., VAN LOON, E. J. and WATHEN, J. D. **The effects of sitosterol on serum lipids.** *Amer. J. Med.*, 1955, **19,** 61–70. [Dept. Med., Sch. Med., Univ. Louisville, Ky.]

Fourteen subjects, of whom 12 had high serum cholesterol levels, were allowed food to appetite and were given 6 to 8 g. of β-sitosterol by mouth immediately before meals for from 13 to 64 weeks; the usual intake of β-sitosterol was 20 to 25 g. daily. Fasting blood samples were analysed at intervals for total cholesterol, lipid P and total lipid. In 7 subjects the effect of sitosterol on serum lipoproteins, as estimated by ultracentrifuge, was studied.

A sustained fall of serum total cholesterol occurred, with concomitant reduction in serum total lipid, neutral fat and, to a less extent, lipid P. There was a trend towards lower levels of the S_f 3–10, 10–30 and 30–100 fractions of lipoproteins; this effect was less consistent than the effect on serum total cholesterol. It is suggested that sitosterol interferes with cholesterol absorption by competing with it for esterification in transport mechanisms.—G. F. Garton.

754

LIN, T. M., KARVINEN, E. and IVY, A. C. **Capacity of the rat intestine to absorb cholesterol.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 422–423. [Dept. Clin. Sci., Univ. Illinois Coll. Med., Chicago.]

Four groups of 6 rats received the same amount of basal fat-free diet plus 2 g. oleic acid every second day for 40 days. Three groups were given a daily supplement of 96, 192 or 288 mg. cholesterol. Faecal cholesterol level showed that the amount of cholesterol absorbed reached a plateau when the intake was 192 mg. per 250 g. rat daily.

G. A. Garton.

755

HERNANDEZ, H. H., CHAIKOFF, I. L. and KIYASU, J. Y. **Role of pancreatic juice in cholesterol absorption.** *Amer. J. Physiol.*, 1955, **181,** 523–526. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

The common bile duct of male rats was cannulated at the duodenal junction and a second cannula was inserted into the duodenum for the introduction of secretions from donor rats; a third cannula was introduced into the thoracic duct to permit collection of lymph. Cholesterol labelled with ^{14}C was given by stomach tube to these rats and the extent of intestinal absorption was judged by the recovery of ^{14}C from the lymph.

The rats lost the capacity to absorb cholesterol, and this was not restored by continuous administration of pancreatic juice through the duodenal cannula. The administration of bile alone brought about some absorption of labelled cholesterol, but much less than in control animals. Normal cholesterol absorption was established when bile and pancreatic juice were given together. Homogenates of duodenum prepared from animals with diverted pancreatic secretion gradually lost the capacity to esterify cholesterol; after 24 hr., when the rats were no longer able to absorb cholesterol, the esterifying power of duodenal tissue was almost nil.—G. A. Garton.

756

MNUKHINA, E. S. O potreblenii fosfatidov i kholesterina pri myshechnoi rabote. [**The utilisation of phosphatides and cholesterol in muscular work.**] *Fiziol. Zh. SSSR Sechenova*, 1955, **41**, 89–94. [Nauch.-Issled. Inst., Leningrad.]

Phospholipin and cholesterol were estimated: on blood samples from athletes taken before and after different periods and types of severe exercise; on frog gastrocnemius muscle after electrical stimulation; on the blood and gastrocnemius muscle of cats after stimulation of the peripheral end of the cut sciatic nerve; and on rat liver, muscle, brain and blood after swimming. In all experiments a brief period of muscular work was associated with a rise, and a prolonged period with a fall in both phospholipin and cholesterol value. This is held to indicate utilisation of these substances in prolonged work.—D. W. Taylor.

757

ZILVERSMIT, D. B., MCCANDLESS, E. L. and SHORE, M. L. **Phospholipide metabolism in various tissues of cholesterol-fed rabbits.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 48–51. [Div. Physiol., Univ. Tennessee, Memphis.]

Two groups of rabbits were fed on 100 g. rabbit chow daily for 5 months; in addition the experimental group received 1 g. cholesterol dissolved in 2·8 g. fat daily. All animals then received an intravenous injection of 0·5 to 1·0 mC. ^{32}P in labelled phosphate; 6 hr. later they were killed and samples of blood, organs and tissues were taken for extraction of phospholipins and assay of their ^{32}P activity.

The rabbits given cholesterol showed greater incorporation of ^{32}P into the phospholipins of aorta, plasma and liver, but not in lung, small intestine, kidney and muscle. The livers of the cholesterol group showed a greater increase in tissue mass than was caused by fatty infiltration; a possible relation between phospholipin turnover and fatty infiltration is discussed.—G. A. Garton.

758

RICE, C. E., DUHAMEL, L. and GIRARD, A. **The effect of prolonged injection of ethionine on rabbits and guineapigs fed a high cholesterol diet. 1. On complement titre.**

PLUMMER, P. J. G., BOULANGER, P., CORNER, A. H. and RICE, C. E. **2. On the development of pathological lesions.**

RICE, C. E., BOULANGER, P. and DUHAMEL, L. **3. On serum lipids.** *Canad. J. Comp. Med.*, 1955, **19**, 167–171; 201–212; 256–263. [Div. Animal Pathol., Canada Dept. Agric., Animal Dis. Res. Inst., Hull, Que.]

1. When guineapigs received repeated subcutaneous injections of ethionine a decline in complement titres occurred whether or not the stock pellet diet was supplemented with cholesterol. Complement titres of guineapigs given cholesterol but not treated with ethionine were comparable to those of control animals on the same diet.

In rabbits injected repeatedly with ethionine for 7 weeks to 6 months the complement titre also fell, but less in animals given cholesterol than in those given the stock diet. Higher complement titre was found in rabbits given cholesterol but not injected with ethionine; this increase was frequently to levels higher than those in controls given the stock ration.

2. None of the ethionine-treated rabbits on the stock diet showed atheromatous lesions of the aorta and vessels of the heart, but similarly treated animals given cholesterol showed after $3\frac{1}{2}$ to 6 months lesions similar in extent and distribution to those in rabbits given cholesterol but no ethionine. Guineapigs in similar studies showed no atheromatous lesion of the aorta or heart vessels.

3. Total lipids, cholesterol and lipid P were estimated in serum from the rabbits and guineapigs described above. In the guineapigs treated with ethionine, serum total lipids and cholesterol were lower than in untreated animals given corresponding diets. Treatment with ethionine had no effect on the serum cholesterol of rabbits on the stock diet, but appeared to reduce cholesterol values in animals given cholesterol. The lipid P content of the pooled sera of both groups of rabbits treated with ethionine tended to be slightly higher

than that of the corresponding controls on the same diet.—G. A. Garton.

759

SHORE, M. L., ZILVERSMIT, D. B. and ACKERMAN, R. F. **Plasma phospholipide deposition and aortic phospholipide synthesis in experimental atherosclerosis.** *Amer. J. Physiol.*, 1955, **181,** 527–531. [Div. Physiol., Univ. Tennessee, Memphis.]

Plasma containing phospholipins labelled with ^{32}P was injected intravenously into 6 normal rabbits and 6 given cholesterol. After 2, 4, 6 and 10 hr. blood samples were taken, then the rabbits were killed and the entire thoracic aorta and 5 g. liver were taken for analysis.

The concentration of phospholipins in the aortas of the animals given cholesterol was about 126 per cent. greater than normal. The differences in phospholipin content of the whole aorta were even greater, with an increase of about 440 per cent. The deposition of plasma phospholipins accounted for a tenth or less of the phospholipins present in the atheromatous thoracic aortas.—G. A. Garton.

760

WILGRAM, G. F., BEST, C. H. and BLUMENSTEIN, J. **Aggravating effect of cholesterol on cardiovascular changes in choline deficient rats.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 476–479. [Banting and Best Dept. Med. Res., Univ. Toronto.]

Groups of rats were fed on high-fat choline-deficient diets with 1, 2 or 4 per cent. cholesterol. The cholesterol increased the incidence of cardiovascular lesions. The significance of kidney damage in the etiology of the condition is discussed. When choline was incorporated in the diet containing 4 per cent. cholesterol, no significant change in the cardiovascular system was found, although the fat content of the liver rose. The role of choline in the production of experimental arteriosclerosis is discussed.—G. A. Garton.

761

GUTMANN, N. and CONSTANTANIDES, P. **Inhibition of experimental atherosclerosis by sulfated alginic acid.** *Arch. Pathol.*, 1955, **59,** 717–722. [Dept. Anat., Univ. British Columbia, Vancouver.]

762

NICHOL, J. T. **The effect of cholesterol feeding on the distensibility of the isolated thoracic aorta of the rabbit.** *Canad. J. Biochem. Physiol.*, 1955, **33,** 507–516. [Dept. Biophys., Univ. W. Ontario, London.]

An apparatus is described for measuring the pressure-volume relations of the isolated aorta of the rabbit. It was demonstrated that in young rabbits fed on cholesterol there was destruction of elastic tissue in the aorta during development of atherosclerosis, so that the vessel was more distensible at low pressures; at pressures above 70 mm. Hg the effect of the loss of elastic tissue was masked by the presence of proliferated collagenous tissue.—G. A. Garton.

763

WELLS, W. W., COLEMAN, D. L. and BAUMANN, C. A. **Intestinal sterols. 1. Δ^7-Cholestenol and 7-dehydrocholesterol in feces.** *Arch. Biochem. Biophys.*, 1955, **57,** 437–444. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Chromatography of the unsaponifiable matter of faeces from rats on a fat-free diet showed the presence of Δ^7-cholestenol, cholesterol, coprosterol and 7-dehydrocholesterol. Substantial amounts of Δ^7-cholestenol were identified in the faeces of man, dog and guineapig; 7-dehydrocholesterol was present in guineapig faeces, but only traces were found in human and dog faeces. The sterol content of the faeces of rats was not altered by a variety of dietary constituents including fats, dextrin, lactose, squalene and sulphasuccidine. It is concluded that much of the faecal Δ^7-cholestenol and 7-dehydrocholesterol originates in the intestinal mucosa.—G. A. Garton.

764

KANDUTSCH, A. A. and BAUMANN, C. A. **Skin sterols. 9. Effect of squalene on the sterols of mouse skin.** *Arch. Biochem. Biophys.*, 1955, **56,** 356–362. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Chromatographically purified squalene was given as 1 or 2 per cent. of a synthetic diet to groups of rats and mice for 1 or 2 days, and a 30 per cent. solution of squalene in acetone was applied daily or thrice weekly, 4 drops each time, to the backs of young adult mice for up to 3 weeks.

Dietary squalene did not affect the amount of Δ^7-cholestenol in the livers of rats or mice. Analysis of skin lipids showed that the application of squalene to the skin of young mice resulted in an accumulation of Δ^7-cholestenol and cholesterol in the epidermis; the skin of adult mice, which normally contains more Δ^7-cholestenol, was less sensitive to squalene.—G. A. Garton.

See also Absts. 533, 573, 575, 598, 687, 749, 821, 823, 824, 902, 981.

MINERALS

GENERAL

See Abst. 1153.

CALCIUM AND PHOSPHORUS

765

SUR, B. K. and SUBRAHMANYAN, V. **Utilization of calcium and phosphorus in the poor rice diet supplemented with lucerne or milk powder.** *Indian J. Med. Res.*, 1955, **43**, 231–235. [Central Food Technol. Res. Inst., Mysore.]

Weanling rats were divided into 4 groups of 8. Three groups were given modifications of a basal diet of polished rice 78·5, tur dhal (*Cajanus indicus*) 5, fat 5, non-leafy vegetables 8·2, leafy vegetables 2·1, whole milk powder 0·9 and NaCl 0·3 per cent.; in the experimental diets rice, 5 per cent., was replaced by whole milk powder, equal quantities of whole milk powder and tender lucerne-leaf flour, or lucerne alone. The rats received the diets for 4 weeks and were killed and analysed for body Ca and P; initial body Ca and P were estimated in the fourth group at the beginning of the experiment.

The percentages of Ca and P in the newly-weaned rats and those on the milk, milk plus lucerne and lucerne diets, in that order, were 0·72 ± 0·014, 0·59 ± 0·012, 0·62 ± 0·014, 0·68 ± 0·009 and 0·536 ± 0·008, 0·45 ± 0·006, 0·45 ± 0·008, 0·48 ± 0·006.—G. F. Garton.

766

LEVINSKAS, G. J. and NEUMAN, W. F. **The solubility of bone mineral. 1. Solubility studies of synthetic hydroxylapatite.** *J. Phys. Chem.*, 1955, **59**, 164–168. [Sch. Med. Dent., Univ. Rochester, N.Y.]

767

FLÜCK, P. Ein Beitrag zum Einfluss von Fluor auf die Calciumausscheidung bei der Milchziege. [**The effect of fluorine on the excretion of calcium by the lactating goat.**] *Thesis, Univ. Berne*, 1955, pp. 21.

A lactating goat received by stomach tube every other day, for a total of 10 doses, 100 ml. of Ca lactobionate solution containing ^{45}Ca. It was fed on oats, with hay to appetite, and was milked once daily. The ^{45}Ca activity was estimated daily in milk and blood until it had almost disappeared. The experiment was then repeated, but the goat received by tube, as well as the ^{45}Ca and at a different time of day, 5 mg. NaF in water daily. Since the goat drank about 4 litres of water daily, this was equivalent to 1·25 mg. NaF per litre.

Except on the first day on which ^{45}Ca was given, the milk was always more radio-active than the blood. The activity in the blood was always low and sometimes absent on the days on which no ^{45}Ca was given, but that in the milk was usually higher on these days. When the ^{45}Ca was withdrawn the blood was almost inactive in 2 days, but milk activity declined slowly for 2 weeks.

When NaF was given there was no adverse effect on appetite or milk yield. The ^{45}Ca activity in the blood was increased and the output in the milk in the first 21 days was double that in the corresponding days without NaF. When the ^{45}Ca was withdrawn the activity of the milk declined more slowly. Most of the activity in milk was in the casein fraction.—D. Duncan.

768

HOGAN, A. G., HOUSE, W. B. and REGAN, W. O. **Effect on guinea pigs of consuming an excessive quantity of phosphates.** *Univ. Missouri Agric. Exp. Stat. Res. Bull.* No. 567, October 1954, pp. 8.

A colony ration supplying 1·2 per cent. Ca and 0·9 per cent. P proved satisfactory for growth and reproduction of guineapigs, although animals over 18 months old sometimes developed sore and stiff joints with visible deposits of calcium phosphate. When the P was increased to 1·6 per cent. for 6 guineapigs, all developed stiffness within about 16 weeks and 5 had deposits of calcium phosphate within about 19 weeks. Guineapigs grew more slowly when fed on a synthetic diet containing about 1 per cent. each of Ca and P than on the colony ration, and 2 of 15 animals had deposits. When P in this diet was increased to 1·65 per cent. growth was depressed still more and 30 of 41 animals had deposits.—A. Hepburn.

See also Absts. 331, 332, 334, 335, 545, 677, 828, 863, 1025, 1026, 1167, 1222.

MAGNESIUM

769

TAPLEY, D. F. **Magnesium balance in myxedematous patients treated with triiodothyronine: preliminary note.** *Bull. Johns Hopkins Hosp.*, 1955, **96**, 274–278. [Dept. Physiol. Chem., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

See also Absts. 338, 583, 1167.

SODIUM, POTASSIUM, AND SODIUM CHLORIDE

770

CLARKE, E., EVANS, B. M., MACINTYRE, I. and MILNE, M. D. **Acidosis in experimental electrolyte depletion.** *Clin. Sci.*, 1955, **14**, 421–440. [Dept. Med., Postgrad. Med. Sch., London.]

In 10 experiments on 3 healthy men the effects of administration of ammonium chloride with a normal diet and during NaCl and K depletion were studied. Each experiment lasted 5 to 7 days, with an interval of at least 3 weeks on a normal diet between successive experiments. During K depletion 1 g. NaCl was taken 4 times a day; during NaCl depletion 1 g. anhydrous K_2HPO_4 was taken 4 times a day. Ammonium chloride was taken as 6 doses, each of 2 g., evenly spaced during waking hours. The low K diet used has been described previously (Abst. 4885, Vol. 24); the Kempner rice diet was used for NaCl depletion and a preliminary intramuscular injection of 2 ml. Mersalyl was given to increase NaCl excretion. Analyses of urine were made; the faecal output of electrolytes was found to be negligible.

In NaCl deficiency the capacity of the kidney to synthesise and excrete ammonia was reduced, but the *p*H of urine was normal. In K deficiency there was impaired ability to secrete urine of maximum acidity, but ammonia excretion was normal. It was confirmed that ammonia excretion depends on both urine *p*H and systemic acid base balance.

G. F. Garton.

771

KRNJEVIĆ, K., KILPATRICK, R. and AUNGLE, P. G. **A study of some aspects of nervous and muscular activity during experimental human salt deficiency.** *Quart. J. Exp. Physiol.*, 1955, **40,** 203–216. [Dept. Physiol., Univ. Edinburgh.]

Salt depletion was produced in 2 men by a low-salt diet and sweating under a hot cradle for an hour twice daily for 10 days. The diet consisted mainly of salt-free bread and margarine, lean meat, potatoes, fresh fruit and green vegetables cooked without salt, and provided about 3000 Cal., 70 g. protein and 16 m. equiv. Na daily. Fluid intake was at least 3 litres daily.

The symptoms of salt deficiency were as described by McCance (Abst. 997, Vol. 6). Weight losses were 4 and 4·5 kg. Plasma Na fell from 134 to 121 m. equiv. per litre in one subject and from 136 to 128 in the other. The diuretic response to a water load was reduced. There was no change in gastric emptying time. There was no significant change in maximum work performed on a fly-wheel or in time of muscular contraction. Differences in the refractory period of the ulnar nerve and decrease in the height of muscle action potential during high frequency stimulation were found in one subject. In the encephalogram the only change, seen in both subjects, was a slight fall in mean alpha frequency.

It was concluded that the quantitative changes in nervous and muscular activity are probably too small to be detected without studying a large number of subjects.—D. Duncan.

772

RENWICK, R., ROBSON, J. S. and STEWART, C. P. **Observations upon the withdrawal of sodium chloride from the diet in hypertensive and normotensive individuals.** *J. Clin. Invest.*, 1955, **34,** 1037–1043. [Dept. Clin. Chem., Univ. Edinburgh.]

Six normal subjects and 6 patients with high blood pressure were given a low-sodium diet supplying 8 m. equiv. Na daily with NaCl added in amounts from 3 to 6 g. daily. Excretion of electrolytes became stable in from 4 to 5 days and, after it had been so for from 7 to 14 days, the salt was withdrawn. Estimations of bodyweight change, volume of urine and amounts of Na, K and Cl in urine and blood serum and of N in urine showed no significant difference between the groups. In all subjects after removal of the salt bodyweight fell during the first 48 hr. and output of K in urine rose, the balance of K being negative usually for a week and in 1 subject for 18 days. There was no associated rise in excretion of N. It is suggested that the change in metabolism of K was due to an increase in adrenocortical activity immediately after salt was withheld.—D. Harvey.

773

HORVATH, B., BERG, L., CUMMINGS, D. J. and SHY, G. M. **Muscular dystrophy. Cation concentrations in residual muscle.**

BERG, L., EBAUGH, F. G. (Jr.), SHY, G. M., HORVATH, B. and CUMMINGS, D. J. **Blood content of dystrophic muscles.**

SHY, G. M., CUMMINGS, D. J., BERG, L. and HORVATH, B. **Potassium exchange in residual muscle.** *J. Appl. Physiol.*, 1955, **8,** 22–30; 31–32; 33–36. [Branch Med. Neurol., Nat. Inst. Health, Bethesda, Md.]

In the first paper the Na and K contents of residual muscle fibres were calculated on the basis of estimations of total water, total Na and K, intracellular water and blood content of tissue obtained by biopsy. In the text and in an addendum the methods and their theoretical implications are described and discussed in detail. Samples of tissue were taken from 20 patients and from 4 control subjects. In the diseased compared with normal conditions the total and intracellular water contents of muscle were low; in muscle fibres the intracellular K was low and the intracellular Na high. The correlation between fall in concentration of K and rise in that of Na was significant.

A simple method with radio-active isotopes ^{42}K and ^{51}Cr or ^{131}I is described for estimating blood in biopsy specimens of muscle. The volume of blood in dystrophic did not differ from that in normal muscle.

Patients with muscular dystrophy and normal subjects were given ^{42}K by mouth and urine samples were collected for 22 hr. afterwards. In

the patients the means for amounts exchanged, 1095 and 597 m. equiv., respectively, were less than the mean, 1731 m. equiv. for the control subjects. At the end of the 22 hr., biopsy specimens of muscle were removed and examined by the above technique. An index of turnover of K in muscle, which was calculated from these data, was found in the dystrophic patients to be within the same range as for the normal subjects.

D. Harvey.

774

FINBERG, L. and HARRISON, H. E. **Hypernatremia in infants. An evaluation of the clinical and biochemical findings accompanying this state.** *Pediatrics*, 1955, **16**, 1–14. [Div. Paediat., Baltimore City Hosps., Md.] Spanish and Interlingua summaries.

An analysis was made of findings in 88 infants in whom concentrations of Na in serum were over 150 m. equiv. per litre. In 69 of these infants the cause of admission to hospital was diarrhoea. Mortality was 11·6 per cent., compared with just under 2 per cent. in a group of 205 children with severe diarrhoea and serum Na values below 150 m. equiv. per litre. Age distribution was not significantly different in the 2 groups, but there were more premature infants in the group with high serum Na. All the patients with high serum Na had a history of acute curtailment of water intake. In about two-thirds of them there was evidence of injury to the nervous system. Low serum Ca often accompanied high Na.

In the treatment of the condition the best results were obtained by the administration of fluids with a total Na concentration of from 15 to 40 m. equiv. per litre.—F. C. Aitken.

775

NATELSON, S. and ALEXANDER, M. O. **Marked hypernatremia and hyperchloremia with damage to the central nervous system.** *Arch. Int. Med.*, 1955, **96**, 172–175. [Labs., Rockford Mem. Hosp., Ill.]

In patients with brain damage high plasma Na and Cl values may persist despite adequate hydration. Two illustrative cases are reported and the dangers of prolonged treatment with non-saline fluids are emphasised.—F. C. Aitken.

776

GREEN, D. M., REYNOLDS, T. B. and GIRERD, R. J. **Effects of diet, salt intake and salt-loading on tissue sodium concentration and turnover.** *Amer. J. Physiol.*, 1955, **181**, 97–104. [Sch. Med., Univ. S. California, Los Angeles.]

The tissue Na concentration was expressed in terms of the ratio of the concentration in the tissue to that in the plasma, T : P ; the advantages of the comparison are discussed.

Adult rats were fed on Purina chow and water to appetite except during experiments. The low-salt diet in experiments lasting not more than 2 weeks was pure Lonalac, but for longer experiments sucrose, minerals and vitamins were added. For high salt intake this diet was supplemented with 0·86 per cent. saline instead of drinking water. ^{22}NaCl was given intraperitoneally or in the drinking water. The turnover of ^{22}Na in muscle after 2 weeks of low-Na diet was very slow ; after 2 weeks of high Na intake it was rapid. The T : P ratio was little affected. In rats given the high Na intake and then injections of ^{22}Na the soft tissues were analysed up to 12 days after the injection for ^{22}Na and ^{23}Na. For the first 96 hr. the distribution of ^{22}Na was similar to that of ^{23}Na, except that the former was higher in kidney and liver. After 96 hr. the T : P ratio of ^{22}Na fell. In longer experiments in which ^{22}NaCl was given in the drinking water the distribution of ^{22}Na in the soft tissues took more than 2 weeks to become constant, but from the third to the 14th week it changed little. The T : P of bone increased throughout the 14 weeks, but at the end equilibrium was near. It is suggested that all bone Na is completely exchangeable when sufficient time is allowed. High concentrations of ^{22}Na in whole bone were due to concentrations in the bone cortex, not so much to marrow.—D. Duncan.

777

TOBIAN, L. (Jr.) (with WHITE, L.) **Effect of a low sodium diet on electrolyte composition of arterial wall.** *Amer. J. Physiol.*, 1955, **181**, 599–601. [Dept. Biol. Chem., Harvard Med. Sch., Boston, Mass.]

Fourteen control rats were given to appetite a diet of water and rat chow containing 0·3 per cent. Na ; 10 similar rats received a diet containing 0·003 per cent. Na with all essential vitamins and minerals. After 5 weeks the rats were killed and their aortas were removed for analysis.

The rats on the low-Na diet had 12 per cent. less Na in their aortas on a dry weight basis than the control rats ; this difference was significant. The decrease in aorta Na on the low-Na diet was accompanied by a very slight rise in serum Na. The aortas of the rats on the low-Na diet had a significantly higher P content than the aortas of the control rats. There was no significant difference between the two groups in water, K or Mg content of the aorta. The average blood pressure of rats on the low-Na diet was 10 mm. Hg lower than that of controls ; this difference was not significant.—G. F. Garton.

778

BERGSTROM, W. H. **The participation of bone in total body sodium metabolism in the rat.** *J.*

Clin. Invest., 1955, **34,** 997–1004. [Dept. Paediat., New York State Univ. Coll. Med., Syracuse.]

Seven rats were depleted of Na and made acidotic by peritoneal lavage with a solution of NH_4Cl and glucose until about 25 per cent. of the estimated total body Na was removed. The rats were then allowed water but no food for 48 hr. during which urine was collected and analysed for Na, after this they were killed and bone, blood and defatted carcase were analysed. Another 14 rats had stock diet and for 13 or 16 days were given acetazoleamide in the drinking water at the rate of 666 mg. per litre. Serum *p*H was studied. Six of these rats were then treated by lavage like the first group. Seven more rats after lavage and fasting for 48 hr. received intraperitoneally in 2 doses 200 ml. per kg. bodyweight of a solution containing, in m. equiv. per litre, Na 150, Cl 100 and HCO_3^-/50, and were killed after 24 hr. Another 9 after lavage and fasting were allowed 5 days on chow and water to appetite and were killed when they had regained 86 per cent. of the weight lost after lavage. Carcases of 20 controls on stock diet were analysed.

In the 48 hr. after lavage the total urine Na was less than 1 m. equiv. per kg. bodyweight daily. Of the total Na loss of 10·8 m. equiv. per kg., 28 per cent. was lost from extra bone Na (*i.e.*, that in excess of the amount predictable from Cl concentration), 20 per cent. from intracellular and 52 per cent. from extracellular Na. After acidosis produced by acetazoleamide total body composition was normal, but bone Na fell as much as after lavage and was not further reduced by subsequent lavage. During repair, whether this resulted from intraperitoneal administration of electrolytes or from normal feeding, there was no increase in bone Na, and apparently little or no Na retention could be ascribed to bone.—D. Duncan.

779

MUNTWYLER, E. and GRIFFIN, G. E. **Tissue electrolyte content of potassium and protein-deficient rats.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 349–352. [Dept. Biochem., Coll. Med., State Univ. New York.]

Apart from a slightly low plasma K concentration, rats fed for 5 weeks on a diet deficient in protein and K had no pronounced difference from normal in tissue electrolyte composition. Supplementing the diet with K restored the plasma K, but did not significantly affect the tissue electrolytes. The rats were in negative K and N balance.

When protein was added to the deficient diet there was a positive N balance and a growth response, but not as much as when K also was added. Chloride, Na and K balances were negative. The concentration of K fell in plasma, kidney, heart muscle and liver and especially in skeletal muscle. The calculated total K in liver and kidneys increased, but insufficiently to account for the loss from skeletal muscle and that not excreted.—A. Hepburn.

780

ST. GEORGE, S., FREED, S. C., ROSENMAN, R. H. and WINDERMAN, S. **Influence of potassium deprivation and adrenalectomy on potassium concentration of the myocardium.** *Amer. J. Physiol.*, 1955, **181,** 550–552. [Harold Brunn Inst. Cardiovascular Res., Mount Zion Hosp., San Francisco, Calif.]

781

HISSINK, L. A. G. De waarde van physiologische zoutoplossing en combinaties daarvan met glycose-oplossingen voor de behandeling van post-traumatische shock. [**Value of physiological saline alone or with glucose solution for the treatment of post-traumatic shock.**] *Nederland. Tijdschr. Geneesk.*, 1955, **99,** 2500–2505. [Prince Henry Hosp., Sydney.] English summary.

No agreement has been reached on the treatment of post-traumatic shock with isotonic saline solution. Glucose solutions or casein hydrolysate solutions are not recommended. The fear of pulmonary oedema seems unfounded in saline treatment after shock, and is probably due to the occurrence of this complication in patients with heart disease. Of 111 rats given traumatic shock the controls all died within 10 hr. Of those given saline infusion, 0·9 per cent. NaCl, 57 per cent. died in 10 hr., 81 per cent. in 24 hr. Two other groups were given saline plus 5 per cent. glucose and saline plus glucose plus 0·4 per cent. KCl. Their mortality rates were, respectively, 93 per cent. after 10 and all after 24 hr., and 86 and 91 per cent. Saline therefore seemed to give the best results without addition of glucose.—M. Eddison.

782

HUANG, K. C. **Effect of salt depletion and fasting on water exchange in the rabbit.** *Amer. J. Physiol.*, 1955, **181,** 609–615. [Dept. Physiol., Coll. Phys. Surg., Columbia Univ., New York.]

In 26 experiments on 16 rabbits the effect of salt depletion and food deprivation on water intake and urine output was studied. Extracellular electrolytes were depleted by intraperitoneal lavage, which produced immediate and profound depression lasting 24 to 48 hr. in all the animals; they usually stopped eating and drank less. Their plasma chloride level and plasma volume were reduced; the plasma protein level was raised. Of 11 rabbits given a low-salt diet all but one showed thirst and polyuria. Of 8 fasted

animals, all showed a gradual increase in plasma chloride and Na and 4 increased their water intake and urine output.—G. F. Garton.

See also Absts. 544, 1159.

HALOGENS

783

BURNETT, G. W. **The effect of fluorides on the organic and inorganic components of intact dentin.** *J. Dent. Res.*, 1955, **34**, 489–502. [Dept. Dent. Res., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

Sections of dentine were made from extracted human teeth which had not been exposed to fluoride during development. They were treated under standardised conditions for 144 hr. with solutions of NaF, CaF_2 or PbF_2 or of potassium or calcium monofluorophosphate and then with a decalcifying acid, lactic, acetic, butyric, citric, succinic, formic, nitric or hydrochloric, for 24 hr. Loss of weight was estimated and the accessibility of the organic matrices of the dentine was measured by the author's method (Burnett and Scherp, *J. Dent. Res.*, 1952, **31**, 776).

In general NaF was most effective, PbF_2 was sometimes nearly as effective as NaF and CaF_2 was least effective in preventing loss of weight; accessibility of the organic matrix was greater in treated than in untreated teeth when organic acids were used, but less with inorganic acids.—D. Harvey.

784

WADHWANI, T. K. **Effect of fluorine on the composition of bones: changes in the composition of bones of monkeys (*Macaca radiata*).** *Indian J. Med. Res.*, 1955, **43**, 321–330. [Sect. Pharmacol., Indian Inst. Sci., Bangalore 3.]

Pairs of monkeys were given a diet of bread, groundnuts and a cake prepared from wheat flour, casein, sugar, yeast, salts and fat, with water to appetite, for 27 weeks. Each animal received daily one banana weighing 70 to 90 g. and containing 5 to 8 mg. vitamin C; one of each pair received daily 10 mg. NaF per kg. bodyweight. At the end of the experiment the monkeys were X-rayed. The experimental animals showed distinct thickening of the periosteum and formation of exostoses; animals which showed gross changes in the bones were killed with their controls and their bones were analysed for N, carbonate, Ca, P, Mg, Na and K; the exostoses of humerus, tibia and femur were removed and analysed separately. Results are tabulated.

Four monkeys with severe bone fluorosis were given a normal diet and the administration of F was discontinued; 2 of them were given 20 mg. ascorbic acid daily for 12 weeks. X-ray examination then revealed that in the animals given ascorbic acid exostoses were almost absent from the bones. The bones of all 4 animals were analysed as before.—G. F. Garton.

785

MILLER, R. F. and PHILLIPS, P. H. **Effect of feeding fluoroacetate to the rat.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 411–413. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Groups of 4, 5 or 10 weanling rats were allowed, to appetite, water and a basal diet of ground whole wheat, ground yellow maize, dried skimmed milk, soya bean meal, linseed meal, alfalfa leaf meal, melted butter, $CaCO_3$ and iodised salt. Sodium monofluoroacetate was ground in sucrose and incorporated into the basal diet to give the required intake. The first experiment was designed to estimate tolerance for fluoroacetate; in the second experiment the tolerance under different conditions was tested, and the adaptability of the rat to larger increments of fluoroacetate.

The rats survived the addition of 20 p.p.m. fluoroacetate to the diet; this level first caused retardation in growth, but after 3 to 4 weeks nearly complete recovery of the growth rate was evident. Rats which had received 20 p.p.m. fluoroacetate became conditioned to further increases, which produced only transitory fluctuations in the growth rate; this conditioned tolerance to fluoroacetate was lost within 2 weeks. Administration of fluoroacetate caused increased storage of F in the femur.—G. F. Garton.

786

ARIZONO, H. and ICHIKAWA, M. **Histochemical studies on the changes of calcium and alkaline phosphatase in experimental dental and bone fluorosis of rats.** *Med. J. Osaka Univ.* (Engl. Ed.), 1955, **6**, 205–216. [Dept. Pub. Health, Wakayama Med. Coll.]

Five groups, each of 5 or 6 male rats aged about 60 days, were given daily, with food, 15 to 20 ml. NaF solution which provided 1, 5, 10, 50 or 100 p.p.m. F; a sixth group was maintained on a fluorine-free diet. After 107, 192 or 210 days the rats were killed and histochemical studies were made of the lower jaw and femur.

Alkaline phosphatase of the pulp and periodontal membrane of the molar teeth decreased or disappeared in proportion to the amount of F administered. With increasing F content calcification of the enamel was unchanged, but the dentine, cement and alveolar bone presented a gradually increasing Ca reaction. In the periosteum, Haversian and Volkmann's canals and epiphyseal plate of the femur phosphatase activity fell after high intakes of F and was little changed at low intakes. In the endosteum and bone marrow

there was no quantitative difference in phosphatase activity. There was less enzyme activity after low levels of F intake when the experimental period was long. Ca reaction of the bone shafts, trabeculae and epiphyseal plate was negative at low F intakes and positive at high intakes, the Ca reaction being proportional to the F concentration; prolonged F intake caused a positive Ca reaction even at low levels.—G. F. Garton.

787

HARRIS, N. O. and HAYES, R. L. **A tracer study of the effect of acute and chronic exposure to sodium fluoride on the thyroid iodine metabolism of rats.** *J. Dent. Res.*, 1955, **34**, 470–477. [Dent. Sci. Div., U.S. Air Force Sch. Aviation Med., Randolph Air Force Base, Randolph Field, Tex.]

Ten adult female rats were divided into 2 groups of 5. The 5 controls were anaesthetised and injected intraperitoneally with 1 ml. saline solution containing 250 μC. ^{131}I. Gamma radiation counts were recorded every min. for 10 min. thereafter. The second group was similarly treated except that 0·33 ml. of 1·25 per cent. NaF in saline was injected intraperitoneally simultaneously with the ^{131}I, on the opposite side of the abdomen. There was no significant difference in ^{131}I uptake between the 2 groups.

In the second experiment there were 4 groups, each of 6 male and 6 female rats. All were given the Remington iodine deficient diet (Abst. 645, Vol. 7) for 35 days, during which they had access to demineralised water containing no F or 10, 50, or 100 p.p.m. NaF. At the end the rats were injected with 1 ml. of saline solution containing 1 μC. ^{131}I. After 24 hr. each was anaesthetised and bled out. Thyroids were weighed and the radio-activity was estimated in thyroids and in plasma. There was no significant difference between the 4 groups. Autoradiographs of thyroid tissue demonstrated that I was concentrated in the colloid no matter what the F intake.

B. W. Simpson.

788

ALLCROFT, R., SALT, F. J. and HIGNETT, S. L. **The effect of commercial phenothiazine on blood iodine values in sheep.** *Vet. Rec.*, 1955, **67**, 626–630. [Vet. Lab., Minist. Agric., Weybridge, Surrey.]

The percentage of total I in 8 commercial samples of phenothiazine ranged from 0·4 to 0·0004. Abnormally high total plasma I values in sheep were associated with administration of even a single dose of 20 g. phenothiazine with a high I content, and these did not fall to normal for about 3 weeks. After such treatment the uptake of radio-active I was greatly reduced, although protein-bound I values were raised only very slightly.

It is suggested that continuous excess of circulating plasma I due to these phenothiazine preparations high in I may have a deleterious effect on physiological functions in the sheep.

B. W. Simpson.

789

NEWBURGER, R. A., SILVER, S., YOHALEM, S. B. and FEITELBERG, S. **Uptake and blood level of radioactive iodine in hyperthyroidism.** *New Engl. J. Med.*, 1955, **253**, 127–130. [Andre Meyer Dept. Phys., Mount Sinai Hosp., New York.]

Each of 96 untreated hyperthyroid patients and 404 normal euthyroid subjects was given by mouth a tracer dose of ^{131}I consisting of 25 to 100 μC. carrier-free ^{131}I in 100 ml. water. The ^{131}I present in the thyroid 24 hr. later was measured and the uptake was recorded as percentage of the dose, allowing for decay. Venous blood was drawn 72 hr. after the same tracer dose and 4 ml. serum or plasma was placed in a well-type crystal scintillation counter. If 0·27 per cent. or more of the dose was found per litre of plasma, thyrotoxicosis was suspected and protein-bound ^{131}I was estimated.

By this technique it was shown that there was little overlap of the values for protein-bound ^{131}I in the plasma of euthyroid subjects and thyrotoxic patients, but in the uptake studies the overlap was much greater. The former method was, therefore, a more helpful diagnostic aid. Statistical examination of the results showed that by the protein-bound ^{131}I technique 1·6 per cent. of errors in classification occurred, compared with 7·2 per cent. by the ^{131}I uptake method.

B. W. Simpson.

790

GILBERT, J. L. and LANGE, G. **Renal clearance of I^{131} in hypothyroid and euthyroid rats.** *Endocrinology*, 1955, **57**, 181–183. [Dept. Physiol., Coll. Med., State Univ., New York.]

Male rats had their thyroids removed. Half of the animals were given daily 5 μg. L-thyroxine parenterally. The rats receiving thyroxine had almost normal pulse rates and the hypothyroid rats had rates slower by 50 to 100 beats per min. For estimation of renal clearance 10 μC. ^{131}I were injected intraperitoneally 2 to 3 weeks after thyroidectomy, and 1 ml. blood was taken by cardiac puncture under anaesthesia half an hour after injection. The rats were then placed in urine collecting jars and 24 hr. later a second blood sample was taken and the urine was measured. The activities of samples of serum and urine were estimated by Geiger Müller tube and scaler. The mean renal clearance rate of the 33 hypothyroid rats was only two-thirds that of the 34 euthyroid rats; the difference was statistically significant. The average renal clearance rate of rats thyroidectomised 1 to 3 days before the test was the same as

that of rats operated on 2 to 3 weeks earlier. It is emphasised that the influence of renal clearance rate of ^{131}I on plasma level should be considered in studies concerning thyroid uptake and thyroid activity.—B. W. Simpson.

See also Absts. 608, 619, 767, 842.

IRON AND COPPER

791

BIELIG, H. J. and BAYER, E. Eisenaustauch zwischen Proteinen; Modellversuche zur Eisenresorption und -speicherung im Tierkörper. **[Iron exchange among proteins; model experiments on absorption and storage of iron in the animal organism.]** *Naturwissenschaften*, 1955, **42,** 466. [Max-Planck-Inst. Med. Forsch., Heidelberg.]

Ferritin formed *in vitro* from ferrous ions, apoferritin and CO_2 in bicarbonate CO_2 buffer at *p*H 7·2 (see Bielig and Bayer, *Naturwissenschaften*, **42,** 125) will give up its Fe at *p*H 5·5 to 7·5 in the presence of excess ascorbic acid, glutathione or dihydrocodehydrase I. The Fe^{+++} was taken up across a cellophane membrane by siderophilin, giving an example of exchange of Fe between 2 proteins *in vitro*.—D. Duncan.

792

SALERA, U. and TAMBURINO, G. Eisenaufnahme, Eisenreserve und Hämoglobinsynthese. **[Iron absorption, iron reserve and haemoglobin formation.]** *Deutsch. med. Wochenschr.*, 1955, **80,** 933–934. [Ist. Patol. Med., Univ. Rome.]

From the rate at which Fe labelled with ^{55}Fe and given by vein is taken up by blood-forming tissues, it is concluded that part of this Fe is used at once for Hb formation, without being converted first to storage Fe. The Fe used for Hb formation, corresponding in quantity with the 24 mg. set free daily by physiological haemolysis, comes partly from " exogenous " and partly from stored sources.

D. Duncan.

793

SMITH, N. J., ROSELLO, S., SAY, M. B. and YEYA, K. **Iron storage in the first five years of life.** *Pediatrics*, 1955, **16,** 166–173. [Dept. Paediat., Sch. Med., Univ. California, Los Angeles.] Spanish and Interlingua summaries.

Iron, total and in the water-insoluble form in haemosiderin, was estimated in liver tissue *post mortem* from 58 children under 5 years of age. The water-soluble Fe could not satisfactorily be separated into Hb and ferritin fractions. The data are presented for 5 age groups, 0 to 6, 6 to 12, 12 to 24, 24 to 40 and 40 to 60 months, at which ages the mean values were for total Fe 1305, 922, 358, 581 and 798, and for water-insoluble Fe 541, 491, 154, 339 and 378 μg. per 10 g. tissue. Attempts to estimate storage in living children by staining bone marrow with Prussian blue were unsuccessful. The fall in Hb seen in the first 2 months of life is associated with the large stores and the incidence of deficiency anaemia in the second year can be linked with the small stores of Fe in the liver at these ages.—D. Harvey.

794

JEFFREY, M. R., FREUNDLICH, H. F., JACKSON, E. B. and WATSON, D. **The absorption and utilization of radioiron in rheumatoid disease.** *Clin. Sci.*, 1955, **14,** 395–406. [Royal Nat. Hosp. Rheumatic Dis., Bath.]

Absorption of ^{59}Fe from one large dose or from repeated smaller doses was studied in patients with rheumatoid arthritis and the hypochromic anaemia which is often refractory to treatment with Fe by mouth, but which responds to Fe given parenterally. Estimations were made of ^{59}Fe in blood and faeces; control subjects were patients undergoing similar treatment for diseases known not to affect haemopoiesis. No evidence was found that failure of absorption of Fe either causes or perpetuates the condition or is the reason for its resistance to treatment with Fe given by mouth.

D. Harvey.

795

KINNEY, T. D., KAUFMAN, N. and KLAVINS, J. **Effect of ethionine-induced pancreatic damage on iron absorption.** *J. Exp. Med.*, 1955, **102,** 151 – 156. [Dept. Pathol., Cleveland City Hosp., Ohio.]

There were 2 experiments. In the first, 5 groups of rats received a synthetic diet to appetite or in restricted amount or with additions of ferric citrate, 2 per cent., or *dl*-ethionine, 0·5 per cent., or both. In the 2 ethionine groups damage to pancreas and to liver was seen histologically and both microscopic and chemical tests indicated that deposition of excess Fe had occurred. The mean values for Fe content in mg. per 100 g. liver for the groups in the above order were 14·6, 25·9, 21·1, 35·3 and 55·8. Corresponding total amounts of Fe were 1·6, 1·6, 2·1, 2·9 and 5·7 mg. In the second experiment 2 groups of mice were fed on the same diet without or with 0·5 per cent. ethionine; total Fe was estimated in body as well as in liver. The findings were, on the average, 32·4 and 79·0 mg. per 100 g. liver, and for total amounts in liver 0·5 and 0·9 mg. and in body 1·9 and 2·3 mg.

Damage to the exocrine cells of the pancreas resulted in increased absorption and deposition of Fe in the liver and not merely in a shift of Fe from endogenous sources.—D. Harvey.

See also Absts. 606, 787, 1001, 1090.

OTHER MINERALS

796

LEONARD, R. O. and BURNS, R. H. **A preliminary study of selenized wool.** *J. Animal Sci.*, 1955, **14,** 446–457. [Wool Dept., Univ. Wyoming.]

797

LEMOIGNE, M. Le role du soufre dans le métabolisme des êtres vivants. [**Role of sulphur in the metabolism of living organisms.**] *Rev. Ferment. Indust. aliment.*, 1955, **10,** 103–118. [Serv. Ferment., Inst. Pasteur.]

798

VALDIGUIÉ, P., AUVERGNAT, R., BRU, A. and DOUSTE-BLAZY, L. Sur l'origine du soufre du tissu cartilagineux. [**Origin of sulphur in cartilaginous tissue.**] *Bull. Soc. Chim. biol.*, 1955, **37,** 677–682. [Lab. Biochem., Fac. Méd., Toulouse.]

Several tissues, particularly cartilaginous tissue, synovial membranes and synovial fluid, were radioactive 24 hr. after injections of $Na_2{}^{35}SO_4$, subcutaneously in dogs and intraperitoneally in guineapigs. Only part of the ^{35}S was found in chondroitin sulphate. $Na_2{}^{35}S$ was rapidly oxidised and was utilised as readily as $Na_2{}^{35}SO_4$.

A. Hepburn.

799

ADDINK, N. W. H. and FRANK, L. J. P. **Zinc in relation to cancer.** *Naturwissenschaften*, 1955, **42,** 419–420. [Spectrochem. Dept., Philips Res. Labs., N. V. Philips' Gloeilampenfabriek, Eindhoven.]

Fuller details will be published elsewhere.

800

FEASTER, J. P., HANSARD, S. L., MCCALL, J. T. and DAVIS, G. K. **Absorption, deposition and placental transfer of zinc^{65} in the rat.** *Amer. J. Physiol.*, 1955, **181,** 287–290. [Nutrit. Lab., Florida Agric. Exp. Stat., Gainesville.]

Forty-four adult nulliparous female rats were maintained on a stock diet and given, at stages of pregnancy ranging from the ninth to the twenty-first day, a single oral or intraperitoneal dose of $^{65}ZnCl_2$. Balance studies were made for the next 96 hr.; the animals were then killed and the foetuses were removed. These, as well as maternal blood, whole body tissues, urine and faeces were analysed for total and radio-active Zn.

The absorption of the ^{65}Zn from the digestive tract was poor, but there was relatively free transfer across the placenta to the foetuses at all stages of gestation. In a study on the mammary transfer of ^{65}Zn, with 8 female rats and their litters, 57 per cent. of the retained portion of the ^{65}Zn was transferred through the milk to the young during 96 hr. In maternal tissues ^{65}Zn content was proportional to total Zn; the kidney had the highest content, followed in order by liver, pancreas and femur. The transfer of total Zn to foetuses was proportional to that of ^{65}Zn; the foetal content of both ^{65}Zn and total Zn increased throughout gestation and reached a maximum at term.

G. F. Garton.

See also Absts. 604–6.

ACID BASE EQUILIBRIUM

See Absts. 579, 770.

METABOLISM OF WATER

801

POLITZER, W. M., BARRY, M. E. and KING, A. **The effect of heat stress on mine workers with regard to loss of water and electrolytes.** *S. African J. Med. Sci.*, 1954, **19,** 155–160. [Dept. Biochem., S. African Inst. Med. Res., Johannesburg.]

The subjects were 81 African miners aged between 18 and 40 years who volunteered for examination at the end of working shifts of 8 hr., in conditions for which mean data were dry bulb temperature 86° F., wet bulb temperature 84° F., relative humidity 92 per cent. and average cooling power 13·3 millicalories per sec. From examinations of abdominal skin and of orbits no evidence of dehydration was found; sweat rash, seen in 9 subjects, suggested profuse sweating; muscular tenderness suggesting cramp was not noted. Blood examinations for urea, Cl, Na, K, total proteins and packed cell volume gave results within normal range, and a more intensive examination of 19 subjects before, and immediately and 18 hr. after, work showed no haemoconcentration. Records of losses of fluid indicated that dehydration was mild and temporary in nature.

D. Harvey.

802

KOZIĆ, LJ. Prilog ispitivanju funkcionalne sposobnosti bubrega konja. [**The function of the kidney in the horse.**] *Acta vet., Belgrade*, 1955, **5**, No. 1, 83–95. [1. Int. Clin., Vet. Fac., Belgrade.] German summary.

Horses were starved for 2 days to produce conditions comparable to those in human subjects fasted overnight. Water loads of 22 ml. per kg. bodyweight were given by stomach tube. No advantage was found from greater loads, up to 88 ml. per kg.

Water diuresis began in the second hour and was greatest in the third, fourth and fifth. After this the volume of urine began to fall and its sp. gr. to rise. The horses were given oats and the return of the sp. gr. to normal was studied.

Such studies are considered to offer a diagnostic method for kidney disorders in horses.

D. Duncan.

803

LE MAGNEN, J. Le rôle de la réceptivité gustative au chlorure de sodium dans le mécanisme de régulation de la prise d'eau chez le rat blanc. [**Role of the taste threshold for sodium chloride in the mechanism for regulation of water intake in the white rat.**] *J. Physiol., Paris*, 1955, **47**, 405–418.

Adult rats received a standard ration for an hour once daily. At first they were offered water 7, 5 and 3 hr. before feeding, for an hour each time, and their water intake was recorded. The first offer of water was then replaced by 2 per cent. NaCl solution given on alternate days to drink or the same amount by stomach tube, and water intake was again recorded 2 and 4 hr. later. On the average the water intake was 60 per cent. greater after saline had been drunk than after it had been given by tube. The difference was highly significant. Only when saline was drunk did intake significantly exceed the control amount.

When the saline was replaced by isosmotic, 12 per cent., glucose solution, rats which drank the solution refused all water offered 2 and 4 hr. later. When the solution was given by tube they drank as much as rats given saline by tube. When water was given by tube it did not affect the amount drunk 2 and 4 hr. later.

Rats given saline by tube had saline applied to the dorsal surface of the tongue for several seconds, and this stimulated them to drink in the next 20 min., but they compensated by drinking less afterwards, so that in 3 hr. there was no difference between their intake and that of rats given saline by tube alone.

It is concluded that taste receptors affect the regulatory mechanism controlling water intake after administration of saline solutions.

D. Duncan.

See also Abst. 782.

METABOLISM OF OTHER SUBSTANCES

804

BERNSTEIN, A., PLETSCHER, A. and RENSCHLER, H. Zur Beeinflussung der Umsatzgeschwindigkeit des Alkohols. 4. Einfluss der Fructose auf den Alkoholstoffwechsel und die Umsatzgeschwindigkeit des Alkohols bei Hepatitis. [**Influencing the transformation rate of alcohol. 4. Effect of fructose on alcohol metabolism and the transformation rate of alcohol in hepatitis.**] *Klin. Wochenschr.*, 1955, **33**, 488–491. [Med. Klin., Univ. Basle.]

805

REID, M. E. **Nutritional studies with the guinea pig. 3. Choline.** *J. Nutrition*, 1955, **56**, 215–229. [Lab. Biochem. Nutrit., Nat. Insts. Health, Pub. Health Serv., Bethesda, Md.]

Groups of 8 guineapigs aged 2 to 4 days were given a semi-synthetic diet containing vitamin-free casein 30, fat 7·3 and salts 6 per cent., with 4 types of carbohydrate and liberal amounts of the known vitamins but no choline. Different levels of choline, from 0·2 to 5 g. per kg. diet, were added and after 6 weeks the animals were killed and the internal organs were examined. Similar studies were made with different compounds used as substitutes for, or supplements to, choline.

The omission of choline from the diet resulted in severe retardation of growth, weakness of muscles, reduction in the number of red blood cells, lower haematocrit and Hb values, small subcutaneous and adrenal haemorrhages and paleness of the kidneys, without severe kidney haemorrhage or much fatty infiltration of the liver; survival time was 21 to 67 days. The inclusion of small amounts of choline in the diet produced a chronic state of deficiency characterised by slight retardation of growth, anaemia and great muscle weakness. From 1 to 1·5 g. choline chloride per kg. diet gave 100 per cent. survival and maximum growth.

Neither betaine nor methionine was an effective substitute for choline, but both had a supplementary value when added to a suboptimum level of choline. Dimethylaminoethanol was the only compound equal in effect to choline when administered on a molar basis. Neither methylaminoethanol nor methionine improved growth or survival when used with the choline-deficient diet, but together

in suitable amounts they were as effective as choline chloride.—G. F. Garton.

806

KNUDSON, A. and HARRIS, R. **Observations on blood pressure and tissue cholesterol following choline deficiency in weanling rats.** *J. Nutrition*, 1955, **56**, 295–301. [Dept. Biochem., Albany Med. Coll., Union Univ., Albany, N.Y.]

Rats aged 3 weeks were given 3·6 mg. choline per 100 g. diet for 5 days; pair-fed controls received the same diet plus 350 mg. choline per 100 g. Thereafter the animals were given a stock diet for 3 to 7 months. Other rats were given a choline-free diet (Abst. 823, Vol. 21) for 3 to 7 months.

The rats briefly given the low-choline diet had an average arterial blood pressure of 108 mm. Hg; only 14 out of 71 had mean arterial pressures above 124 mm. Hg. Of the 69 rats on the choline-free diet, only 24 had mean arterial pressures above 124 mm. Hg, the average for this group being 133 mm. In animals with high blood pressure there was no significant change in total and free cholesterol in plasma, aorta, heart, kidney and liver. Renal lesions, slight or severe, were found in 37 out of 70 rats on the choline-free diet.—G. F. Garton.

See also Absts. 742, 758, 759, 912.

METABOLISM OF CELLS, TISSUES, ETC.

GENERAL PHYSIOLOGY

807

HEALY, G. M., FISHER, D. C. and PARKER, R. C. **Nutrition of animal cells in tissue culture. 10. Synthetic medium No. 858.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 71–77. [Connaught Med. Res. Labs., Univ. Toronto.]

The 62 ingredients, which include 3 antibiotics, and the system of combining them are described. The tissue cells with which nine- and tenfold increases in 7 days are reported are L strain cells from the mouse (Sanford *et al.*, *J. Nat. Cancer Inst.*, 1948, **9**, 229). The medium with 20 per cent. horse serum added is being used by the authors for the propagation of all strains of cell.—D. Harvey.

808

EAGLE, H. **The specific amino acid requirements of a mammalian cell (strain L) in tissue culture.** *J. Biol. Chem.*, 1955, **214**, 839–852. [Sect. Exp. Therap., Pub. Health Serv., U.S. Dept. Health, Bethesda, Md.]

The cells were of the L strain of mouse fibroblast, grown in a monocellular layer on a glass surface. The basal medium contained 19 amino-acids, the known vitamins, inorganic salts, choline, glucose, glutamine, glutathione and inositol and was supplemented with 0·25 to 2 per cent. of dialysed horse serum. In this medium cultures could be maintained for as much as 8 weeks without change in growth rate or appearance of the cells.

By omitting them from the medium in turn it was shown that arginine, cystine, histidine, *iso*-leucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, tyrosine and valine were essential for survival and growth. Alanine, aspartic acid, glutamic acid, glycine, hydroxyproline, proline and serine were not essential; it is unlikely that the small amount of serum protein in the medium was supplying them. The cytological effects of deficiency of any one essential amino-acid were reversible for 2 to 6 days. The concentrations of essential amino-acids needed for maximum growth varied from 0·005 μmole tryptophan per ml. to 0·1 or 0·2 μmole *iso*leucine per ml., and below these concentrations the rate of growth fell sharply. None of the 12 essential L-amino-acids could be replaced by the D-isomer, but the D-isomers did not actively inhibit growth.

Although the cultures required 12 amino-acids, arginine, cystine and tyrosine are not essential for the mouse.—D. Duncan.

809

KIENY, M. Les besoins nutritifs spécifiques des tibias d'embryon de poulet en culture *in vitro* sur milieux synthétiques. [**Specific nutrient requirements of the tibia of the chick embryo cultured *in vitro* on synthetic media.**] *C.R. Soc. Biol.*, 1955, **149**, 418–421.

For earlier experiments see Abst. 4302, Vol.23; Kieny *et al.*, *C.R. Acad. Sci.*, 1954, **239**, 1426.

The linear growth and survival of tibias were studied in media containing 3 to 5 amino-acids; the basal medium contained cysteine, methionine, arginine, histidine, lysine, glutamic acid and *p*-aminobenzoic acid. Growth was retarded when arginine, methionine, glutamic acid, or lysine plus histidine was omitted. Augmentation of growth occurred when cysteine, lysine or histidine was omitted.

In a medium with arginine, methionine, glutamic acid, histidine and *p*-aminobenzoic acid growth was 93 per cent. better than in the basal medium.

The basal medium was improved by addition singly of serine, threonine, asparagine, taurine and

hydroxyproline. Linear growth of tibia was accelerated but survival was reduced by valine, glutamine or tyrosine. Survival was improved, but growth was not, by alanine, glycine, glutathione, phenylalanine, ornithine or *iso*leucine. Leucine, tryptophan, proline and aspartic acid were valueless or detrimental.—D. Duncan.

810

RAPOPORT, S. and HOFMANN, E. C. G. Untersuchungen über den Atmungsstoffwechsel von Reticulocyten. [**Respiratory metabolism of reticulocytes.**]

HOFMANN, E. C. G. and RAPOPORT, S. Der Einfluss der Hämolyse auf die Atmung von Reticulocyten. [**Effect of haemolysis on the respiration of reticulocytes.**] *Biochem. Ztschr.*, 1955, **326,** 493–498; 499–506. [Physiol. Chem. Inst., Humboldt Univ., Berlin.]

811

NEWEY, H., SMYTH, D. H. and WHALER, B. C. **The absorption of glucose by the *in vitro* intestinal preparation.** *J. Physiol.*, 1955, **129,** 1–11. [Dept. Physiol., Univ. Sheffield.]

The loss of glucose in preparations of rat's small intestine *in vitro* during the transport of glucose across the mucosal surface was examined. Lactic acid was the main metabolite and was formed in sufficient quantity to account for 50 to 70 per cent. of the glucose lost, and carbon dioxide could account for about another 25 per cent. Some evidence was obtained, from experiments with glucose labelled with ^{14}C, of the production of a keto-acid; this was not identified, but was presumed to be pyruvic acid.—A. T. Phillipson.

812

BLOOM, B., EISENBERG, F. (Jr.) and STETTEN, DEW. (Jr.) **Glucose catabolism in liver slices via the phosphogluconate oxidation pathway.** *J. Biol. Chem.*, 1955, **215,** 461–466. [Div. Nutrit. Physiol., Pub. Health Res. Inst. City of New York, Inc.]

Glucose, gluconate and ribose, all labelled with ^{14}C, were incubated with rat liver slices and the radio-activity of CO_2, fatty acids and glycogen was estimated. The results suggest that some of the glucose was catabolised via phosphogluconate.
A. Hepburn.

813

BLOOM, B. and STETTEN, D. (Jr.) **The fraction of glucose catabolized via the glycolytic pathway.** *J. Biol. Chem.*, 1955, **212,** 555–563. [Div. Nutrit. Physiol., Pub. Health Res. Inst. City of New York, Inc.]

Glucose, gluconate and lactate, all labelled with ^{14}C, were incubated with liver slices from normal rats and the radio-activity of CO_2 and fatty acids was estimated. About half the glucose was considered to be catabolised via the Embden Meyerhof pathway, *i.e.*, via glucose-6-phosphate and fructose-6-phosphate to lactate.—A. Hepburn.

814

TENG, C. T. **Studies on carbohydrate metabolism in rat kidney slices. 3. Effect of adrenalectomy and hypophysectomy on glucose uptake and glucose formation. 4. Effect of cations on metabolism of glucose, pyruvate and glycerol.** *Arch. Biochem. Biophys.*, 1955, **57,** 61–65; 66–70. [Dept. Physiol., Baylor Univ. Coll. Med., Houston, Tex.]

For previous parts see Title 4953, Vol. 24.

815

TAUPITZ, A. Histochemische Untersuchungen an Gewebekulturen über den Kohlenhydratstoffwechsel der Zelle in Abhängigkeit vom Kaliumgehalt des Nährmediums. [**Histochemical studies with tissue cultures of the carbohydrate metabolism of the cell as related to the potassium content of the culture medium.**] *Arch. exp. Pathol. Pharmakol.*, 1955, **226,** 197–206. [Pathol. Inst., Akad. Med. Forsch., Justus Liebig Hochsch., Giessen.]

The tissue cultured was spleen from adult guineapigs or rats. The basal culture medium contained, per cent., extract of 9-day chicken embryos 25, Tyrode solution 25 and plasma from fasted guineapigs or rats 50. The mineral content, per cent., was K 0·03, Na 0·32 and Ca 0·009, the K concentration being about 30 per cent. above that in normal plasma. K was added in different experiments as aqueous KCl or $KHCO_3$ to give concentrations of 0·01, 0·02, 0·03 and 0·05 mole per litre. Growth experiments lasted 48 hr.

Even at 0·01 mole the K caused a perceptible decrease in growth of cultures from both species, and at 0·03 and 0·05 mole the inhibition was considerable. There was little glycogen in normal cultures, but addition of 0·02 mole K was followed by deposition of much glycogen in rounded-off fibroblasts. With more K there was again little glycogen.

Dehydrase, detected by the reduction indicator triphenyltetrazolium chloride, was not affected by 0·01 mole K, but was reduced by 0·02 mole and much reduced or absent with higher concentrations. The same was true for alkaline phosphatase.
D. Duncan.

816

PEETERS, G., SIERENS, G., TINDAL, J. and COUSSENS, R. Échanges de sucres dans le pis de vache isolé et perfusé. [**Sugar exchanges in the isolated perfused udder of the cow.**] *Arch. internat. Pharmacodyn.*, 1955,

102, 470–475. [Lab. Physiol., École Vét., Univ. Ghent.] English summary.

Halves of isolated udders were perfused with 8 litres of oxygenated, heparinised whole blood to which was added sodium acetate, 15 g. in 250 ml. water, or glucose, 10 g. in 250 ml. water. In control experiments nothing was added. Blood samples were examined for sugars by paper chromatography before and after perfusion for 90 to 120 min.

The whole blood always contained glucose and fructose initially, and these sugars partly or completely disappeared during perfusion. Lactose always appeared during perfusion, and galactose in one experiment. The quantities of glucose which disappeared were from 2300 to 8870 mg. (the higher values after addition of glucose), of fructose 85 to 355 mg., and the quantities of lactose which accumulated were from 693 to 4240 mg.

The mammary vein blood of 2 cows within a few hours after calving contained 2·2 and 3 mg. lactose per cent.—D. Duncan.

817

BASSIR, O. **A pathological study of the effect of low-protein diet on liver cell metabolism.** *West African Med. J.*, 1955, **4,** 78–91. [Area Pathol. Lab., Westwood Hosp., Beverley, Yorks.]

The livers of rats after 4 days of a protein-free diet were compared with those of rats on a diet with 27 per cent. casein. In the deprived animals the water content of the liver was unchanged; there was a non-significant increase in the neutral fat and a significant decrease in the N content of neutral-fat-free tissue, which was evidence of a decrease in labile cytoplasm. Histological examination showed no change in the size of the liver cells, but the mitochondria were arranged round the nucleus and at the periphery of the cells, and masses of glycogen filled the vacuoles caused by this rearrangement, though the animals had been starved for 6 hr. before death. Ribonucleic-acid-bearing particles in the cytoplasm were less concentrated in the protein-starved than in the normal rats. Studies with radio-active tracers confirmed the loss of labile protein and ribonucleic acid from the cytoplasm in the protein-starved rats and showed an increase in the amount and activity of deoxyribonucleic acid per g. liver. After one day of the high-casein diet the changes in the liver caused by protein deprivation were reversed.

L. Wills.

818

FRITZ, I. (with BERECH, J. (Jr.)). **Studies on the incorporation and release of N^{15} by tissue proteins of rats fed N^{15}-glycine. 1. The protein metabolic activity of salivary glands. 2. The activities of muscle, oral mucosa, and incisor pulp proteins.** *J. Dent. Res.*, 1955, **34,** 435–445; 446–451. [Dept. Dent. Res., Dent. Div., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

1. Rats received a diet containing, per cent., casein 15, maize starch 47, lard 23, Wesson oil 4, cod liver oil 2, brewer's yeast 5 and salt mixture 4. After about 2 weeks they were given 1 ml. of 2·5 per cent. solution of glycine labelled with ^{15}N, twice daily for 3 days. Then half were fed and killed after 18 or 161 hr. and half were fasted and killed after from 10 to 161 hr. Selected tissues were extracted in cold trichloroacetic acid and protein and N.P.N., and their ^{15}N content, were estimated.

The ^{15}N content of salivary gland proteins declined with time after the last dose of ^{15}N, especially in rats allowed to eat. Liver protein had always a higher ^{15}N concentration than salivary gland protein. The submaxillary gland protein had a slightly higher ^{15}N concentration than parotid gland protein. Submaxillary glands lost over 25 per cent. of their total protein N during the first 90 hr. of fasting and later regained some N, but parotid protein N was maintained at first and declined mainly after 90 hr.

2. The decline in ^{15}N activity in proteins from the gingival mucosa, palatal mucosa and tongue membranes was very rapid; that in incisor pulp proteins was about equal to that in liver. Although all skeletal muscles studied took up a little ^{15}N, the greatest concentration was reached in tongue muscle. The high ^{15}N uptake and rapid turnover in oral mucosa are thought to reflect the rapid regeneration of the tissues.—D. Duncan.

819

BURR, W. W. (Jr.) and MCPHERSON, J. C. (Jr.) **Metabolic transformations and incorporation of labeled alanine in liver tissue.** *Arch. Biochem. Biophys.*, 1955, **57,** 87–93. [Dept. Biochem., Southwestern Med. Sch. Univ. Texas, Dallas.]

Alanine-1-^{14}C was incubated with rat liver slices and alanine, glutamic acid, aspartic acid and serine were isolated from the hydrolysed liver protein. Glutamic acid and alanine were radio-active, serine only slightly.—A. Hepburn.

820

MORGAN, J. F. and MORTON, H. J. **Studies on the sulfur metabolism of tissues cultivated *in vitro*. 1. A critical requirement for L-cystine.** *J. Biol. Chem.*, 1955, **215,** 539–545. [Lab. Hyg., Dept. Nat. Health Welfare, Ottawa.]

Chick embryonic heart fibroblasts survived for about 35 days in a synthetic medium containing sulphur amino-acids, but only for 8 to 12 days in their absence. L-Cystine, but not L-methionine, increased the time of survival. Both were required

for survival for 35 days. L-Cystine could be almost replaced by cysteine and to a smaller extent by lanthionine, ergothioneine, oxidised glutathione, cystathionine or 2 : 3-dimercaptopropanol.

A. Hepburn.

821

DIANZANI, M. U. **Content and distribution of pyridine nucleotides in fatty livers.** *Biochim. biophys. Acta*, 1955, **17**, 391–405. [Lab. Physiol. Chem., Univ. Utrecht.] French and German summaries.

The content of pyridine nucleotides in experimentally induced fatty livers from rats was below normal, particularly in the mitochondria. In homogenates the pyridine nucleotides were displaced into the supernatant fluid. The loss and displacement of diphosphopyridine nucleotide and the reduced oxidation of substances requiring it occurred before fat accumulated within the cells.

A. Hepburn.

822

FRUNDER, H., DITTRICH, H., LACHHEIN, L. and MITEFF, I. Weitere Beobachtungen zum Stoffwechsel der verfetteten Leber. [**Further observations on the metabolism of the fatty liver.**] *Hoppe-Seyler's Ztschr.*, 1955, **301**, 210–223. [Physiol.-Chem. Inst., Univ. Leipzig.] English summary.

Carbohydrate metabolism.

823

HAUSBERGER, F. X. and MILSTEIN, S. W. **Dietary effects on lipogenesis in adipose tissue.** *J. Biol. Chem.*, 1955, **214**, 483–488. [Dept. Anat., Jefferson Med. Coll., Philadelphia, Pa.]

Adipose tissue was obtained from male rats which had been fasted or fed on a stock diet, high-fat diets or low-fat diets. The tissue was incubated with ^{14}C-labelled glucose as described by Hausberger *et al.* (*J. Biol. Chem.*, 1954, **208**, 431); the radio-activity of the CO_2 evolved and the fatty acids formed was measured.

Fasting or a high-fat diet abolished formation of fatty acid by adipose tissue, and the oxidation of glucose was greatly diminished.

The administration of protamine zinc insulin for 60 hr. to animals receiving the stock diet increased the production of ^{14}C-labelled fatty acids and $^{14}CO_2$; this effect was much less in animals on high-fat diets.

Fatty acid production from carbohydrate appears to be regulated not only by the carbohydrate content of the diet. Glucose utilisation increased as the carbohydrate content of the diet increased or as the fat content decreased.—G. A. Garton.

824

MAYER, J., HAGMAN, N. C., MARSHALL, N. B. and STOOPS, A. J. **Fat metabolism in three forms of obesity. 5. Hepatic lipogenesis *in vitro*.** *Amer. J. Physiol.*, 1955, **181**, 501–503. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

See also Absts. 5292, Vol. 25; 738, Vol. 26.

Liver slices were prepared from mice with hereditary obesity and diabetes or mice rendered obese by goldthioglucose injections and from hypothalamic hyperphagic rats. The slices were incubated at 37·5° C. for 3 hr. in the presence of ^{14}C-carboxyl-acetate; incorporation of ^{14}C into liver fat was then studied.

The slices from all 3 forms of obese animals incorporated more ^{14}C-acetate into lipids, expressed both per liver and per g. fat-free tissue, than their controls. Similar experiments with fasting animals showed less incorporation of ^{14}C into liver lipids; the rate of liver fat formation was depressed in mice fasted after goldthioglucose to the same low values as were found in the non-obese controls, but the rate observed in the livers of genetically obese mice, though depressed, was twice that found in their corresponding controls. The results suggest a distinction between regulatory and metabolic types of obesity (See Vol. 25, p. 607).

G. A. Garton.

825

EISLEY, N. F. and PRITHAM, G. H. **Arterial synthesis of cholesterol *in vitro* from labeled acetate.** *Science*, 1955, **122**, 121. [Dept. Agric. Biol. Chem., Pennsylvania State Univ., University Park.]

Minced aorta tissue from male and female turkeys was incubated for 24 hr. at 37° C. in different concentrations of Na acetate-^{14}C-carboxyl. After incubation cholesterol was isolated as the digitonide, which was assayed for ^{14}C. From a consideration of the results of these and other studies it was concluded that, although aorta appears to be less active than liver in formation of cholesterol, it may be an important site of synthesis in atherosclerosis.—G. A. Garton.

826

ESKELSON, C. D., FIRSCHEIN, H. E. and JENSEN, H. **Effect of thyrotropin administration on the *in vitro* uptake and conversion of I^{131} and release of organic-bound I^{131} by the isolated thyroid gland.** *Endocrinology*, 1955, **57**, 168–172. [Dept. Biochem., Army Med. Res. Lab., Fort Knox, Ky.]

Male rats weighing from 205 to 270 g. were injected intraperitoneally with 5 U.S.P. units of thyroid-stimulating hormone in 1 ml. saline, 3, 6, 12, 24 or 42 hr. before they were killed. Controls were given saline alone. The thyroids were incubated at 37° C. for 4 hr. in 2 ml. Krebs buffer with 1 μC. ^{131}I. Distribution of ^{131}I in the gland and in the fluid was studied.

At 3, 6 or 12 hr. the isolated thyroid from rats given hormone did not concentrate or convert ^{131}I to the same extent as glands from the controls, but 24 hr. after administration of hormone the glands seemed to regain their capacity to concentrate ^{131}I to the same extent as those of controls. At 36 hr. the differences between control and experimental glands were inconsistent, but at 42 hr. there was indication of an increase in total and organic ^{131}I in the glands of the treated rats. The decrease of activity of the glands 3, 6 and 12 hr. after administration of hormone is interpreted as being caused by the increase of thyroid hormone in the blood.—B. W. Simpson.

827

CARTIER, P. and PICARD, J. La minéralisation du cartilage ossifiable. 1. La minéralisation du cartilage *in vitro*. [**Mineralisation of ossifiable cartilage. 1. Mineralisation of cartilage *in vitro*.**] 2. Le système ATPasique du cartilage. [**2. The adenosine triphosphatase system of cartilage.**] *Bull. Soc. Chim. biol.*, 1955, **37**, 485–494; 661–675. [Fac. Méd., 149 Rue de Sèvres, Paris.]

1. Thin slices of cartilage were prepared from the carpal and tarsal bones of sheep embryos of 1500 to 3000 g. bodyweight. Mineralisation was studied in solutions containing different proportions of Ca and of P as orthophosphate or organic compounds.

No mineralisation occurred in the absence of organic P compounds, and mineralisation was negligible with a Ca : P ratio of 2 and P in the form of glucose-1-phosphate, fructose-1 : 6-phosphate, phospho-2-glyceric acid or β-glycerophosphate. Considerable mineralisation occurred only when the P was in the form of adenosine triphosphate (ATP). The results are opposed to those of Robison (*Biochem. J.*, 1923, **17**, 286) and of Gutman *et al.* (Abst. 1418, Vol. 12).

2. Mineralisation in solutions containing ATP was prevented after heating to 60° C. and much reduced after heating to 50° C. The optimum *p*H was about 8·0 to 8·2. Mineralisation increased with ATP concentration up to 10 mg. per 100 ml. Mineralisation at first increased with time, but almost reached its limit within 24 hr. unless successive additions of ATP were made. It was similar in aerobic and anaerobic conditions. The presence of Mg was essential, but at high concentrations it was inhibitory. F was without effect. Cysteine and ascorbic acid were inhibitory, HCN slightly so at concentrations greater than 0·002 *M*. Hydrogen peroxide and iodine were without effect except in concentrations high enough to cause protein denaturation. Low K concentrations reduced mineralisation. Histidine had a favourable effect. Phloridzin was inhibitory.

ATP could not be replaced by acetylphosphate, phosphocreatine, phosphoenolpyruvic acid, cocarboxylase or similar P compounds. The enzyme was not readily extractable. It was partly inactivated by formalin, completely by sodium nitrite.

The enzyme differs in properties from bone alkaline phosphatase and its localisation in the epiphyseal cartilage is different.—D. Duncan.

828

DAWSON, K. B. **Calcium exchange in bone.** *Biochem. J.*, 1955, **60**, 389–391. [Inst. Clin. Res., Med. Sch., Middlesex Hosp., London, W.1.]

The percentage of total exchangeable Ca in the humerus of an adult ox was found to be 33. The rise in the percentage of Ca exchanged was rapid at first and later became slow. With particles of bone which passed a 1/200 in. mesh the initial rapid exchange was complete in from 2 to 4 hr.

D. Harvey.

829

ODEBLAD, E. and ZILIOTTO, D. **Accumulation of radioactive phosphate in epithelia.**

ZILIOTTO, D. and ODEBLAD, E. **A study on the uptake of P^{32} in several organs of anemic rats.** *Acta pathol. microbiol. scand.*, 1955, **37**, 150–152; 153–156. [Dept. Gynaecol., Sabbatsberg Hosp., Karolinska Inst., Stockholm.]

Most epithelial linings in a number of mammalian species studied, and also epithelial derivatives such as salivary glands and hair follicles, take up ^{32}P more readily than connective tissue and muscle.

In rats made anaemic by repeated bleeding some of the epithelia, such as those of the digestive tract, took up less ^{32}P than those of normal rats. The red pulp of the spleen and also the adrenals appeared to take up more ^{32}P than was normal.

D. Duncan.

830

PIGMAN, W., HAWKINS, W. L., WATSON, J., POWELL, R. and GASTON, C. **The effect of the concentration of D-glucose on the attack of tooth substances in the artificial mouth.** *J. Dent. Res.*, 1955, **34**, 537–545. [Dent. Sch., Univ. Alabama, Birmingham.]

Extracted teeth were mounted in plastic boxes and treated with a bacteriological medium containing, per cent., 0·5 tryptone, 0·2 yeast extract and 0·025 $CaHPO_4 . 2H_2O$ at *p*H 6·4, to which different amounts of glucose were added. In some experiments dentine was decalcified before exposure with a buffered solution of sodium lactate. With glucose in relatively high concentration, 0·5 per cent., the effect was mainly decalcification of dentine; dentine already decalcified was softened and, in time, completely destroyed. With a lower concentration, 0·25 per cent., of glucose both

decalcification and destruction of dentine matrix occurred; in a few months dentine, enamel and cement of sound teeth were extensively destroyed.

In bacteriological studies after inoculation with pooled samples of saliva of known streptococcus and lactobacillus counts it was found that streptococci reached maximum growth when the glucose concentration was 0·25 per cent., and that lactobacilli required the same concentration for survival.—D. Harvey.

See also Absts. 347, 670.

GROWTH AND METABOLISM OF TUMOUR CELLS

831

LEMON, H. M., WALKER, B. S., REYNOLDS, M. M. D. and WOTIZ, H. H. **Biochemistry of human cancer.** *New Engl. J. Med.*, 1954, **251,** 937–944; 975–980; 1011–1016. [Robert Dawson Evans Mem., Massachusetts Mem. Hosps., Boston.]

A review with 346 references.

832

GREENBERG, D. **Isotopic tracer studies on the biochemistry of cancer.** *Cancer Res.*, 1955, **15,** 421–436. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

833

PLAZA DE LOS REYES, M., MARTENS, J., BRADFORD, I. and MERINO, I. Investigacion de un inhibidor de la catalasa en el plasma de individuos cancerosos y no cancerosos. [**Investigation of an inhibitor of catalase in the plasma of subjects with and without cancer.**] *Rev. méd. Chile*, 1955, **83,** 185–188. [Cat. Med., Univ. Chile.]

834

EAGLE, H. **The specific amino acid requirements of a human carcinoma cell (strain HeLa) in tissue culture.** *J. Exp. Med.*, 1955, **102,** 37–48. [Lab. Infect. Dis., Nat. Microbiol. Inst., Nat. Insts. Health, Bethesda, Md.]

The human carcinoma cell, like the mouse fibroblast (see Abst. 808, Vol. 26) required the 8 essential amino-acids plus arginine, cyst(e)ine, histidine and tyrosine for growth. Degenerative changes and death followed the absence of any of these, but the early changes could be reversed by addition of the missing amino-acid. The D-enantiomorphs had no apparent effect. The minimum and optimum concentrations for growth varied with the amino-acid. High concentrations of at least 6 separate amino-acids inhibited growth.

A. Hepburn.

835

BERNFIELD, P. and HOMBURGER, F. **The influence of tumor growth on the plasma proteins in mice.** *Cancer Res.*, 1955, **15,** 359–364. [Cancer Res. and Cancer Control Unit, Dept. Biochem., Sch. Med., Tufts Univ., Boston, Mass.]

Plasma proteins from 85 normal and 126 tumour-bearing mice were analysed by micro-electrophoresis. α-Globulin had considerably increased 4 days after the implantation of tumours, while the tumour nodules were still hardly palpable, and reached a maximum after 8 to 14 days and then declined. Albumin remained constant until the tenth day, when it began to decline. In one experiment total plasma protein fell greatly during tumour growth. α-Globulin rose by about 50 per cent., albumin fell by about 40 per cent. and the changes in β- and γ-globulins were not significant.

A. Hepburn.

836

HOLZER, H., HAAN, J. and SCHNEIDER, S. Zum Mechanismus des anaeroben Glucose- und Fructose-Abbaues im Mäuse-Ascites-Carcinom. [**Mechanism of anaerobic decomposition of glucose and fructose in the mouse-ascites carcinoma.**] *Biochem. Ztschr.*, 1955, **326,** 451–463. [Physiol. Chem. Inst., Univ. Hamburg.]

837

LINKO, P. and VIRTANEN, A. I. **Studies on keto acids of normal and cancerous tissues of rabbit.** *Acta chem. scand.*, 1955, **9,** 855–857. [Found. Chem. Res., Biochem. Inst., Helsinki.]

838

WARD, D. N. and GRIFFIN, A. C. **Phosphorus incorporation into nucleic acids and proteins of liver nuclei of normal and azo dye-fed rats.** *Cancer Res.*, 1955, **15,** 456–461. [Dept. Chem., Stanford Univ. Sch. Med., Calif.]

Rats received for 6 to 8 weeks a purified diet with or without 0·06 per cent. of 3′-methyl-4-dimethylaminoazobenzene, which usually requires 12 to 15 weeks to produce liver tumours. The controls gained more weight than those given the dye. At the end of this time each rat received an intraperitoneal injection of ^{32}P as phosphate; they were killed between $\frac{1}{2}$ and 18 hr. later. The liver nuclei were isolated and fractionated.

There was no difference in uptake of ^{32}P by the nuclear ribonucleic acid between the groups. Adenylic acid took up more ^{32}P than the other constituent nucleotides.—D. Duncan.

839

CEDRANGOLO, F., VERGA, P., DELLA PIETRA, G. and QUAGLIARIELLO, E. Acidi deossiribonucleinici e tumori. [**Deoxyribonucleic acids and tumours.**] *Arch. Sci. biol., Bologna*, 1955, **39,** 384–390. [Ist. Chim. Biol., Univ. Naples.]

No specific effect on tumours could be found when the host rats or mice were treated with

deoxyribonucleic acids, nor did deoxyribonucleic acids from rats treated with benzopyrene transform normal into neoplastic cells.—D. Duncan.

840

LEVY, H. M., MURPHY, E. A. and DUNN, M. S. **Effect of ethionine on the free amino acids in liver of tumorous and nontumorous rats.** *Cancer Res.*, 1955, **15,** 302–305. [Chem. Lab., Univ. California, Los Angeles.]

841

SAMPEY, J. R. **In vivo experiments with carcinogens: a survey from 1932 to 1953.** *Amer. J. Surg.*, 1955, **90,** 427–433.

A brief review with many references, of which only a few refer to diet.

842

OBERHAUSER, F. B., CROXATTO, H. R., GAILLARD, M. Q. and SILVA, V. M. **Anti-tumorigenic action of iodinated compounds.** *Nature*, 1955, **176,** 466–467. [Lab. Chem., Fac. Phil. Educat., Univ. Chile.]

Rats received by oesophageal tube 3 daily doses of a solution containing 0·482 *M* KI and 0·083 *M* KIO_3, equivalent to 43 mg. I per 100 g. bodyweight every 24 hr. This treatment, begun on the same day as or 2 weeks before the implantation of spindle cell sarcoma in 19 rats, caused inhibition of tumour growth and complete disappearance of tumour in 70 per cent. [exact number not given] of the rats. Large tumours developed in 21 control rats, which died. In another experiment, of 38 rats treated 45 days before implantation of the sarcoma and 38 control rats, 34 in each group developed tumours. All the treated rats were alive after 64 days and there was no trace of tumour, but the 34 control rats died with large tumours.—A. Hepburn.

See also Absts. 591, 607.

METABOLISM OF GROWTH, REPRODUCTION AND SENESCENCE

GROWTH

843

HUGHES, E. C. **Nutrition and fetal growth.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 783–789. [Dept. Obstet., Med. Centre, State Univ. New York, Syracuse.]

844

WASHBURN, A. H. **Human growth, development, and adaptation.** *Amer. J. Dis. Child.*, 1955, **90,** 2–5. [Child Res. Counc., Denver, Colo.]

Address of the President, American Pediatric Society.

845

SCOTT, R. B., FERGUSON, A. D., JENKINS, M. E. and CUTTER, F. F. **Growth and development of Negro infants. 5. Neuromuscular patterns of behavior during the first year of life.** *Pediatrics*, 1955, **16,** 24–30. [Dept. Paediat., Coll. Med., Howard Univ., Washington, D.C.] Spanish and Interlingua summaries.

846

SÁNCHEZ AGESTA, A. Patologia general del crecimiento. Factores que lo condicionan y regulan: su fisiopatologia. [**The general pathology of growth. Factors which condition and regulate it: its physiopathology.**] *Rev. clín. española*, 1955, **57,** 143–162. [Fac. Med., Granada.]

A review with 189 references.

847

MØLLGAARD, H. Den kvantitative vaekstmålings metodik. Virkningen af indre og ydre faktorer på vaekstprocesserne. [**Quantitative methods of measuring growth. Effect of internal and external influences on the growth processes.**] *Førsogslab. København Beretn.*, 1955, No. 282, pp. 190. English summary.

For an account of most of the practical work described here see Abst. 5421, Vol. 25. Here the derived philosophical concepts also are elaborated. The hyperbolic function of age holds so long as the metabolic gradient does not suffer a qualitative change; any quantitative change is shown only in change of the constant Q, which is therefore a measure of the absolute level of the activity of synthesising enzymes. There are reasons to associate such activity with the mitochondria and it follows that (since mitochondria will then have a critical size above which they either become less active or subdivide) activity and number of mitochondria in living cells are probably synonymous. It is argued from this that the growth constant Q is a function of the absolute concentration of mitochondria in self-reproducing cells, which also falls as the mitochondria are distributed over increasing numbers of descendent cells.

It follows that no external agent can alter the constant Q unless it can enter as a component of the mitochondrial enzyme system. For instance, penicillin was found to alter the Q of protein and P deposition in pigs. On the assumption that there might be bacteriostatically inactive but

physiologically active split-products, *e.g.*, SH^- groups which might catalyse the turnover of active acetyl, perhaps in Lipmann's coenzyme A, experiments were made with dimercaptopropanol (BAL), aminoethylmercaptan and phenylthiodiazolethionsulphydrate. All three reproduced the effect of penicillin which is, therefore, thought to be independent of any effect on the gut microflora. The effect is probably a general mercaptan effect, which penicillin shares, and depends on building a sulphydryl group into the coenzyme A system with a speeding-up of the synthetic processes in the Krebs cycle.

Normal growth of young pigs, birth to 180 days, proceeds with a series of changes of Q, *i.e.*, abrupt increases in number of mitochondria, which resemble mutations.—I. Leitch.

848

THOMSON, J. **Observations on weight gain in infants.** *Arch. Dis. Childhood*, 1955, **30**, 322–327. [Dept. Child Life and Health, Univ. Edinburgh.]

The infant population of a clinic was sampled at ages 2 weeks ± 2 days; 4, 8, 16, 20 and 24 weeks, ± 3 days; 28, 32 and 36 weeks, ± 5 days; 40, 44, 48 and 52 weeks, ± 7 days. Birthweights were available for all the infants. A total of 1737 observations on boys and 1605 on girls were made and from the data the mean birthweights and the mean weight gains with their standard deviations for each sex at each age were calculated. The inquiry was confined to single legitimate infants of birthweight 5½ to 9½ lb.

The results confirmed that throughout the first year the mean weight gain is greater in boys than girls. Apart from a doubtful and slight relationship in the early weeks of life, the correlation coefficients between birthweight and postnatal weight gain were not of statistical significance. The data did not substantiate the prevalent idea that birthweight is doubled and trebled at certain ages. It is suggested that graphs of infant weight should be begun at zero on the birthday so that only gains and losses of weight are recorded thereafter. Comparison of the mean weight at 1 year, undifferentiated for sex, with data published in 1926 showed an increase of about 2 lb. over the earlier data. Examination of weight charts in use in local authority infant welfare clinics indicated that they are outmoded.—F. C. Aitken.

849

THOMSON, J. **Infant size at six months.** *Health Bull., Dept. Health Scot.*, 1955, **13**, 46–48.

For 130 boys and 106 girls born in Edinburgh Royal Infirmary the respective means and standard deviations at about 2 and 26 weeks were: weight in oz. 122·8 ± 14·6, 277·9 ± 27·2, and 117·4 ± 15·3, 262·6 ± 27·9; crown-heel length in inches 20·5 ± 0·74, 26·2 ± 0·72, and 20·1 ± 0·85, 25·6 ± 0·76; crown-rump length 13·7 ± 0·60, 17·4 ± 0·57 and 13·5 ± 0·61, 16·9 ± 0·53; occipitofrontal circumference 14·3 ± 0·45, 17·3 ± 0·47, and 13·8 ± 0·47, 16·9 ± 0·45. Many were first babies, but since the separate results for first-born and subsequent infants did not differ significantly, the data were combined. The weight and crown-heel length at 26 weeks exceed the Edinburgh Welfare Clinic norms, set up 30 years ago, by about 2½ lb. and 0·85 in., and it is considered that there is need for a large-scale study of infant growth to provide new norms of weight and length. There were positive correlations between weight at birth and at 26 weeks and between all 3 linear measurements at 2 weeks and 26 weeks and negative correlations, significant only for linear measurements, between early values and increments to 26 weeks. Boys increased more in weight and in length than girls, but for occipito-frontal circumference there was no sex difference.—W. M. Deans.

850

PROVIS, H. S. and ELLIS, R. W. B. **An anthropometric study of Edinburgh schoolchildren. 1. Methods, data and assessment of maturity.** STEIN, L. **2. Comments on results.** *Arch. Dis. Childhood*, 1955, **30**, 328–337; 432–438. [Dept. Child Life and Health, Univ. Edinburgh.]

1. Measurements of recumbent crown-heel length, crown-rump length and span; erect bi-acromial diameter and intraspinous pelvic width; unclothed weight; head length, breadth and circumference, and estimates of maturity, were made, mostly by a single observer in 1951–52, on 1730 Edinburgh schoolchildren between the ages of 5 and 18, from 2 primary and 3 secondary mixed state schools and 4 fee-paying schools, 2 for boys and 2 for girls. Full details of measuring technique are given. Maturity in boys was estimated by criteria previously set up (Abst. 2264, Vol. 17); girls were reckoned pubescent when early signs of breast development were found and adolescent when menstruation began. Mean values, standard deviations and coefficients of variation of the 9 body measurements are tabulated for boys and girls separately for each year of age, and crown rump length : length and span : length ratios and cephalic index are also given. Some of the results are presented graphically [other graphs are in the second part].

Between the ages of 11 and 14, girls were longer than boys; at younger ages sex differences were not consistent, and it is suggested that the measurement of recumbent length might eliminate the small differences usually found in erect height.

The median ages of pubescence and adolescence were 13·45 and 15·35 years for boys and 11·30 and 13·35 years for girls. There was some indication that pubescence in boys lasts longer in those who begin early, but not in those who begin late. There is evidence that the age of menarche in Edinburgh is significantly earlier than it was 50 years ago. The data are compared with other British and American results.

2. The results are discussed in more detail, with additional graphs. For crown-heel length the coefficients of variation were mostly about 4 to 5 per cent., *i.e.*, most of the children in each age group had lengths within 10 per cent. of the group mean. The same was true of several other body measurements. Their variability increased slightly for ages from about 12 to 16. Head measurements were much less variable and there was no age effect on variability, presumably because much of the head growth has already occurred before the age of 5. Weight was much more variable than linear measurements. Generally speaking, the boys' means formed a more regular pattern than those of the girls. Whether this is due to greater variability in girls or to less consistent measuring of girls by a male investigator is not clear.

W. M. Deans.

851

SAITO, K. and TSUJI, T. **Birth weight and subsequent physical development. 2. School age periods.** *Bull. Inst. Pub. Health, Tokyo*, 1954, **4,** No. 1/2, Japanese pp. 20–23; English p. 20. [Dept. Maternal and Child Health.]

In continuation of the previous report on preschool children (Abst. 2426, Vol. 25) a study was made of Japanese schoolchildren aged from 7 to 10 years. The subsequent development of the 4 birthweight groups, less than 2·5 kg., from 2·5 to 3·0 kg., from 3·0 to 3·75 kg., and 3·85 kg. or more, was followed by making 5013 measurements of weight and 4082 of height. The close relation between birthweight and subsequent weight was again apparent for both sexes. No clear relation between birthweight and subsequent height was established. The subsequent growth and height of the premature group contrasted sharply with those of the next higher birthweight group in boys but not in girls; no explanation could be obtained from the present sample. (From English summary.)—E. M. Hume.

852

MARESH, M. M. **Linear growth of long bones of extremities from infancy through adolescence.** *Amer. J. Dis. Child.*, 1955, **89,** 725–742. [Child Res. Counc., Denver, Colo.]

A further report on a study of growth in length of the long bones from infancy to maturity for both sexes (see Abst. 3292, Vol. 13). Measurements of these lengths have been obtained from X-ray examinations made at regular intervals on 175 subjects. In addition to the bone lengths, height and sitting height were recorded on each occasion. This is a longitudinal study, but up to the present the records for each subject cover only a section of the total age range. Measurements are grouped at ages of 2, 4 and 6 months, and then by 6-monthly intervals from one year to 18 years, males and females being treated separately. On the average there are over 40 sets of measurements in each of the age and sex groups.

The growth of the bones of each individual has been assessed by finding at each age where they stand in relation to the rest of that age group. This is expressed numerically by the percentiles, the percentages of the comparable measurements which they exceed. Attention is thus focused on relative rather than on absolute growth, but tables are given of the lengths in cm. corresponding to the 10th, 25th, 50th, 75th and 90th percentiles for each group.

For detailed discussion the total age range is divided into 3 parts. In the period of infancy up to 3 or 4 years there are marked differences in growth from one child to another and also from one bone to another, so that there are changes in relative lengths of up to fifty percentiles. The picture is quite different for the mid-childhood period, from about 3 to 9 years in girls and about 4 to 11 years in boys. Here there are much smaller changes in percentile values, and the bones all behave in much the same way. Finally, in the adolescent period up to the completion of long-bone growth, there is again more variation, much of it associated with variations in the onset, magnitude and duration of the adolescent growth spurt.

A further analysis was made to study the relation between early adult height and childhood height, taking the latter at age 6 for girls and 7 for boys. The results showed that those who mature early tend to have a smaller adult height than those of the same childhood height who mature late.

I. McDonald.

853

ASMUSSEN, E. and HEEBØLL-NIELSEN, K. **A dimensional analysis of physical performance and growth in boys.** *J. Appl. Physiol.*, 1955, **7,** 593–603. [Lab. Theory Gymnastics, Univ. Copenhagen.]

Anatomical and physiological measurements were made on Danish schoolboys from 7 to 16 years of age. The data were split up into classes by height, and mean values of the other measurements were obtained for each height. It was found possible to express the change of each measurement with increasing body height by fitting equations of the form $y = ah^b$ to the data, where h is the height, y is the other measurement and a and b are

numerical constants differing for each measurement. The values of the exponent b found in this way, were compared with the values which would be expected if growth of schoolboys took the form of an equal proportionate increase in all the linear dimensions of the body and was unaccompanied by any qualitative change in the tissues. The differences between the observed values of b and those expected on this simple hypothesis are discussed in detail and show where the hypothesis must be modified. For the anatomical measurements the predictions were not far out, although there was a slight decrease in the ratio of trunk length to body length as height increased, which caused weight to increase at somewhat less than the expected third power of the height. There were bigger differences in the respiratory measurements, particularly in the maximum voluntary breathing capacity, which increased much less with height than would be expected, although the maximum inspiratory and expiratory forces increased more than would be expected. It is concluded that the linear dimensions of the bronchi do not increase in proportion to height. The most striking discrepancy concerned muscular strength, which was found to increase at significantly more than the expected second power of height, although by different amounts for the different groups of muscles tested. This point is discussed in detail and it is concluded that there is a qualitative increase in muscular strength due to increasing ability to mobilise and co-ordinate the muscles as the nervous system reaches maturity.—I. McDonald.

854

OSGOOD, E. E. **Development and growth of hematopoietic tissues. With a clinically practical method of growth analysis.** *Pediatrics*, 1955, **15**, 733–751. [Div. Exp. Med., Univ. Oregon Med. Sch., Portland.] Spanish summary.

From a survey of the literature tables have been compiled showing for different stages of gestation, childhood and adolescence and for adults bodyweight, height, weights of liver, spleen and thymus, blood volume, Hb and number of red cells and white cells in blood and marrow. Growth in bodyweight, organ weight, volume or number of cells is described by straight lines on logarithmic paper. The equation used to describe the straight lines is

$$y_2/y_1 = (t_2/t_1)^x,$$

where y is any measured variable and t the time from fertilisation in pre-natal life and from birth in post-natal life. Then $x = d(\log y)/d(\log t)$, *i.e.*, the slope of the straight line.

The qualitative development of the haematopoietic system in early foetal life is outlined and the total number of cells in the human foetus, at the ages of about 56 and 150 days, has been calculated from estimations of deoxyribonucleic acid phosphorus.—F. C. Aitken.

See also Absts. 923, 1079, 1080, 1120.

REPRODUCTION AND LACTATION: MAMMALS

855

CUTHBERTSON, D. P. **Some aspects of nutrition in relation to pregnancy and lactation and to the toxaemias of pregnancy.** *Patna J. Med.*, 1955, **29**, 197–203. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

856

HOLEMANS, K. Les protéines sériques de la femme indigène du Kwango pendant la grossesse et la lactation. [**Serum proteins in native women of the Kwango during pregnancy and lactation.**] *Ann. Soc. belg. Méd. trop.*, 1955, **35**, 29–34. [Lab. Nutrit., Hôp. Feshi, Belgian Congo.] Flemish summary.

In 36 women of the Kwango at term the mean serum values for total protein and for albumin were considerably below the mean for the non-pregnant adult population of the same district. During lactation there was a steady rise in the values for total protein and albumin until, at the end of 2 years' lactation, they were about the same as for the non-pregnant women. At term the serum globulin value was slightly lower than for the non-pregnant population, but during lactation it increased to reach its highest value at the end of the first year; it then fell gradually to normal at the end of lactation. The albumin : globulin ratio was lowest at the end of the first year's lactation. The diet was extremely low in protein. The unexpected rise in the serum protein during lactation was related to the very small secretion of milk of 350 ml. a day, containing 1·1 per cent. protein, representing a daily loss of 0·61 g. N, compared with an average daily secretion in better-fed lactating women of 800 ml., representing a daily loss of 1·9 g. N, which is greater than the average N requirement during pregnancy. Eclampsia was never seen in the district, though it is not uncommon in Léopoldville, where the fall in the serum albumin during pregnancy is known to be considerably greater than in the Kwango women studied.—L. Wills.

857

FERRANDO, R., JACQUES, F., MABBOUX, H. and SOLLOGOUB, C. Influence du tourteau d'arachide délipidé par extraction sur la croissance et l'intégrité des testicules du rat. [**Effect of solvent-extracted groundnut cake on growth and integrity of the testicles of the rat.**] *C.R. Acad. Sci.*, 1955, **241**, 107–109.

There were 3 groups of 5 rats weighing from 85 to 89 g. The basal diet contained, in g., defatted casein 147, brewer's yeast 73, sugar 757 and salt mixture 25. In the 2 experimental groups the diet contained 8·7 per cent. extracted groundnut cake or 8·6 per cent. pressed groundnut cake at the expense of enough casein to keep the protein contents equal. All received vitamins A and E. After 344 days the rats were killed and their testes were examined.

The rats on the basal diet and those given extracted cake grew a little less than is normal, but appeared healthy. Their testicles weighed on the average only 0·8 g., compared with 2·8 in the group given pressed cake, and showed histological degeneration. It is suggested that solvent extraction of the cake had removed essential fatty acids.

D. Duncan.

858

FERRANDO, R., JACQUES, F., MABBOUX, H. and PRIEUR, G. Influence du tourteau d'arachide délipidé par extraction sur la fécondité de la femelle du rat. [**Effect of solvent-extracted groundnut cake on fertility in the female rat.**] *C.R. Acad. Sci.*, 1955, **241,** 253–254.

The experimental conditions were similar to those in the preceding Abst., but the rats were females and were allowed to breed.

The rats on the basal diet and those given solvent-extracted cake were sterile and vaginal smears showed no sign of oestrus. The 5 rats given pressed cake had 7 litters between them and a normal incidence of oestrus.—D. Duncan.

859

BAIER, W. Über den frühembryonalen Fruchttod als paternell bedingten Zuchtschaden. [**Early death of the embryo as a paternally determined genetic fault.**] *Züchtungskunde*, 1955, **27,** 93–99. [Inst. Geburtshilfe, Tierärzt. Fak., Univ. Munich.]

The evidence discussed was obtained from the literature and from the records of an artificial insemination station. It is suggested that in cows the so-called persistent corpus luteum is evidence of a previous pregnancy with early death of the embryo. A high incidence of this condition can sometimes be related to a certain bull. More study on the subject is called for.—D. Duncan.

860

BLACK, A. L., KLEIBER, M. and BAXTER, C. F. **Glucose as a precursor of amino acids in the intact dairy cow.** *Biochim. biophys. Acta*, 1955, **17,** 346–353. [Univ. California Sch. Vet. Med., Davis.] French and German summaries.

Glucose labelled with ^{14}C was injected intravenously into a lactating cow and the specific activity of the component amino-acids of casein obtained from milk taken up to 34 hr. later was studied. The percentage derived from plasma glucose was in alanine 26, serine 23, glutamic acid 10, aspartic acid 9 and glycine 7. The values for the other acids were very small. Transfer via carbonate was most frequent for the essential amino-acids, but was unimportant for the others.

A. Hepburn.

861

ASKONAS, B. A., CAMPBELL, P. N., GODIN, C. and WORK, T. S. **Biosynthesis of proteins. 3. Precursors in the synthesis of casein and β-lactoglobulin.** *Biochem. J.*, 1955, **61,** 105–115. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

For part 2 see Abst. 2456, Vol. 25.

The radio-activity of casein and β-lactoglobulin obtained from goat's milk after the injection of mixtures of radio-active glycine, valine and lysine was shown by partial hydrolysis to be uniformly distributed within the protein molecules. This indicated that the milk proteins were synthesised from the free amino-acids of the blood. It was suggested that any peptide formed during synthesis had only a brief existence and that exchange reactions between pre-existing protein and amino-acids were negligible.—A. Hepburn.

See also Absts. 210, 606, 767, 816, 925, 958, 976, 996, 1012, 1027, 1028, 1051, 1209.

REPRODUCTION: BIRDS

862

ROMIJN, C. and LOKHORST, W. **Chemical heat regulation in the chick embryo.** *Poultry Sci.*, 1955, **34,** 649–654. [Lab. Vet. Physiol., State Univ., Utrecht.]

Continuous recording of respiratory exchange and temperature in incubated eggs showed that the embryo reacts to changes in environmental temperature as a cold-blooded animal. The full-term embryo responds to cooling through at least 10° C. by a slight increase in R.Q., but temperature regulation is still poor just after hatching. Energy output and water loss are better controlled in chicks a week old.—D. Duncan.

863

KOMETIANI, P. A., KOKOCHASHVILI, V. I. and DOLIDZE, SH. V. Izuchenie obmena phosphornykh soedinenii yaichnogo zheltka v protzesse razvitiya zarodysha metodom radioaktivnoi indikatzii. [**Study of metabolism of phosphorus compounds of egg yolk in foetal development by a method of radio-active indicators.**] *Biokhimiya*, 1955, **20,** 100–105. [Gosud. Univ., Tbilisi.]

Lipid and protein fractions of egg-yolk P had a slower turnover than the nucleotide fraction. The

incorporation of ^{32}P into deoxyribonucleic acid was more rapid than that into ribonucleic acid. The nucleic acid content of the yolk of fertilised eggs was renewed more rapidly than that of unfertilised eggs, and incubation increased the amount of deoxyribonucleic acid.—D. W. Taylor.

See also Abst. 218.

SENESCENCE

864

GAFFURI, E., BERRA, A. and NEIROTTI, P. G. La capacità di lavoro del torace nella vecchiaia. [**Thoracic working capacity in old age.**] *Acta gerontol.*, 1955, **5**, 67–78. [Ist. Clin. Med. Gen., Univ. Turin.] English and French summaries.

The subjects were 40 men aged from 61 to 88 years, mean 72. None had heart trouble or asthma, and slight bronchitis was ignored. A Benedict spirometer was used to record vital capacity, and maximum inspiratory and expiratory pressures were measured with an aneroid manometer. The sum of the maximum pressures expressed as fraction of atmospheric pressure and multiplied by the vital capacity in litres gave the maximum thoracic work-potential in litre-atmospheres, and this was multiplied by 24·2 to give work in g. cal. The values were compared with those for a group of 30 young men with a mean age of 30 years.

The values for the old men, expressed as percentage of those for the young, were vital capacity 57, maximum expiratory pressure 61, maximum inspiratory pressure 50, maximum work potential 32·2. The maximum work potential was $11{\cdot}6 \pm 4{\cdot}5$ g. cal., which should permit a subject of about 70 years old and 70 kg. bodyweight a maximum energy consumption during muscular work of 8 Cal. per kg. per hr. In fact the value is about 3·5 Cal. per kg. per hr., which suggests that the maximum is limited also by the efficiency of the circulation.—D. Duncan.

865

WATKIN, D. M., PARSONS, J. M., YIENGST, M. J. and SHOCK, N. W. **Metabolism in the aged: the effect of stanolone on the retention of nitrogen, potassium, phosphorus, and calcium and on the urinary excretion of 17-keto, 11-oxy, and 17-hydroxy steroids in eight elderly men on high and low protein diets.** *J. Gerontol.*, 1955, **10**, 268–287. [Sect. Gerontol., Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

Metabolic balance studies consisting of 12 and 13 five-day periods, respectively, with a 10-day interval between the studies, were made on 8 men aged from 70 to 93 years. During the first study daily protein intake was 106 g. and during the second 52 g. In each study the first 4 periods formed the control phase and the second 4 periods the experimental phase, when 50 mg. of the synthetic androgen stanolone were injected intramuscularly on alternate days ; the follow-up phase lasted for 4 periods in the first study and 5 periods in the second.

Stanolone caused increased retention of N, K and P, but not of Ca, on both levels of protein intake, but especially on the higher. The hormone had no significant effect on serum Ca, total protein or albumin, nor was there any effect on P or alkaline phosphatase when the protein intake was high, but with low protein intakes both P and alkaline phosphatase of plasma fell significantly when the hormone was given and approached or even exceeded control values when the hormone was withdrawn. Polymorphonuclear leucocytosis was found during the hormone treatment, but no other haematological change. Significant increases in average 17-ketosteroid excretion occurred with the hormone treatment on both protein intakes and a significant decrease occurred on cessation of treatment ; no significant change in average 11-oxysteroid or 17-hydroxysteroid excretion was found.—G. F. Garton.

See also Abst. 1082.

EXPERIMENTAL STUDIES OF IMMUNITY AND MICRO-ORGANISMS

866

PIERCE, A. E. **Electrophoretic and immunological studies on sera from calves from birth to weaning. 1. Electrophoretic studies. 2. Electrophoretic and serological studies with special reference to the normal and induced agglutinins to *Trichomonas foetus*.** *J. Hygiene*, 1955, **53**, 247–260 ; 261–275. [Agric. Res. Counc. Inst. Animal Physiol., Babraham, Cambridge.]

1. Calves were removed from their mothers at birth and pail-fed ; some received colostrum, others had a small amount of precipitated lactoglobulin and boiled milk or glucose saline for the first 48 hr. They all received milk for from 10 to 12 weeks and hay and meal from the fourth week. Blood serum was examined in a Tiselius apparatus.

In 9 calves serum taken before they were fed contained albumin and α-, β- and γ-globulin ; in 6 the α-globulin could be separated into α_1- and α_2-components. The γ-fraction made up only 1·4 per cent. of the total protein and was considered to be either autogenous γ-globulin or globulin passively acquired *in utero*. In 4 calves given colostrum the γ-globulins rose in 24 hr. to 30·4 per

cent., albumin fell and the albumin : globulin ratio therefore fell. The α- and β-globulins were unchanged. By the next day the albumin content had begun to recover and the elimination of lactoglobulin exceeded absorption. By the tenth day after birth γ_1- and γ_2-components replaced the original lactoglobulin, and after from 60 to 80 days γ-globulin had reached 14·1 per cent., about half the adult value.

In 3 calves given precipitated lactoglobulin the passive increase was only just detectable. The α-globulins increased in the first 2 days. In one calf given whole colostrum, but not until 17 hr. after birth, the α-globulin remained constant for 2 days and then increased. All 4 showed evidence of autogenous development of γ-globulin by the tenth day, and in 3 this began within 5 days with an increase in γ_1-globulin. Changes in albumin usually occurred inversely with changes in total globulins.

The mobilities of the major components did not differ significantly from those in adult serum or change significantly in the first 6 weeks of life.

2. Colostral whey lactoglobulin contained both normal and immune agglutinins to *Trichomonas foetus*. In 4 cows the percentage of γ-globulin in serum fell in the last month of pregnancy; this may be associated with the concentration of lactoglobulin in the udder.

In calves given colostrum containing either normal or induced maternal agglutinins the elimination of passive agglutinins was logarithmic. In calves with a low titre from normal colostrum there was a gap between the disappearance of passive agglutinin and the autogenous production of normal agglutinin, but this gap was absent in calves given colostrum from immunised mothers. Autogenous normal agglutinins first appeared from 16 to 60 days after birth, whether the calves received colostrum or not. Appearance of these agglutinins was not correlated with development of any one γ-globulin. Two calves given *T. foetus* antigen developed autogenous normal agglutinins, but did not produce induced agglutinins.

D. Duncan.

867

BOYDEN, S. V. and ANDERSEN, M. E. **Diet in experimental tuberculosis in the guinea-pig.** *Acta pathol. microbiol. scand.*, 1955, **37**, 201–204. [Tuberculosis Immunization Res. Centre, Statens Seruminst., Copenhagen.]

The winter diet of guineapigs at the State Serum Institute consisted of hay, a concentrate mixture containing crushed oats 84, bran 30, fishmeal 1 and meat-and-bone meal 1 part, with about 100 g. fodder beet daily. In the summer diet the fodder beet was replaced by about 100 g. of equal parts of freshly cut lucerne and grass. Guineapigs were given these 2 diets at the same time and were housed in one room; 10 animals on each diet were challenged after 2 weeks with a large dose of virulent tubercle bacilli and 10 were not challenged.

The average survival time of challenged animals on the winter diet was 28 days and all were dead before the first death on the summer diet. The average survival time on the summer diet was more than 73 days. There was no death in the control groups, but animals on winter diet gained more weight than those on summer diet. No sign of nutritional deficiency was found *post mortem*.

D. Duncan.

868

CORRADETTI, A., TENTORI, L. and VEROLINI, F. Osservazioni sull'infezione da *Plasmodium berghei* in ratti tenuti a dieta lattea. [**Infection with *Plasmodium berghei* in rats on milk diet.**] *Rend. Ist. Super. Sanità, Rome*, 1955, **18**, 256–260. [Lab. Parassitol., Ist. Super. Sanità, Rome.] French, English and German summaries.

The rats were 2 or 3 months old and were given a stock diet or milk alone or with *p*-aminobenzoic acid for from 3 to 14 days before inoculation with one of 2 strains of *Plasmodium berghei*. In contrast to the results of other authors (*e.g.*, Abst. 4848, Vol. 23), there was no suppression of development of the parasites in rats on the milk diets. Possible reasons for the discordant results are discussed.—D. Duncan.

869

CORRADETTI, A., TOSCHI, G. and VEROLINI, F. Comportamento dei componenti proteici del siero durante l'attacco primario nei ratti infetti da *Plasmodium berghei*. [**Behaviour of serum protein components during the primary attack in rats infected with *Plasmodium berghei*.**] *Rend. Ist. Super. Sanità, Rome*, 1955, **18**, 246–255. [Lab. Parassitol., Ist. Super. Sanità, Rome.] French, English and German summaries.

The rats, in groups of 4, 6 or 8, weighed from 150 to 200 g. and were fed on the MacCollum diet with fresh liver and greenstuff. Electrophoretic studies were made on serum taken before and up to 16 days after infection with *Plasmodium berghei*.

In each group there was a small but highly significant increase in the percentage of γ-globulin 12 or 16 days after infection. In 3 out of 4 groups there was a fall in α-globulin, which in 2 groups was found on the sixth day. In one experiment there was a fall in albumin. There was no significant change in total N.—D. Duncan.

870

BERG, M. and LEVINSON, S. A. **Nephrotoxic damage by Clostridium perfringens toxin.**

Protective effect of amino acids against hyperglycemia and renal damage by C. perfringens toxin. *Arch. Pathol.*, 1955, **59**, 656–668. [Univ. Illinois Res. Hosp. Lab., Chicago.]

Nine groups of from 3 to 12 dogs were used. In 6 groups the dogs received by intramuscular injection a lethal dose of *Clostridium perfringens* toxin, 8 ml. per kg. bodyweight, and in 5 of these groups the toxin was preceded by intravenous injection of 3 per cent. *dl*-methionine solution providing 1 g. amino-acid per kg. bodyweight, or a similar dose of arginine or glycine, or 5 per cent. dextrose solution, or isotonic saline. Other groups were given the amino-acids but no toxin. Blood pressure, urine volume, urine sugar, haematocrit, blood chloride, urea N and blood sugar were studied until the dogs were killed, usually about 4 hr. after the injection of toxin. Kidney and other tissues were examined histologically.

The amino-acids when given alone produced no histological change in the kidney. The toxin alone produced high blood sugar, but no sugar in the urine. The rise in blood sugar was prevented by the amino-acids and by dextrose, but not by saline. The toxin alone destroyed alkaline phosphatase activity in the brush border of cells of the proximal convoluted tubules. This was best protected by dextrose, less well by glycine and arginine and least by methionine. The amino-acids, but not dextrose, protected the mitochondria of these cells from destruction. There was no protection, by any of the substances studied, against the lethal effects of the toxin.—D. Duncan.

871

Bruni, A. and Stancanelli, G. Ricerche sull' alimentazione lattea esclusiva della cavia. 4. Comportamento della flora fecale. [**On the feeding of guineapigs with a diet of milk only. 4. Behaviour of the faecal flora.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 787–788. [Ist. Igiene, Univ. Messina.]

For part 3 see Abst. 2022, Vol. 22.

According to Volpone and Buda (*Arch. ital. Med. sper.*, 1939, **4**, 769) guineapigs maintained on a diet of milk die in from 10 to 20 days, but are protected by greenstuff such as cabbage.

Cultures on several media were made from the faeces of guineapigs normally fed or given only raw, summer milk. The latter all died within 19 days. With the milk diet the number of organisms, including *Bacterium coli*, increased greatly and anaerobes appeared in large numbers. Acidophil organisms increased. No light was thrown on the significance of the changes.—E. M. Hume.

872

Marget, W. and Naber, G. Über das Wachstum von Lactobacillus bifidus in erhitzter und verdauter Frauenmilch. [**Growth of *Lactobacillus bifidus* in heated and digested human milk.**] *Monatsschr. Kinderheilk.*, 1955, **103**, 181–184. [Kinderklin., Univ. Freiburg i. Br.]

Strains of *Lactobacillus bifidus* were isolated from the stools of healthy infants and grown on a culture medium to which had been added human milk, unheated or heated for different periods to different temperatures. Of 26 strains thus tested, 12 were not affected in their growth by heating of the milk; the other 14 would not grow if the heating had lasted for more than about 10 min. at from 55° to 60° C.—A. M. Copping.

873

Bonsembiante, M. Funzioni ed importanza della microflora dei prestomaci nel quadro della nutrizione dei ruminanti domestici. 3. [**Functions and importance of the microflora of the forestomachs in the nutrition of domestic ruminants. 3.**] *Riv. Zootec.*, 1955, **28**, 171–174. [Ist. Zootec. Gen., Univ. Padua.]

For parts 1 and 2 see Title 5454, Vol. 25.

874

Oxford, A. E. **The bacteriology and protozoology of ruminant digestion.** *J. Sci. Food Agric.*, 1955, **6**, 413–418. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

875

Gutierrez, J. **Experiments on the culture and physiology of holotrichs from the bovine rumen.** *Biochem. J.*, 1955, **60**, 516–522. [Dept. Bacteriol. Pub. Health, State Coll. Washington, Pullman.]

Holotrich protozoa from the rumen were separated from oligotrichs by sedimentation in the presence of glucose, as described by Heald *et al.* (*Nature*, 1952, **169**, 1055). Advantage was taken of the differing sedimentation rates of holotrich species to obtain separate living suspensions of *Dasytricha ruminantium* and of *Isotricha prostoma* with *I. intestinalis*.

Both genera synthesised and stored iodine-staining polysaccharide when given glucose, fructose, sucrose, inulin or raffinose. *Dasytricha* also used to a smaller extent salicin and cellobiose. Starved *Isotricha* ingested small starch grains, given as " soluble starch ".

Manometric experiments with glucose or cellobiose as substrate showed that while *Isotricha* did not use cellobiose, with *Dasytricha* suspensions gas production from cellobiose almost equalled that from glucose. *Isotricha* produced a higher $CO_2 : H_2$ ratio from glucose than did *Dasytricha*. In flask fermentation cultures lactic, acetic and butyric

acids, with traces of an unidentified acid, were formed by both genera, but the proportion of end products differed, *Dasytricha* producing relatively more acetic and less butyric acid than *Isotricha*. Amounts of CO_2, H_2 and acid per cell per hour were calculated, and the protozoan contribution of these products within the rumen was assessed. Relatively pure suspensions of *I. prostoma* had a higher metabolic rate than a mixture of *I. prostoma* and *I. intestinalis*.

Micro-Kjeldahl estimations of N in washed, counted suspensions of the 2 genera are reported.

In culture experiments with alfalfa, ground wheat and rumen fluid medium, isotrich protozoa survived for 96 hr. In small numbers they were kept alive for 3 weeks by removing them individually to fresh medium every 24 hr. The generation time at the start of these experiments was about 48 hr.—J. C. Appleby.

See also Absts. 286, 1212.

MISCELLANEOUS FEEDING EXPERIMENTS

876

VAN DER RIJST, M. P. J., JANSEN, B. C. P., BEEKER, T. W. and WÖSTMANN, B. S. J. **Experiments to determine the nutritive value of the average diet consumed in the Netherlands, when fed to white rats ad libitum and under conditions of restricted consumption (70 %).** *Voeding*, 1955, **16**, 708–725. [Netherlands Inst. Nutrit., Amsterdam.]

White rats were fed to appetite for 7 generations on a diet which corresponded to the national average diet. The diet was given in dried form. Its proximate composition was protein 11·4, fat 17, water 6, crude fibre 1, ash 3·7 g. and Cal. 444 per 100 g. The stock diet with which the experimental diet was compared contained protein 20, fat 6, water 12, crude fibre 1·4, ash 2·6 g. and Cal. 373 per 100 g. The experimental diet gave slower gain of weight, lower maximum weight and shorter life than the stock diet; rats lost weight during lactation on the experimental diet and gained weight on the stock diet. Five generations were fed on the experimental diet restricted in amount to 70 per cent. of that eaten by rats fed to appetite. An extra allowance of food was given to restricted animals during lactation. Food restriction had no significant unfavourable effect; it prolonged life, especially in males, and reduced the incidence of dental caries compared with unlimited intake of the same diet.

The superior growth of rats on the stock diet is attributed to the higher quantity or quality of protein, and their longer life is thought to be due to the lower fat content of the stock diet.

Some results are presented of blood urea estimations in old animals in the 3 groups.—F. C. Aitken.

877

MORALES J., V. Suplementación de la dieta estadística nacional con carbonato de calcio. **[Supplementing the average national diet with calcium carbonate.]** *Rev. Chilena Educac. fis.*, 1955, **21**, 948–952.

In an experiment lasting 35 days with 3 groups of 6 rats 39 days old a basal ration corresponding to the average national diet of Chile was supplemented for one group with dried whole milk to raise the percentage of protein from 12·2 to 14·2 and for another group with $CaCO_3$ to supply as much Ca as the supplement of milk. The rations were equal in energy value.

Total intake of food was least on the control ration. During the first week weight increases of the 3 groups were similar, and gains per g. protein eaten were also similar. In the following weeks the supplemented groups gained almost twice as much as the control group, rats given $CaCO_3$ being slightly superior to those given milk, in both weight gain and efficiency of protein utilisation. The results seem to indicate that the national average diet was not deficient in protein, but was low in Ca. But parallel experiments in which Ca lactate was used did not indicate the same advantage from this form of Ca, and further experiments are necessary.—T. D. Bell.

878

SURE, B. **Relative nutritive values of proteins in foods and supplementary value of amino acids in pearled barley and peanut flour.** *J. Agric. Food Chem.*, 1955, **3**, 789–792. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

The relative nutritive values of the proteins in dried whole egg, dried non-fat milk solids prepared at low and high temperatures, rolled oats, whole rye, groundnut meal, whole barley, soya bean meal, whole wheat and sorghum were estimated in a 10-week growth experiment with rats. The gain in bodyweight per g. protein intake, *i.e.*, the protein efficiency ratio, declined in the order given above. Heating for 30 min. at 205° F. appreciably reduced the nutritive value of the milk solids.

At the 8 per cent. protein level the addition of 0·4 per cent. L-lysine alone or with 0·5 per cent. DL-threonine, or with threonine and 0·5 per cent. DL-methionine, to pearl barley produced increases of 50·0, 168·4 and 224·7 per cent. in the protein efficiency ratio and of 57·2, 135·8 and 151·1 per cent. in bodyweight. Supplements of 0·5 per cent. methionine alone or with 0·5 per cent. threonine

to groundnut flour at the 9 per cent. protein level produced corresponding increases of 44·0 and 61·5 per cent. and 44·1 and 60·6 per cent.—A. Hepburn.

879

SURE, B. **Nutritive value of proteins in buckwheat and their role as supplements to proteins in cereal grains.** *J. Agric. Food Chem.*, 1955, **3**, 793–795. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

Whole buckwheat or buckwheat flour given at the 8 per cent. level to rats was the best plant source of protein of high biological value, with protein efficiency ratios of 2·06 and 2·03 compared with 2·53 for dried whole egg. When part of a cereal protein diet was replaced by buckwheat, growth was considerably increased. The desirability of expanding the cultivation of buckwheat in some countries is stressed.—A. Hepburn.

880

RANDOIN, L., JOURDAN, C. and CAUSERET, J. Influence du caillage sur l'utilisation digestive et sur la valeur biologique des protides du lait. Essais de supplémentation des protides du lait, du caillé et du Camembert par la cystine. **[Effect of curdling on utilisation and biological value of milk proteins. Supplementation of the proteins of milk, curd and Camembert with cystine.]** *Lait*, 1955, **35**, 272–275. [Inst. Nat. Recherche Agronom.]

The 5 products compared were commercially pasteurised and bottled milk, curd prepared from this milk and pressed to remove 500 ml. whey from each litre, the same curd with the whey restored, and 2 samples of Camembert. Diets were prepared by the addition of starch, sucrose and salt mixture and, for the 2 cheese diets, of arachis oil and agar, so that each contained 10 per cent. protein. Five similar diets were supplemented with 0·2 per cent. cystine. Groups of 5 or 10 growing rats, from 70 to 100 g. in weight, received for 9 days a protein-free diet and then the experimental diets for 16 days. Faeces and urine were collected for the last 6 days on the former diet and the last 10 days on the latter. From N estimations the coefficient of digestibility and the biological value of the proteins were calculated.

All the curdled products had a slightly higher digestibility than milk, but their biological value was always lower. The biological value of curd with whey was higher than that of curd alone or of cheese. There was no benefit from adding cystine.—D. Duncan.

881

LILY, G., MANI, G. S., BALASUBRAMANIAN, S. C. and BASU, K. P. **Growth-promoting value of milk and some indigenous milk products.** *Indian J. Med. Res.*, 1955, **43**, 243–248. [Dairy Chem. Sect., Indian Dairy Res. Inst., Bangalore.]

Five groups, each of 5 male and 5 female littermate albino rats, one month old, were reared exclusively on cooled boiled milk, dahi, khoa, kheer and channa, respectively; all the products were obtained from cow's milk (for their composition see Abst. 212, Vol. 26). Water was provided to appetite, and a mineral supplement was given which supplied 8·04 mg. Fe, 0·6 mg. Cu and 0·6 mg. Mn daily. Food intake and bodyweights were recorded. After 12 weeks males and females belonging to the same group were mated; the number of young which survived till weaning was taken as the index of reproductive performance; the weight of the young at weaning was considered to represent the lactating capacity of the mother. The weaned young rats were maintained on the same diet as their parents for 12 weeks; then they were mated as before within the same group and their reproductive performance and lactating capacity were assessed, as were those of the third generation.

For the first generation of rats, milk was superior to dahi, khoa or channa but equal to kheer in promoting growth; channa was the least nutritious of the products. With the second and third generations dahi and milk supported similar growth and significantly better growth than did kheer, which was superior to khoa or channa. The reproductive and lactating capacity of rats on milk was uniformly good in the first 2 generations, with dahi, kheer and khoa next in value. Rats on channa were sterile even in the first generation. Kheer alone allowed reproduction in the third generation; milk, dahi and khoa did not.

G. F. Garton.

882

LILY, G., MANI, G. S., BALASUBRAMANIAN, S. C. and BASU, K. P. **Supplementary value of milk and some indigenous milk products to a poor rice diet.** *Indian J. Med. Res.*, 1955, **43**, 249–253. [Dairy Chem. Sect., Indian Dairy Res. Inst., Bangalore.]

Young rats were divided into 5 groups each of 6 males and 6 females and a sixth group of 6 males. Of the first 5 groups one received the basal diet of rice 81·4, tur dhal (*Cajanus indicus*) 5, non-leafy vegetables 8·2, leafy vegetables 2·1, NaCl 0·3 and groundnut oil 3 per cent., and the others the basal diet plus 10 ml. boiled cooled milk or the dahi, khoa or channa obtained from 10 ml. milk. The sixth group received the basal diet plus kheer obtained from 10 ml. milk. The milk or its product was given first separately and was followed by the basal diet and water to appetite. After 12 weeks when food intake and bodyweights were recorded, rats of the same group were mated;

reproductive performance and milk production were studied. The experiments were continued to the third generation (see previous Abst.).

Supplementation of the rice diet with milk or its products gave growth two or more times as rapid as that with the rice diet alone; milk and the products were almost equally effective in improving the growth rate. The supplementary effect was less noticeable in the second generation. The reproductive and lactating capacity of the females on the basal rice diet was poor and breeding could not be continued to the third generation. Milk had a uniformly good effect on all 3 generations; dahi gave good survival in the first generation, but there was a sharp decline in the second. Khoa and channa ranked next in order to milk in all 3 generations considered collectively.

G. F. Garton.

883

BALASUBRAMANIAN, S. C., LILY, G., MANI, G. S. and BASU, K. P. **Nutritive value of the proteins of milk and some indigenous milk products.** *Indian J. Med. Res.*, 1955, **43,** 255–264. [Dairy Chem. Sect., Indian Dairy Res. Inst., Bangalore.]

Six adult rats were given diets containing fat 10, protein 10, salts 4 and carbohydrates 76 per cent., with added Marmite and cod liver oil. For 7 days milk, dahi, khoa, kheer and channa, respectively, were used as sources of protein, and in one experiment the diet lacked N. N balance was studied during the last 4 days of each experiment. The biological value and digestibility coefficients of milk, dahi, khoa, kheer and channa were, respectively, 76, 66, 69, 76 and 67 and 95, 98, 90, 97 and 97.

From studies on the growth of 30 young rats given a diet of maize starch, sucrose, salts and Marmite with about 10 per cent. of protein as above, the protein efficiency ratios of milk, dahi, khoa and kheer were found to be 2·013, 2·130, 2·292 and 2·316; that of channa could not be ascertained because the rats would eat so little.

G. F. Garton.

884

VALANJU, N. N. and SOHONIE, K. **The studies in the nutritive value of Bombay fish. 1. Study of fats of different fishes.** *Indian J. Med. Res.*, 1955, **43,** 223–229. [Dept. Biochem., Inst. Sci., Bombay 1.]

Fat from 10 different varieties of fish, namely, boya (*Mugil speigleri*), bombil (*Harpodon nehereus*), ghol (*Sciaena diacanthus*), halwa (*Stromateus niger*), mandeli (*Coilia dussumieri*), mushi (*Carcharias limbatus*), pala (*Hilsa ilisha*), pomphret (*Stromateus cinereus*), toli (*Belone* sp.) and colambi (*Parapeneopsis stylifera*), was analysed for N and P. The N : P ratio was calculated; the digestiibility was estimated *in vitro* with pancreatic lipase and the nutritive value for rice moth larvae was estimated.

The N : P ratio of the fats varied from 0·9 to 4·5; 8 of the ratios were near to unity. The fats of boya, bombil, ghol and colambi were easily digested; mandeli was least digestible. The digestibility *in vitro* and the nutritive value were positively correlated. The ether extracts of boya, bombil, halwa, ghol and colambi possessed higher nutritive values than those of mushi, pala, toli, pomphret and mandeli; the fat of mandeli supported poor growth. Wheat fat and mushi muscle fat had the same biological value, but the fats of boya, bombil, halwa, colambi and ghol were superior to wheat fat. The digestibilities *in vitro* and the nutritive values of the fats were not correlated with their N : P ratios.—G. F. Garton.

885

SUR, B. K. and SUBRAHMANYAN, V. **Supplementary value of lucerne at different levels in the poor rice diet.** *Current Sci.*, 1954, **23,** 188. [Central Food Technol. Res. Inst., Mysore.]

For previous work see Abst. 774, Vol. 20.

In experiments with rats on a poor South Indian rice diet to which lucerne powder was added at levels of from 2 to 16 per cent., maximum growth was found at the 4 per cent. level and was three times as great as on the basal ration alone.

J. S. Thomson.

886

SUR, B. K. and SUBRAHMANYAN, V. **Effect of lucerne supplement to the rice diet on the body composition of growing rats.** *Current Sci.*, 1955, **24,** 15–16. [Central Food Technol. Res. Inst., Mysore.]

One group of rats were fed on a poor South Indian rice diet and another group on the same diet with a supplement of 4 per cent. lucerne leaf meal. At the end of 8 weeks the average weights of the 2 groups were 79·3 and 126·2 g. The rats were killed and body composition was estimated. The supplemented group had a higher content of body solids, chiefly as lipids. Body ash was 0·61 per cent. in the controls and 0·76 per cent. in the supplemented group.—J. S. Thomson.

887

SUBRAMANIAN, N., SUR, B. K. and SUBRAHMANYAN, V. **On the role of tamarind and chilli in the rice diet.** *Current Sci.*, 1952, **21,** 190–191. [Central Food Technol. Res. Inst., Mysore.]

When tamarind and chilli are added to foods, extra salt is always required. Rat growth experiments showed that the improved growth rate found when tamarind and chilli were added to a poor rice diet (Abst. 3863, Vol. 19) was due to the extra salt, and probably to the Ca and other mineral impurities in the crude bazaar salt used. It is suggested that attempts to improve the keeping quality of salt made from sea water by

removal of impurities may impair its nutritive value.—W. M. Deans.

888

KADKOL, S. B., SRINIVASAMURTHY, V. and SWAMINATHAN, M. **Nutritive value of the seeds of *Paspalum scrobiculatum*.** *J. Sci. Indust. Res. India* [B], 1954, **13,** 744–745. [Central Food Technol. Res. Inst., Mysore.]

The millet *Paspalum scrobiculatum* is a poor man's food in India. Rats on a poor vegetarian diet supplemented with the husked millet made much poorer growth than on a similar diet supplemented with wheat. Compared with wheat the husked millet is low in Ca, P, Fe and protein.

J. S. Thomson.

889

KADKOL, S. B. and SWAMINATHAN, M. **The nutritive value of Italian millet (*Setaria Italica*).** *Science and Culture,* 1955, **20,** 340–341. [Central Food Technol. Res. Inst., Mysore.]

Analyses of whole and husked Italian millet (*Setaria italica*) are given. The husked millet had the percentage composition: moisture 10·7, protein 12·4, ash 1·2, ether extract 2·2, fibre 0·5, carbohydrate 73·0; Ca 14·0, P 240, Fe 3·8 mg. per cent., vitamin B_1 380 μg. per 100 g. In comparison with whole wheat the husked millet was low in Ca, P and vitamin B_1.

In experiments with rats a poor vegetarian diet containing husked millet was inferior to a similar diet containing wheat and a diet of husked millet supplemented with Ca was much inferior to a diet of wheat similarly supplemented.—J. S. Thomson.

890

RAJU, N. V. and RAJAGOPALAN, R. **Nutritive value of heated vegetable oils.** *Nature,* 1955, **176,** 513–514. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

Groundnut, sesame and coconut oils were heated in an open iron pan for 8 hr. at 270° C. to resemble the usual practice in India, where most of the oil consumed is heated. The oils were incorporated in the diet of rats, weighing 45 to 50 g., to provide 15 per cent. of fat. Comparable littermates received the oils unheated. Average weekly gain in weight for the controls was 11·3 g. and for the groups receiving heated oil 4·6 g. Efficiency of feed conversion was much less in the latter. The average percentage of fat in the liver was 4·6 for the controls and 7·3 in the experimental group. The livers of the latter were badly damaged, congested and not of normal colour.

When heated fats were given at a level of 30 per cent. all the rats died within a week. At a level of 15 per cent. jaundice was produced.

J. S. Thomson.

891

FINK, H. and SCHLIE, I. Magermilch erhält Lebernekrose-verursachende Eigenschaften beim technischen Trocknen. Ein Beitrag zur alimentären Lebernekrose der Ratte. **[Skimmed milk acquires liver-necrosis-producing properties during drying. A contribution to dietary liver necrosis in the rat.]** *Naturwissenschaften,* 1955, **42,** 446–447. [Inst. Gärungswiss., Univ. Cologne.]

With diet and procedure as described in Abst. 4002, Vol. 25, roller-dried skimmed milk produced liver necrosis and death in 16 out of 16 rats. With spray-dried skimmed milk only 5 out of 16 had necrosis and the rest survived. It is concluded that some essential amino-acids may be damaged during drying.—D. Duncan.

892

SILBERBERG, R., SILBERBERG, M. and RILEY, S. **Life span of 'yellow' mice fed enriched diets.** *Amer. J. Physiol.,* 1955, **181,** 128–130. [Snodgras Lab., Sch. Med., Washington Univ., St. Louis, Mo.]

Observations were made of the life span of 335 mice of the strain YBR/Wi, divided almost equally between grey and yellow. Groups of 117, 96 and 122, respectively, were given a control diet providing 3·5 Cal., a high-fat diet, 4·6 Cal., and a high-carbohydrate diet, 3·7 Cal. per g. The high-fat diet caused obesity and shortened by a significant amount the lives of these mice, more so of the yellow than of the grey and of the males than of the females. The high-carbohydrate diet caused obesity, but had no adverse effect on life span.

D. Harvey.

893

GORDON, A. S., PILIERO, S. J. and TANNENBAUM, M. **Erythropoietic activity of blood and tissues of anemic rabbits.** *Amer. J. Physiol.,* 1955, **181,** 585–588. [Dept. Biol., Grad. Sch. Arts Sci., Univ. New York.]

Boiled filtrates of plasma, peripheral blood cells and liver were prepared from 10 male rabbits on a diet of Purina rabbit checkers supplemented with fresh greens and water to appetite, which were bled 3 times weekly for 3 weeks. The extracts obtained were given to 7 groups of 6 adult female rats by subcutaneous injection of 3 ml. extract daily for 9 to 17 days. Two other groups were injected intraperitoneally daily with 1 ml. marrow filtrate and residue, respectively. The blood picture was examined usually on the sixth, tenth and eighteenth days of experiment. At the end of the experiment the rats were killed and bone marrow from femur and tibia was removed for examination.

The extracts produced small but significant increases in red cell count, Hb and haematocrit

values. Reticulocytosis occurred in the rats given the plasma and blood cell extracts. Principal effects on bone marrow included increases in the percentages of nucleated erythrocytes and immature neutrophilic granulocytes. Similarly prepared filtrates from control rabbits were without effect on the blood cell values studied. Homogenates prepared from bone marrow produced no significant effect on the erythrocyte picture of intact rats.—G. F. Garton.

894

MAJORI, L. and SQUERI, L. Modificazioni ematologiche nella cavia e nel ratto albino per ingestione di *Allium cepa*. [**Haematological changes in the guineapig and albino rat caused by eating *Allium cepa*.**] Studio comparativo delle modificazioni ematologiche in *Rattus norvegicus* in seguito ad ingestione di *Allium cepa* di varia provenienza. [**Comparative study of the haematological changes in *Rattus norvegicus* caused by eating *Allium cepa* from different sources.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 791–792; 792–793. [Ist. Igiene, Univ. Messina.]

Administration to rats of 6 or 18 g. per kg. bodyweight daily of raw or cooked onion grown near Messina, or of concentrated extracts, caused a decrease of about one million in the red cell count, with lymphocytosis and neutropenia.

With the same doses the effect on guineapigs was very small, but when one animal was given 54 g. per kg. bodyweight daily, there was a rapid fall in the number of red cells with death on the 23rd day (*cf.* Absts. 498, 3514, Vol. 24).

Onions grown near Milan and Modena had no greater effect in promoting anaemia in rats than those grown near Messina.—E. M. Hume.

895

WILLIAMS, R. J., PELTON, R. B. and ROGERS, L. L. **Dietary deficiencies in animals in relation to voluntary alcohol and sugar consumption.** *Quart. J. Studies Alcohol*, 1955, **16**, 234–244. [Biochem. Inst., Univ. Texas.]

Two groups of 15 young rats received for 3 periods of 28 days a purified basal diet with a high or a low vitamin supplement. In the first period a choice was offered of a 10 per cent. sucrose solution or distilled water, and in the second and third the sucrose was replaced by a 10 per cent. solution of alcohol. In the third period the vitamin supplements were changed over for the 2 groups. The reactions of the rats were highly individual, but the average intake of sugar solution in the first period, and of alcohol in the second, was greater in rats with a low vitamin intake. In the third period the alcohol intake of the 2 groups was much the same after the first few days.

The observations are discussed with reference to human craving for alcohol and to the problem of the part played in it by nutritional and genetic differences.—A. M. Copping.

896

VAN DER VEEN, H. E. and HART, P. C. Oriënterend onderzoek naar het voorkomen van strumogene stoffen in steenperen. [**Preliminary studies of the occurrence of goitrogens in pears.**] *Voeding*, 1955, **16**, 619–624. [Inst. Veeteeltk. Onderzoek T.N.O., Utrecht.] English summary.

Four groups each containing 10 cockerels were fed on a normal ration of cereal and protein feeds with minerals and a vitamin supplement. One group was given pear, another pear juice and a third pear presscake, the reason for this being that the incidence of goitre is very high in an area where the population, particularly children, eat a great many pears. Most of the pears, but not enough for the entire 20 days of experiment, came from that area. They were skinned and cored, ground or pressed and the residue was dried. The fresh pear group had 234 g. daily; the other groups 236 ml. juice or 38 g. dried residue. There was no effect on the thyroids.—I. Leitch.

897

BEAN, W. B. and PONSETI, I. V. **Dissecting aneurysm produced by diet.** *Circulation*, 1955, **12**, 185–192. [Dept. Orthopaed., Coll. Med., State Univ. Iowa, Iowa City.] Interlingua summary.

Rats were given a diet containing, per cent., sweet pea (*Lathyrus odoratus*) meal 50, maize starch 28, sucrose 6, salt mixture 4, dried yeast 10 and maize oil with halibut liver oil 2. They developed skeletal demineralisation and scoliosis, which were not prevented by supplements of casein or methionine.

In different groups from 38 to 75 per cent. of the rats died after from 12 days to 9 weeks, of dissecting aneurysm of the aorta. This was when the diets were given at 22 days old, but when the diets were not given until 51 days or later there was no aneurysm. All the aneurysms were in the thoracic aorta and there was no lesion in other vessels. The skeletal lesion and the aneurysm could, it is suggested, be results of defective formation or excessive destruction of chondroitin sulphate.

It is considered suggestive that of 20 patients whose skeletons were examined after death from dissecting aneurysm, 5 had deforming kyphoscoliosis and 2 severe pigeon breast. The possible role of defects of ground substance in dissecting aneurysm in man is discussed.—D. Duncan.

898

MUHLER, J. C. **The cariogenicity of various corn diets in the rat.** *J. Dent. Res.*, 1955, **34,** 364–367. [Indiana Univ. Sch. Dent., Bloomington.]

Six cariogenic diets were used, 5 of which contained yellow maize. The sixth was a synthetic diet with 70 per cent. sucrose and 0·2 per cent. ethylenediaminetetra-acetic acid and was for comparison with the work of Stephan *et al.* (*J. Dent. Res.*, 1952, **31,** 475) and of Zepkin (*Proc. Soc. Exp. Biol. Med.*, 1953, **82,** 80), which showed that that acid produced in rats caries comparable with that found in human subjects. Of the diets with the cereal 3 had 64 per cent. maize which differed only in degree of fineness of grinding and was described as meal, grits, and a coarser form prepared in the laboratory; the 2 others had 46 per cent. maize in the last 2 of these forms and 19·5 per cent. sucrose. About 250 rats were fed on these diets for 140 days after weaning. Data are tabulated showing the average severity of caries in all groups except the one on the synthetic diet; in it all the rats died before they were 100 days old.

Caries was worst in the group with sugar and 46 per cent. maize as grits; in the other group with the same maize content in the coarser form the incidence was less. In the 3 groups with 64 per cent. cereal the incidence was not the same; it was greatest in the grits group, where the particles were of intermediate size. Increasing the amount of grits from 46 to 64 per cent. at the expense of the sucrose did not increase the incidence of caries.—D. Harvey.

899

MCCLURE, F. J. and FOLK, J. E. **Experimental variables affecting caries production in rats fed diets containing processed foods.** *J. Dent. Res.*, 1955, **34,** 358–363. [Nat. Inst. Dent. Res., Pub. Health Serv., U.S. Dept. Health, Bethesda, Md.]

In continuation of earlier work (see Absts. 2112, Vol. 23, 958, Vol. 24), 9 experiments were made in which rats were housed and given one of 2 diets under different conditions. In experiments 1 and 4 the food was given fresh daily to 38 and 29 rats, respectively, in individual cages; in experiments 2 and 6 with 60 and 39 rats it was replenished every 3 or 4 days without removal of uneaten food and the rats were housed in pairs; in experiments 7, 8 and 9 with 30, 45 and 45 rats, respectively, duration of feeding with one diet was 30, 60 and 90 days and there were from 6 to 12 animals in a cage; in experiment 5 with 29 rats the diet had been heavily contaminated with faeces before being given. Each of these experiments began at weaning. In experiment 3, with 123 rats, the mothers were given their diet during lactation and the young which, after weaning, were in groups of from 3 to 10 in a cage, had had access to their diet at an earlier age than the rats in the other experiments.

The percentage incidence of caries in the groups in the above order was 29·0 and 37·9; 43·3 and 51·3; 76·6, 97·7 and 91·1; 75·9; 80·5. The data for distribution of caries and for its severity also are tabulated. It is concluded that systems of housing and feeding are of importance in influencing both the incidence and the severity of caries in rats.—D. Harvey.

900

NIZEL, A. E. and HARRIS, R. S. **Effects of ashed foodstuffs on dental decay in hamsters.** *J. Dent. Res.*, 1955, **34,** 513–515. [Tufts Dent. Sch., Boston, Mass.]

Ash prepared from diet A, with whole maize 63, whole milk powder 30, alfalfa meal 6 and NaCl 1 per cent., was added at the rate of 3 parts to a mixture of 61, 29, 6 and 1 parts of those foods to provide diet B. From the birth of their young, mothers of 24 and 17 hamsters were given diets A and B, respectively, and from weaning until 20 weeks of age the young received the same diets. At that age they were killed and their dental lesions were measured by the method of Johansen (*J. Dent. Res.*, 1953, **32,** 578).

On diet A, 4 animals had no caries and for 20 with caries the average score was 0·18; on diet B, 13 had none and for 4 the average was 0·01. It is concluded that the ash contains a substance which inhibits caries, but it is not known whether the effect is local or nutritional.—D. Harvey.

901

SHAFER, W. G. and MUHLER, J. C. **Experimental dental caries. 6. The effect of hypophysectomy on dental caries and the salivary glands of the rat.** *J. Dent. Res.*, 1955, **34,** 531–536. [Dept. Oral Pathol., Sch. Dent., Indiana Univ., Indianapolis.]

For part 5, see Abst. 4896, Vol. 24.

902

MORAN, T., PACE, J. and HUTCHINSON, J. B. **Toxicity trials: palatability of the diet as a factor in experiments on the rate of growth of rats.** *J. Sci. Food Agric.*, 1955, **6,** 324–329. [Res. Assoc. Brit. Flour-Millers, Cereals Res. Stat., St. Albans, Herts.]

The growth of weanling rats fed on a diet containing fat extracted from flour treated at 600 p.p.m. with NCl_3 was significantly slower than that of rats supplied with fat from untreated flour or flour treated with 300 p.p.m. of ClO_2. The slower growth was due to a smaller food intake. No pathological change was found. Other

experiments showed that fats from flour untreated, treated with ClO_2 and treated with NCl_3 were preferred in that order. The peroxide value of the fats and complete diets increased in that order. Growth rate was therefore reduced by a decrease in palatability of the diet.—A. Hepburn.

903

WASSERMAN, R. H. and TRUM, B. F. **Effect of feeding dogs the flesh of lethally irradiated cows and sheep.** *Science*, 1955, **121,** 894–896. [Univ. Tennessee–U.S. Atomic Energy Commission, Agric. Res. Programme, Oak Ridge.]

Pups fed from weaning for over 18 weeks on a diet containing flesh from cows or sheep treated with lethal doses of γ-radiation had weight gains, final weights and haematological values similar to those of pups fed on normal flesh. No pathological change was found. The results were similar in albino rats and chicks.—A. Hepburn.

904

POLING, C. E., WARNER, W. D., HUMBURG, F. R., REBER, E. F., URBAIN, W. M. and RICE, E. E. **Growth, reproduction, survival and histopathology of rats fed beef irradiated with electrons.** *Food Res.*, 1955, **20,** 193–214. [Res. Labs., Swift and Company, Chicago, Ill.]

Weanling rats in 2 groups of 80, 40 of each sex, were fed to appetite on a diet of the following percentage composition, on a dry basis: beef solids 45, maize starch 43, salt mixture 4, liver concentrate 2, Ruffex 2, vitamin A and D oil 1, wheat germ oil 1, yeast 1, orthophosphoric acid 1, with 1 mg. per cent. of 2-methylnaphthoquinone from the 11th week, intended to provide all known nutrient requirements. In one group the beef solids were supplied by ground raw beef hamburger and in the other by the same sterilised by exposure to a beam of electrons. The diets contained about 42 per cent. moisture and 12 per cent. protein. The beef hamburger supplied from 60 to 65 per cent. of the total energy. The experiment was continued for 2 years and into the third generation, 2685 rats in all. Weight and food consumption were recorded weekly. Blood of the parent generation was examined during the 11th and 15th months and after 20 months, and some animals were killed after 3, 6, 12 and 18 months for pathological examination, as were also some of the offspring. The results are tabulated.

With both diets the rate of growth was unusually good. Unexpected deaths among the offspring of rats fed on irradiated beef were probably due to muscular dystrophy resulting from marginal vitamin E intake, since they were prevented subsequently by a supplement of DL-α-tocopherol, 10 mg. per rat daily for 5 days a week. There was evidence suggesting that irradiated beef contained some oxidising substance which destroyed part of the tocopherol in the diet during mixing and storage. Apart from this, no great difference between the groups was found. There was no evidence of tumour production or ill effect on the blood picture. Slight, not always significant, inferiority of the groups given irradiated beef in growth, food efficiency, reproduction and survival was interpreted as due to slight reduction of the nutritive value of the beef hamburger, not to impairment of its protein or to a toxic effect; ordinary sterilisation by heat might have yielded similar results. Growth and food efficiency tended to improve in succeeding generations rather than to decline. It is concluded that sterilisation of beef by a beam of electrons does not significantly impair its nutritive value or wholesomeness.

W. M. Deans.

905

COLE, L. J., HABERMEYER, J. G. and BOND, V. P. **Recovery from acute radiation injury in mice following administration of rat bone marrow.** *J. Nat. Cancer Inst.*, 1955, **16,** 1–9. [Div. Biol. Med. Sci., U.S. Naval Radiol. Defence Lab., Francisco, Calif.]

Groups of up to 40 adult female mice of strain LAF_1 had total body exposure to X-rays in lethal doses of 790 to 815 r. Some mice received, usually 2 to 3 hr. after exposure, 60 to 90 mg. bone marrow from rats, injected in suspension into the tail vein. Controls received phosphate buffer or sucrose and salt solution.

All the controls died within 14 days, but in different groups up to half the mice given bone marrow, and on the average one-third of them, were alive after 30 days. Such mice ceased to lose weight after about 8 days, and leucocyte counts rose from the twelfth day. Bone marrow destruction was reversed and spleen regeneration was shown by increasing content of deoxyribonucleic acid. Many late deaths occurred.

Injections of cortisone enhanced the protective effect of bone marrow.—D. Duncan.

GENERAL METABOLISM AND FEEDING HABITS OF ANIMALS OTHER THAN MAMMALS AND BIRDS

906

KARKHANIS, Y. D. and MAGAR, N. G. **Component fatty acids of Indian snake oils.** *Biochem. J.*, 1955, **60**, 565–568. [Dept. Biochem., Inst. Sci., Bombay 1.]

The fatty acids of the oils from the Indian python (*Python molurus*) and the Indian diamond snake (*Python stinotis*) were estimated by ester fractionation after preliminary separation by low-temperature crystallisation. The major component saturated acids in both fats were palmitic and stearic acids. Among the unsaturated fatty acids, oleic and eicosenoic acids predominated in both fats; of the minor component acids **hexadecenoic, octadecadienoic and octadecatrienoic acids** were present in both fats, but eicosatetraenoic acid was found only in the diamond snake fat and docosenoic acid only in the python fat.—G. A. Garton.

907

RUHRMANN, G. Vergleichende morphologische und physiologische Untersuchungen zur experimentellen Dysproteinämie an Winter- und Sommerfröschen. [**Comparative morphological and physiological studies of experimental disturbance of blood protein in winter and summer frogs.**] *Virchows Arch.*, 1955, **327**, 366–390. [Pathol. Inst., Univ. Tübingen.]

This study of the effects of intramuscular injections of sodium caseinate in fasting winter and summer frogs (*Rana esculenta*) includes data for normal animals on relative organ weights, muscle and liver protein, serum proteins, histology of kidney, liver and spleen, and urine proteins.

W. M. Deans.

908

DELSOL, M. Phosphatases acides et alcalines chez *Rana esculenta* L. Comparaison des principales localisations histochimiques. Action du jeûne alimentaire sur ces localisations. [**Acid and alkaline phosphatases in *Rana esculenta*, L. Comparison of the chief histochemical locations. Effect of fasting on these locations.**] *C.R. Soc. Biol.*, 1955, **149**, 473 – 474. [Lab. Zool., Fac. Catholiques, Lyons.]

909

FORTUNE, P. Y. **Comparative studies of the thyroid function in teleosts of tropical and temperate habitats.** *J. Exp. Biol.*, 1955, **32**, 504–513. [Dept. Zool., Univ. Leeds.]

The species of fish were *Phoxinus laevis*, found in England in temperatures from that of ice-covered water to 23° C., and *Lebistes reticulatus*, which lives in waters at from 15° to 35° C., with an optimum of 25° C. Groups of 10 fish were kept in tap water and in solutions of 0·05 g. thiourea per 100 ml. water, *Phoxinus* at 3°, 15°, 20° and 25° C. and *Lebistes* at 20°, 25° and 30° C. *Phoxinus* controls could not survive for a week at 25° C. One fish from each group was killed twice weekly. Thyroid activity was estimated histologically and expressed as the percentage ratio of cell area to total follicular area.

In *Phoxinus* in tap water there was only slight increase in thyroid activity with increasing temperature, but in *Lebistes* thyroid activity was greater at 30° and 25° C. than at 20° C. At all temperatures in both species the activity ratio rose during exposure to thiourea, and the higher the temperature, the more quickly was the maximum attained. *Phoxinus* tolerated much higher temperatures with thiourea than without, surviving indefinitely at 33° C.

When the experiments were repeated at different times of the year, *Phoxinus* was shown to have peaks of thyroid activity in April and May and in late August and September, at all 3 temperatures, but *Lebistes* had no seasonal variation.

When *Phoxinus* eggs were hatched in thiourea solution the young developed with thyroid hyperplasia, but there was only a slight and temporary reduction of growth rate and the fish were the same size as controls 3 months after hatching. In *Lebistes* born from females kept in thiourea there was thyroid hyperplasia at birth, but no difference in growth rate.—D. Duncan.

910

STAMM, M. D. and AGUIRRE, L. Estudo sobre bioquímica de insectos. 1. Amino-acidos aromaticos y triptófano en la metamorfosis de *Saturnia Pyri*. [**Biochemistry of insects. 1. Aromatic amino-acids and tryptophan in the metamorphosis of *Saturnia pyri*.**] 2. Aminoácidos aromáticos y triptofano en la metamorfosis de *Pieris Brassicae* y *Ocnogyna Baetica*. [**2. Aromatic amino-acids and tryptophan in the metamorphosis of *Pieris brassicae* and *Ocnogyna baetica*.** 3. Aminoácidos aromáticos y triptófano en dos coleópteros, un hemíptero y un ortóptero. [**3. Aromatic amino-acids and tryptophan in two coleopterans, a hemipteran and an orthopteran.**] *Rev. Española Fisiol.*, 1955, **11**, 63–68; 69–73; 75–81. [Inst. Español Fisiol. Bioquim., Madrid.] English summaries.

1. Caterpillars of *Saturnia pyri* contained much phenylalanine, but the proportion of phenylalanine fell in the chrysalis and the adult moth; that of tyrosine slightly increased. In the caterpillar and the chrysalis there was more albumin than globulin, but the reverse was true of the adult. In each phase glycine, serine, valine, lysine, proline, and tryptophan were identified as well as tyrosine and phenylalanine.

2. Besides the amino-acids found in *Saturnia pyri*, the caterpillars of the cabbage white butterfly, *Pieris brassicae*, contained also histidine and the chrysalides and butterflies contained glutamic acid, as did caterpillars and chrysalides of *Ocnognya baetica*. The amounts of globulin were always less than those of albumin. In *Ocnogyna* part of the phenylalanine appears to be transformed into tyrosine at pupation.

3. The coleopterans examined were *Doryphora decemlineata* and *Colaspidema atrum*, the hemipteran was *Eurydema ornata* and the orthopteran *Acridium aegyptium*. There was no important difference in amino-acid content. The insects contained more protein, albumin and globulin than the leaves which they ate.—D. Duncan.

911

ATWAL, A. S. **Influence of temperature, photoperiod, and food on the speed of development, longevity, fecundity, and other qualities of the diamond-back moth *Plutella maculipennis* (Curtis) (Lepidoptera: Tineidae).** *Austral. J. Zool.*, 1955, **3,** 185–221. [Dept. Entomol., Waite Agric. Res. Inst., Univ. Adelaide.]

At both 18° and 25° C. caterpillars of the diamond-back cabbage moth developed more slowly and produced less silk on mature cabbage leaves than on young green and white leaves. Moths from caterpillars fed on white leaves laid more eggs than those fed on young green leaves. When mature leaves were given to larvae in the second 2 instars after tender leaves in the first 2, their fecundity was depressed, but mature leaves were less harmful when given only in the fourth instar. There was some indication that male moths reared on mature leaves were of low fertility. Food had a greater influence on growth and fecundity than had length of daylight.—D. Duncan.

912

LEMONDE, A. and BERNARD, R. Importance de la choline et de certaines substances analogues dans la nutrition des larves de *Tribolium confusum* Duval. **[Importance of choline and of certain analogous substances for the nutrition of the larvae of *Tribolium confusium*, Duval.]** *Rev. canad. Biol.*, 1955, **14,** 8–13. [Dept. Biol., Laval Univ., Quebec.] English summary.

Choline was an essential nutrient for the larvae of *Tribolium confusum*, in relatively large amounts of from 1 to 4 mg. per g. purified diet. It could not be replaced by betaine or aminoethanol. Monomethylaminoethanol and dimethylaminoethanol could replace it to some extent, but could not support optimum growth of the larvae.

A. M. Copping.

913

CLEMENTS, A. N. **The sources of energy for flight in mosquitoes.** *J. Exp. Biol.*, 1955, **32,** 547–552. [Dept. Zool., Univ. Cambridge.]

In *Culex pipiens*, form *berbericus*, flown on a mill to exhaustion, there was no difference in the extent of fat in the fat bodies, but glycogen had almost disappeared. Females flown to exhaustion and then fed on glucose resumed flight, and the flight reserves of the unfed female were calculated as about equal to 0·12 mg. glucose. Females fed on blood were able to fly more than twice as far as those unfed, and the energy value of the blood meal was much more than that of its sugar content, so energy was obtained from digestion products of blood.—D. Duncan.

914

KERMACK, W. O., LEES, H. and WOOD, J. D. **Some non-protein constituents of the tissues of the lobster.** *Biochem. J.*, 1955, **60,** 424–428. [Dept. Biol. Chem., Univ. Aberdeen.]

The water-soluble N.P.N. of lobster muscle and hepatopancreas contained amino-acids, trimethylamine oxide, glycine betaine, volatile base and taurine. Non-protein amino-N was in the greatest quantity, 200 to 400 mg. per 100 g. wet tissue, but there was less than 10 mg. per 100 ml. in blood. Muscle contained 15 free amino-acids, hepatopancreas 7 and blood 6. Relatively large amounts of proline were in muscle, taurine in hepatopancreas and glycine in all 3 tissues. Lobster blood contained 20 mg. glucose per 100 ml.

A. Hepburn.

915

HELLER, I. M. and KOPAC, M. J. **A microincinerative study of normal and starving *Amoeba proteus*.** *Exp. Cell. Res.*, 1955, **8,** 563–566. [Dept. Biol., Grad. Sch. Arts Sci., Univ. New York.]

See also Abst. 299, 303, 324, 357.

5. HUMAN DIET IN RELATION TO HEALTH AND DISEASE

DIET

REQUIREMENTS

916

TROWELL, H. C. **Calorie and protein requirements of adult male Africans.** *East African Med. J.*, 1955, **32,** 153–163. [Uganda Med. Dept.]

A general article.

917

DEAN, R. F. A. **Protein requirements and their satisfaction.** *East African Med. J.*, 1955, **32,** 79–86. [Med. Res. Counc. Infantile Malnutrition Group, Mulago Hosp., Kampala, Uganda.]

A general article.

918

PRATT, E. L., SNYDERMAN, S. E., CHEUNG, M. W., NORTON, P., HOLT, L. E. (Jr.), HANSEN, A. E. and PANOS, T. C. **The threonine requirement of the normal infant.** *J. Nutrition*, 1955, **56,** 231–251. [Dept. Paediat., Coll. Med., Univ. New York.]

Metabolic and clinical studies were made of 8 normal infants under 6 months of age who were given a synthetic diet providing N as a mixture of 18 essential and non-essential amino-acids, all as the natural L-isomers. The composition of the mixture was based on that of breast milk. In a preliminary study the infants gained weight normally and exhibited every sign of health although some required an intake of energy higher than average.

The minimum requirement of threonine estimated by making graded reductions of the threonine in the diet and replacing it by glycine was found to be 60 mg. per kg. bodyweight daily. Reduction of the intake below this level was associated with failure to gain weight and by impaired retention of N. There was increased loss of N but not of amino-acids in the urine. Changes were found in the pattern of amino-acid excretion, especially a reduction in the amount of threonine.

G. F. Garton.

919

SNYDERMAN, S. E., PRATT, E. L., CHEUNG, M. W., NORTON, P., HOLT, L. E. (Jr.), HANSEN, A. E. and PANOS, T. C. **The phenylalanine requirement of the normal infant.** *J. Nutrition*, 1955, **56,** 253–263. [Dept. Paediat., Coll. Med., Univ. New York.]

From studies identical with those made by Pratt *et al.* (see preceding Abst.) but on 6 normal infants aged from 1 to 9 months, the minimum phenylalanine intake compatible with normal health was found to be 90 mg. per kg. bodyweight daily. Phenylalanine deficiency was associated with failure to gain weight, impaired retention of N due to increased excretion of N in urine, and reduction of the globulin level in blood. There was an increase in excretion of free amino-acids in the urine; the pattern showed a striking decrease in phenylalanine and an increase in histidine.—G. F. Garton.

FEEDING OF INFANTS AND CHILDREN

920

ARIZTÍA, A., HOWARD, J. E., ASPILLAGA, M. and JARPA, S. **The feeding of premature infants.** *Acta paediat.*, 1954, **43,** Suppl. 100, 199–210. [Luís Calvo Mackenna's Child. Hosp., Santiago.]

The organisation and feeding routine of a 40-cot premature infant unit are described. The high mortality of 29·3 per cent. in 211 infants admitted in 7 months was due in part to the poor condition of infants at admission; all were under 2000 g. birthweight and 22·7 per cent. had some infection. The success of the feeding routine was indicated by the good growth of 65 per cent. of the survivors. The feeding routine was based on a 24-hr. fast followed by small feeds, 8 or 10 a day, of skimmed or half-skimmed breast milk, with amino-acids and carbohydrates added after the eighth or tenth day. Energy intake was kept below 70 Cal. per kg. in the first week and did not exceed 100 to 115 in the second or third week. By 3 weeks of age most of the infants were receiving 5 feeds at intervals of 4 hr.—F. C. Aitken.

921

HOLMDAHL, K. **Milk drip via an indwelling nasogastric rubber tube for feeding premature infants.** *Acta paediat.*, 1955, **44,** 330–336; Suppl. 103, 109–110. [Paediat. Clin., Child. Hosp., Gothenburg.] French, German and Spanish summaries.

The method has practical advantages over the previously used technique of indwelling tube and intermittent feeding and its success has been demonstrated in a group of 72 premature infants.

F. C. Aitken.

922

YLPPÖ, A. **Premature children—should they fast or be fed in the first days of life?** *Ann. Paediat. Fenn.*, 1954–55, **1,** 99–104. [Child. Clin., Univ. Helsinki.]

A case is argued against the modern practice of starving premature babies for the first few days of life. The author's own scheme of feeding is to give 5 per cent. glucose solution on the first, glucose solution and mother's milk on the second and mother's milk alone on the third day of life. After 2 or 3 weeks mother's milk with cow's milk and sugar added is given.—F. C. Aitken.

923

NASSO, I., VERGA, A. and POTOTSCHNIG, C. Unsere Erfahrung in der Aufzucht von Frühgeburten. [**Our experiences in the rearing of premature infants.**] *Helv. paediat. Acta*, 1955, **10,** 484–490. [Kinderklin., Univ. Milan.] French, Italian and English summaries.

In the premature baby unit established in Milan with the help of UNICEF in 1952, low-fat acidified dried milk is used when human milk is not available. With both, great stress is laid on precautions to ensure sterility. No food is given for the first 48 to 72 hr.; the smaller the infant, the longer the fasting period. Infants under 1800 g. are fed by stomach tube, the smallest and those with serious heart or respiratory disorders by indwelling polyethylene tube. Feeds are frequent, up to 12 in 24 hr. Only after the first month does the diet supply as much as 100 to 110 Cal. per kg. bodyweight daily. If oedema appears in the early days of life, salt-free skimmed milk (Pannac) is used.

Anaemia is treated with blood transfusions and more recently liver and iron preparations have been used as well.

Because of shortage of beds, infants are generally sent home when they reach 2500 g., but they are supervised up to the age of 2 years; they are considered to catch up physically on normal infants in the first years of life, except for delay in teething and walking, and to show normal psychological development. Dystrophy and florid rickets have occurred only rarely, where the parents were poor or ignorant. Efforts to rear premature infants are considered well worth while, and provision of enough premature baby units to take all premature infants in poor general condition would soon reduce infant mortality in Italy to that in other countries.—W. M. Deans.

924

PRAY, L. G., POINDEXTER, M. H. and LEBIEN, W. E. **Breast feeding: a four-and-one-half-year experience.** *J. Pediat.*, 1955, **47,** 68–72. [St. Luke's Hosp., Fargo, N. Dak.]

A survey of 3729 infants showed that 1104 or 29 per cent. were not breast fed at all. The mothers of 785 of these infants had no reason for not nursing. The percentages of infants breast fed were: for 6 months or more 18; 2 to 6 months 16; 2 weeks to 2 months 18; less than 2 weeks 19. Importance is attached to antenatal education in the value of breast feeding.—F. C. Aitken.

925

HYTTEN, F. E. and THOMSON, A. M. **Clinical and chemical studies in human lactation. 10. The maintenance of breast-feeding.** *Brit. Med. J.*, 1955, ii, 232–237. [Obstet. Med. Res. Unit (Med. Res. Counc.), Dept. Midwifery, Univ. Aberdeen.]

For Part 9 see Abst. 2550, Vol. 25.

Recently published observations on the incidence of breast feeding are reviewed and the results of a further inquiry are reported.

The data presented relate to 2404 of 2769 infants delivered in Aberdeen in 1951. At the age of 3 months 35·6 per cent. of the infants were wholly breast fed and after 6 months 24·5 per cent. were still feeding from the breast although most were receiving supplementary food. The percentage breast fed at 3 months was higher for infants delivered in a private nursing home and lower for infants delivered at home than for those delivered at the maternity hospital. The proportion of women breast feeding at the time of discharge from hospital declined with maternal age. At 3 months the incidence of breast feeding was higher among older than among younger mothers. For mothers of all age groups except those under 20 the incidence of breast feeding at 3 months was higher after second than after first pregnancies and thereafter declined with increasing parity. The incidence of breast feeding during the first week was lowest in the highest social class but at 3 months the incidence increased with rising social class. Tall women maintained breast feeding better than did small women, and women of good physique and health did better than those of fair physique, who in turn did better than those of poor physique. In the whole sample the incidence of breast feeding at 3 months decreased with increasing number of persons per room of the mother's home, but this relation did not obtain within social classes.

The results are discussed with special reference to the high energy requirement for milk production.
F. C. Aitken.

926

KIMBALL, E. R., JONES, E., LEWIS, M. E. and KOLB, E. R. **The breast milk bank as a community project.** *Pediatrics*, 1955, **16,** 264–269. [Div. Paediat., Evanston Hosp., Ill.]

The organisation of the breast milk bank is described. Comparison of equal groups of 134 premature infants born before and after establishment of the bank showed that the number fed on breast milk increased threefold after the bank was established. No significant difference in length of

stay in hospital, mortality or weight gain was noted.—F. C. Aitken.

927

SINIOS, A. Sammelfrauenmilch und Milchzucker-Fettmilch im statistischen Ernährungsvergleich. [**Statistical comparison of the nutritive value of pooled human milk and lactose-fat milk.**] *Monatsschr. Kinderheilk.*, 1955, **103,** 300–303. [Kinderkrankenhaus Borgfelde, Allg. Krankenhaus St. Georg, Hamburg.]

Observations made on 98 infants receiving human milk or a milk preparation with added lactose and fat (Human Milch) showed no significant difference in weight gain or incidence of dyspepsia, infections, anaemia or rickets.—A. M. Copping.

928

JAMES, U. and COLES, B. L. **Feeding difficulties in infancy. Their cause and prevention.** *Brit. Med. J.*, 1955, ii, 656–658. [Violet Melchett Mothercraft Home.]

929

SMITH, C. A. **The newborn patient.** *Pediatrics*, 1955, **16,** 254–263. [Dept. Paediat., Harvard Med. Sch., Boston, Mass.]

Report of the Clifford D. Sweet Lecture, Children's Hospital of the East Bay, Oakland, Calif., 22 May 1953.

930

MARTIN DU PAN, R. Le rôle du goût et de l'odorat dans l'alimentation du nourrisson. [**The part played by taste and smell in infant feeding.**] *Pédiatrie*, 1955, **10,** 169–176. [Geneva.]

Reaction to solutions of sugar and salt was investigated in 20 infants aged from 3 days to 8 weeks. Even at one week infants showed preference for sugar, and strong reactions to taste were apparent in all infants more than a few days old. Olfactory and taste reactions were studied with vegetables in infants aged from 3 to 8 months. Carrots were preferred to tomatoes, peas, haricot beans or mixed vegetables. In view of the positive findings on reaction to taste and smell in very young children, it is considered that more attention should be given to palatability in planning diets for infants.—A. M. Copping.

931

CENTERWALL, W. R. and CENTERWALL, S. A. **Thickened formulas: standardization of preparation and a new method of administration.** *J. Pediat.*, 1955, **47,** 194–197. [Dept. Paediat., Sch. Med., Coll. Med. Evangelists, Los Angeles, Calif.]

Thickened mixtures are used in the treatment of pernicious vomiting in infants. A table shows the amounts of proprietary cereals to be added to a liquid preparation with 20 Cal. per oz. and the energy value and proximate composition of the resulting feed. Two brands of rice are the preparations of choice. A special feeding bottle is described.—F. C. Aitken.

932

JOPPICH, G. Über die Bedeutung der Milchmolke für die Ernährung des Säuglings. [**Importance of whey in infant feeding.**] *Ztschr. Kinderheilk.*, 1955, **76,** 531–541. [Kinderklin., Univ. Göttingen.]

Of 117 healthy infants about 2½ months old, 48 were given a 2/5 milk based on Kleinschmidt's mixture of milk, cereals and butter (*Öst. Ztchr. Kinderheilk.*, 1949, **3,** 55) and 69 the same with whey instead of water as diluent. Full details of preparation are given.

There was a greater incidence of mild diarrhoea in the whey group, ascribed to the lactose. The attacks ceased when ordinary whey was replaced by a reconstituted dried whey preparation (from Alete G.m.b.H.) supplying protein 0·5, minerals about 0·27 and lactose from about 0·7 to 0·9 per cent. Weight gains over 6 weeks were satisfactory in both groups but significantly greater in the whey group. No difference in stomach emptying time (9 infants), fat excretion (16), or serum protein (75) was found.

N balance experiments lasting 14 days or more were made on 11 male infants aged from 2 to 10 months, of whom 6 had a mixture with whey and no casein, based on the dried whey and supplying 1·5 per cent. whey protein and 2 per cent. total protein, and 5 a mixture containing casein but no whey, based on Plasmon and supplying 1·66 per cent. protein. Three infants had both at different times. With whey N retention was good, mean 49 per cent. of the N supplied; with casein it was small or negative. Weight gains could not be related to N retention and, as might have been expected with such unnatural mixtures, were generally unsatisfactory; a few infants did well with whey alone, none with casein alone.

Tests on the breakdown of whey protein by cathepsin or a preparation of pancreatic enzymes *in vitro* showed no difference between raw or boiled whey, or whey from acidified dried milk (Elodon) or from condensed milk overheated to about 120°. When 5 infants on the whey mixture of the first experiment were given the whey raw instead of heated with the other ingredients, no effect on weight gain was found, which suggests that ordinary cooking does not affect the digestibility of whey protein; but all of 8 infants given a mixture made from dried whey of which the protein was so much altered as to be insoluble in water had digestive disorders. It is possible that

slight denaturation of the whey protein may explain the poor results with whey reported by the workers of 50 years ago.—W. M. Deans.

933

NATELSON, S., PENNIALL, R., CRAWFORD, W. L. and MUNSEY, F. A. **Noncasein protein to casein ratio of feeding formulas. Effect on blood component levels in normal infants.** *Amer. J. Dis. Child.*, 1955, **89,** 656–668. [Rockford Mem. Hosp., Ill.]

The ratio of non-casein protein to casein is roughly 7 : 3 in breast milk and 1 : 3 in cow's milk. One group of 15 infants was fed at the breast and 2 groups were given cow's milk mixtures containing 2·1 per cent. protein in which the ratios of non-casein protein to casein were 3 : 2 and 1 : 8. The groups were matched for weight and sex and the feeding experiment was from the 2nd to 32nd day of life. Blood samples were analysed at intervals and *p*H and haematocrit values were estimated. Breast milk was analysed on the 7th and 30th days after parturition. Records were kept of weight gains and of volumes of mixtures consumed.

Energy intake was less in the breast-fed than in the artificially-fed groups because the greater volume of breast milk did not entirely compensate for its lower energy value. There was no significant difference in weight gain between groups. Blood urea was highest in the high-casein group and lowest in the breast milk group. Plasma protein was highest in the low-casein group. Haematocrit declined steadily with no significant difference between groups until the 32nd day of life, when that in the breast milk group was significantly higher than in the other groups. Glucose in blood rose steadily in all groups and did not differ significantly. Minerals in blood varied with the type of feeding.—F. C. Aitken.

934

JADRNÍČEK, M. and MORES, A. Schnelle Realimentation bei schwerer Dyspepsie und Toxicose im Säuglingsalter. [**Rapid re-feeding of infants with severe dyspepsia and toxicosis.**] *Acta paediat.*, 1955, **44,** 293–301. [Kinderklin., Palacký-Univ., Olomouc, Czechoslovakia.] English, French and Spanish summaries.

During 1952–53, 171 infants with diarrhoea, of whom 144 had severe dyspepsia and 27 toxicosis, were treated, 120 by the rapid method. After correction of dehydration, infants over 3 months were given dried whole acid milk or 2/3 strength dried milk, and infants under 3 months or atrophic infants dried buttermilk to appetite, immediately or in some after a day or two of tea or carrot soup diet; or regular breast feeding was resumed. They worked up to full feeding on the average in 5 days ; the older slow method of re-feeding took 11 days. Most children in both groups required supplementary infusions for a day or two to maintain a positive water balance. Weight gains in the 2 groups were similar, but the rapid method reduced time of treatment on the average by 8 days and relapses were fewer. Previous correction of dehydration and control of infection are important.

W. M. Deans.

935

SCHIFF, E. Künstliche Ernährung und Ekzemverhütung beim Säugling. [**Artificial feeding and the prevention of eczema in infants.**] *Ztschr. Kinderheilk.*, 1955, **76,** 426–434. [Child. Dept., Sydenham Hosp., New York.]

Full details are given (p. 427) of the author's scheme for infant feeding, based on 2/3 milk with 5 per cent. added sugar for the first 2 months, in 5 feeds at 4-hr. intervals. Vitamins A, D and C are given from the second week of life. After 2 months only 4 feeds are given, and between 2 and 4 months cereals (Pablum), banana pulp, orange juice, prepared carrots, liver, fruit pulp, yolk of egg and finally whole egg are introduced in succession. From 3 months infants get from 400 to 450 g. whole milk, much less than is usually advocated, but no rickets has occurred. At $3\frac{1}{2}$ months the number of meals is reduced to 3, at 7 a.m., noon and 6 p.m. This pattern continues to about 14 months. The diet supplies about 700 Cal. daily. It is claimed that the infants thrive on it, with daily gains of about 30 g. and few infections ; not a single case of eczema has occurred in 20 years.

The rest of the paper is a discussion of the etiology of eczema in infants. The possible role of allergy is not denied, but the risk of sensitisation by allergens in the food is thought to be grossly overrated, and early introduction of a mixed diet relatively low in salt and water may prevent retention of surplus water in the skin and render it more resistant to external irritation.—W. M. Deans.

936

STRÖM, J. **Medical child care in Sweden: short review of its development, importance and immediate objectives.** *Acta paediat.*, 1954, **43,** Suppl. 100, 97–108. [Child Health Div., Royal Med. Board, Sweden.]

The development of the child welfare service is described and its importance is assessed mainly in terms of declining infant mortality.—F. C. Aitken.

937

MEYER ZU HORSTE, G. Über die Bedeutung der Eier als Bestandteil der Kinderernährung. [**Importance of eggs as a constituent in the diet of children.**] *Monatsschr. Kinderheilk.*, 1955, **103,** 231–235. [Städt. Kinderklin., Dortmund.]

The use is reviewed of whole egg and of egg yolk as supplements for feeding infants from 6 months of age or earlier and as substitutes for milk in diets where milk must be avoided. Diets suggested by several authors are described in detail [no references]. Beneficial results are briefly reported from treating nutritional disturbances in 25 infants aged from 10 days to 5½ months, in the Dortmund Clinic, with egg yolk as source of animal protein.

A. M. Copping.

938

GROOT, E. H. Antibiotica in de voeding voor kinderen. [**Antibiotics in children's diets.**] *Voeding*, 1955, **16,** 624–636. English summary.

A review.

See also Absts. 168, 210, 1016.

DIETARY SURVEYS AND INDIVIDUAL STUDIES

939

GOVIL, K. K. and MITRA, D. **Comparison of nutrient values of individual diets found by calculation from food tables and by chemical analysis.** *Indian Med. Gaz.*, 1954, **89,** 476–480. [Nutrit. Lab., Provincial Hyg. Inst., Lucknow.]

The weights of food eaten in 3 days by 28 medical students were recorded. Evaluation of the individual diets in terms of protein, fat, Ca, P and Fe by calculation from food tables and by chemical analysis showed such wide differences in Ca, P and Fe that calculation of nutritive value of individual diets from food tables is thought to be of doubtful value. Differences between means obtained by the 2 methods were statistically significant for Ca, P and Fe, but the difference in Fe was considered to have no practical significance.

F. C. Aitken.

940

LINTZEL, W. Eiweissmenge und Eiweissqualität in den menschlichen Kost- und Diätformen. [**Quantity and quality of protein in typical human diets.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1047–1050. [Biochem. Lab., Krefeld.]

A lecture.

941

TRULSON, M. F. **Assessment of dietary study methods. 2. Variability of eating practices and determination of sample size and duration of dietary surveys.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 797–802. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston.]

For Part 1 see Abst. 2564, Vol. 25.

Consumption of milk and intakes of protein and vitamin A were tabulated from 7-day diet records obtained from 132 children aged 10 to 12 in one school, 120 children of the same ages in a second and 70 of the first group of children re-surveyed over a year later. Correlation coefficients for each day with every other day were calculated and means, standard deviations and coefficients of variation were listed for each day of the week. For the first survey averages of intakes for the 3 days Tuesday to Thursday and for the week were calculated. Individual records were taken at random from the groups and means and standard deviations were computed on a day-to-day basis.

Protein and milk showed approximately the same amount of day-to-day association. Vitamin A showed little or no daily correlation. Increasing the length of survey from 1 to from 3 to 7 days caused standard deviations and coefficients of variation to decrease, the reductions being greatest for vitamin A. The size of sample necessary to give a stated degree of reliability was greater for vitamin A than for protein.—F. C. Aitken.

942

HOLLINGSWORTH, D. F. **Lessons learnt from the National Food Survey.** *Nutrition*, 1955, **9,** 104–108. [Sci. Adviser's Div. (Food), Minist. Agric. Fish. Food.]

A lecture.

943

GARRY, R. C., PASSMORE, R., WARNOCK, G. M. and DURNIN, J. V. G. A. **Studies on expenditure of energy and consumption of food by miners and clerks, Fife, Scotland, 1952.** *Med. Res. Counc. Spec. Rep. Ser.* No. 289, 1955, pp. vi + 70. H.M.S.O., London. Price 5s. net.

The studies were made in 1952. Nineteen miners and 10 clerks took part in a total of 752 measurements of energy exchange in which samples of expired air were collected in Kofranyi Michaelis respirometers. During working hours records were kept by observers of the minute-to-minute activities of the subjects; while off duty the subjects themselves recorded their activities with, as far as possible, the same degree of accuracy. During the week when these data were being collected a dietary survey was made by the weighing method.

In the mine there was some mechanisation but the long distances separating shaft and coal-face had to be covered on foot. Measurements of miners' expenditures were made at work when sitting, walking, loading, girdering and hewing and, when not at work, during lying, sitting, standing and walking each at his own pace. The time study showed that, because of breakdown of the haulage system, miners were, on the average, inactive for 38 per cent. of their time spent underground; nevertheless, their output of coal was comparable with the average for the industry.

Clerks' activities were divided between indoor office duties and outdoor work connected with weighing, labelling and dispatch of coal wagons. For both groups energy expenditure during sleep was estimated by using the method of Robertson and Reid for predicting B.M.R. (Abst. 2278, Vol. 22) and the expenditure during dressing, shaving and walking was calculated from the results in the pilot study already reported (Abst. 558, Vol. 23).

Mean values showed that during sleep with daytime dozing and while not at work the daily expenditure of energy by miners, 490 and 1420 Cal., respectively, did not differ from that by clerks, 500 and 1410 Cal.; at work daily average expenditure was 1750 Cal. for miners and 890 Cal. for clerks. Mean daily intakes of energy were 4030 Cal. and 3040 Cal. for miners and clerks, respectively. Individual intakes exceeded estimated outputs of energy for 13 miners and 7 clerks; the range of differences was from + 1320 to — 540 Cal. and the overall average excess was 370 and 240 Cal., for miners and clerks, respectively. There was no difference between the groups in the proportion of energy which they derived from protein, carbohydrate and fat.

Findings in the dietary survey were compared with allowances recommended (Abst. 1264, Vol. 20), by the British Medical Association's Committee on Nutrition for energy, protein, Ca, Fe, vitamins A and B_1, riboflavin, nicotinic acid and vitamins C and D; except for deficits of riboflavin in some, diets were generally adequate.

In the final part of the report by K. Mahadeva practice or training in the use of respiratory equipment was concluded not to influence the results. Except for that during loading, which was performed with relatively little body movement, energy expenditure for all activities was found to be linearly related to bodyweight. The relation between bodyweight and energy expenditure was highly significant; that between energy intake and bodyweight also was significant, but at a lower level.—D. Harvey.

944

Rapport van de Voedingsraad over de voeding van de Nederlandse bevolking. [**Report of the Nutrition Council on the diet of the Nederlands population.**] *Voeding*, 1955, **16**, 636–645.

The report is a preliminary one and is in 2 parts.

The first is based on National Budget Survey data and is for the first quarter of 1951. It covered 3085 families spread over the whole of the Netherlands. Conditions appeared satisfactory, average consumption agreeing with average requirements. In large families of more than 5 persons intakes of energy and protein were not always adequate. In many families amounts of Ca, riboflavin and carotene also were inadequate, a state which could be improved by greater use of milk.

The second part summarises work in 1951 and 1952 with children who were grouped according to their parents' incomes. Those in the highest of the 3 income groups were taller, heavier and in better condition clinically than were those in the other groups [no data tabulated]. The average intakes of food and nutrients for the first and third groups are given.—M. Eddison.

945

Kaayk, C. K. J. Voeding en voedingstoestand van het schoolkind ten plattelande. [**Diet and nutritional condition of the schoolchild in The Netherlands.**] *Thesis, Leyden*, 1955, pp. xv + 212. English and French summaries.

This well-documented thesis reports a detailed survey of the diet and nutritional condition of 612 schoolchildren between the ages of 7 and 9 out of a total of 7000 on the island of Ysselmonde, South Holland. The island is surrounded by rivers and linked by a tunnel with Rotterdam. For the purpose of this survey the population is divided into 3 groups, in descending order of income, and each is further subdivided as agrarian or non-agrarian in origin. In many instances findings are given separately for boys and girls. The survey was made between September 1952 and June 1953. Chapter headings are: a social-hygienic and demographic survey; absenteeism; somatometric survey; clinical tests; biochemical tests; details of diet; excretion of vitamin B_1 in the urine; dental caries and diet; conclusions.

For social hygiene the conclusion is that conditions were worst in the agrarian section of group 3. For all the agrarian families 99 per cent. of fathers and 89 per cent. of mothers had been born in rural areas; for the whole survey 88 per cent. of the parents were from the country, 12 per cent. from the town. Sleeping accommodation for children was unsatisfactory for 14·6 per cent. of those in agrarian families. Total absenteeism was 4·43 per cent., of which 15 per cent. was not due to illness; it bore no relation to income group, but in a special selection of paired children those who had more than 14 absences were taller and thinner and had significantly less Hb in comparison with children without absences. In the somatometric tests great value is attached to the skeletal age, as measured by X-ray photographs of the bones of the hand. The skeletal age of children in the highest was about six months more than that of those in the lowest income group. The clinical condition of all the children was fairly satisfactory. In group 1, 22·2, 75 and 2·8 per cent. were in excellent, good and indifferent condition; for group 3 the figures were 8·3, 55·6 and 35·4 per cent. In groups 1 and 2 none and in group 3

only 0·7 per cent. were in bad condition. No relation was found between vitamin content of the blood serum and folliculosis, cheilosis or nasolabial seborrhoea. Hb and inorganic P and vitamins A and C in blood were on the average normal. Energy intake was, in all groups, above the requirement, taken to be 2000 Cal. daily, and was highest, 2262 Cal., in the lowest income group, in which consumption of carbohydrates was highest. Group 1 had more milk, egg, cheese and orange than the others. Fat consumption was well above average requirement in all income groups. There were slight deficits of animal protein, riboflavin and carotene in the low-income group in relation to the Dutch standards (see Abst. 3390, Vol. 23). Half a litre of milk was always taken daily. Fortified margarine provided most of the vitamins required. In about 40 per cent. of the children excretion of vitamin B_1 was low; this was attributed to high consumption of refined carbohydrates. Only 10 children had no caries; the average number of carious lesions was 6·08. Goitre was found in a few regions where the I content of the water was low.

Recommendations are made for feeding children and parents are advised to pay more attention to the quality and less to the quantity of the children's diets.—M. Eddison.

946

LATSKY, J. M. **Dietary habits in Finnish Lapland. Some personal investigations.** *S. African Med. J.*, 1955, **29,** 794–796. [Union Dept. Nutrit.]

Information was obtained during a visit sponsored by two international organisations and notes are now presented. Consumption of reindeer meat is high, all parts of the animal being eaten; other flesh food is obtained from elk, bear, beaver, squirrel, hare, otter, seal, sea-birds and fish. Eggs also are eaten. Reindeer milk with 33 per cent. total solids and 7 per cent. fat and cheese made from it are common foods. Foods of vegetable origin are bread made from rye and some barley and, during the winter, potatoes. Vegetables are scarce and expensive. When available in autumn some berries are eaten.

Many infants show signs of rickets in spring; the incidence is highest in central and southern districts, inland and away from supplies of cod liver oil.

In adults signs of dietary deficiencies are almost unknown and caries is rare.—D. Harvey.

947

POTGIETER, M. and MORSE, E. H. **Food habits of children.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 794–796. [Sch. Home Econ., Univ. Connecticut, Storrs.]

Diet records covering 4 to 7 days were kept by 1242 children in school grades 5 to 8. The diets were scored for nutritive quality. Rural children had better diets than city children; the diets of girls were somewhat better than those of boys; 11-year-old children had better diets than those aged from 12 to 14 years. The foods most often lacking were green and yellow vegetables and other foods rich in ascorbic acid.—F. C. Aitken.

948

LISANSKY, E. S., GOLDER, G. and LOLLI, G. **Relationship of personality adjustment to eating and drinking patterns in a group of Italian Americans.** *Quart. J. Studies Alcohol,* 1954, **15,** 545–561. [Lab. Appl. Physiol., Yale Univ., New Haven, Conn.]

An intensive study of eating and drinking habits, social and physical status, and medical and emotional disturbances was made in 50 Italian-American subjects. There was no significant difference in eating and drinking patterns, but when the subjects were classified into those with normal personalities and those with psychological maladjustments, the latter presented significantly more signs of disease and disturbance and a greater frequency of drunkeness than the former.

A. M. Copping.

949

MANN, G. V., MUÑOZ, J. A. and SCRIMSHAW, N. S. **The serum lipoprotein and cholesterol concentrations of Central and North Americans with different dietary habits.** *Amer. J. Med.*, 1955, **19,** 25–32. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Three groups of subjects were compared: (1) Mayan Indians with agricultural mode of life in rural villages in Guatemala, (2) citizens of Guatemala City or the town of Antigua on a higher social and economic level, (3) North American business and professional subjects in U.S. cities. Diet surveys were made in (1) with daily visits and, where possible, weighing of food by dietitians; the subjects in (2) themselves kept records and data for (3) were from published findings. Examinations of blood were made for cholesterol and for the lipoprotein fractions S_f 12–20 and S_f 35–100.

For the groups, in order, the mean energy intake was 2306, 2810 and 3250 Cal. with 8, 36 and 40 per cent., respectively, of calories derived from fat. The mean for cholesterol in serum in each decade of age from 20 to 60 and for both sexes was lowest in (1), and in (1) there was little evidence of the rise with age which was characteristic of (2) and (3). Differences between groups in lipoprotein levels were variable; those in women were generally higher in (1) than in (2) and (3). Changes in

weight with advancing age were in (1) towards a decrease and in (2) and (3) towards an increase.

It is suggested from the findings in (1) that a higher level of lipoproteins may be associated with a high energy turnover and leanness and from those in (2) and (3) that a higher level of cholesterol may be a consequence of storage of energy as fat. The dissociation of cholesterol and lipoproteins in these Guatemalan subjects has prompted the study which has been begun in them of the pathology of atherosclerosis.—D. Harvey.

950

UHL, E., BORREBY, K., POROTNIKOFF, O., HJARDE, W., JENSEN, F. B. and LIECK, H. Nogle undersøgelser af grønlandske levnedsmidler og kostforhold. [**Foods and diet in Greenland.**] *Beretn. vedrørende Grønland*, 1955, No. 3, part 1, pp. 123 ; part 2 (Appendix), Tables, pp. 47. [Stat. Prakt. Sundhedsmæssige Undersøg. Vit. Lab.] English summary.

This is an account of an extensive study by a team of workers led by Uhl. Part 1 includes an account of the plan of study, a description of the country and its people and of their health ; a descriptive section on the composition of Greenland foods ; studies of plant foods and of diet habits ; an account of diet surveys in 13 families and 2 hospitals ; notes on the use of imported foods ; and there are proposals for improving the people's diet. Part 2 contains all the analytical data and details of the foods and diets.

The investigation was initiated by the Danish Grønlandskommission and a dietitian, Miss Karen Borreby, spent a year in Greenland making the field studies. She collected and sent to Copenhagen such representative samples of all common foods as, and when, shortage of food in general permitted. These were analysed at Stein's analytical laboratory and vitamins were estimated at the State vitamin laboratory. Miss Borreby also estimated vitamin C in vegetables and fruits and made diet surveys. It was the original intention that this should be preliminary to a full-scale diet and clinical survey by a team as recommended by WHO ; but experts were not available and opinion in Denmark, in agreement with the views of Thomson and Duncan (*Nutrit. Abst. Rev.*, 1954, **24,** 1), was that clinical and laboratory investigations of a population with modern technical methods give information which is not in proportion to the work or the expenditure required.

The report includes data from the literature on diet of Arctic populations.

The account of health is based on earlier published reports and the experience of doctors serving in or retired from Greenland. In the out-settlements the people are sometimes underfed when weather is bad and sealing, whaling and fishing are impossible or the catch is poor. Scurvy is sometimes seen, beriberi and pellagra not at all.

Snow blindness is common ; hemeralopia is said to occur in some districts, but not in others. Keratitis, corneal opacities, conjunctivitis and fissures at the angles of the eyelids are attributed to deficiency of vitamin A, deficiency of riboflavin and the climate. The tendency to epistaxis, haemoptysis (without tuberculosis), haematemesis and melaena is attributed by one to chronic excess of vitamin A and by another to lack of vitamin K. Rickets, according to one report, is not uncommon in infants and rachitic deformities are seen in schoolchildren, at least where there is most fog and rain. The early appearance of atherosclerosis has been affirmed and denied.

The composition of the family diets compared each with the requirement in terms of U.S. National Research Council (1948) allowances showed in 2 districts generally low intakes of Ca and riboflavin and in all districts and the hospitals of ascorbic acid. Proposals are made to reinforce imported flour with Ca, riboflavin, vitamin B_1 and Fe ; to add ascorbic acid to dried milk and to cheapen dried milk ; to give schoolchildren vitamin tablets and cheese, and to try to reduce the use of sugar.—I. Leitch.

951

SCHWARTZ, R. and DEAN, R. F. A. **An investigation of the daily intakes of food of individual boys at a boarding school in Uganda.** *Brit. J. Nutrition*, 1955, **9,** 230–244. [Med. Res. Counc. Group Res. Infantile Malnutrit., Mulago Hosp., Kampala.]

A full description is given of the foods used and of the methods and conditions of their preparation. Surveys lasted 1 week, servings were weighed and records were kept of the amounts passing through the kitchen. There were 3 periods, the first with 30 boys in which, because of financial difficulties, a restricted and somewhat unpopular diet was provided, the second with 32 boys when a more acceptable diet was re-introduced but remained restricted in quantity, and the third when this same diet was provided for 19 boys in unlimited amount. The findings were compared with those for British children (see Abst. 3602, Vol. 17).

No change in energy intake with age was found. The amount of carbohydrate was as great as for British children, that of total protein was less than the intake by a British boy of 9 years of age and that of animal protein and of fat much less. Mean values for daily energy intake were about 700 Cal. less than that of the British boy of 9 and 1500 Cal. less than for one of 15 years of age. The change to the popular diet in either limited or unlimited amount made little difference to food intake because, it would seem, of the bulky nature of the

foods. Sugar was the commonest supplement and was eaten in large amounts. For the 3 periods the ranges of percentages of calories from animal and total protein, fat and carbohydrate, respectively, were 1·9 to 3·3, 9·9 to 12·5, 12·7 to 16·2, 72·8 to 76·3 compared with 7·5, 11·9, 36·4, 51·3, respectively, for British children.

Because of leakages between kitchen and dining table, intakes were much below the amounts provided by the authorities. Signs of undernutrition were absent, but further investigations are necessary to discover the effects and value of additions to such diets of protein and fat.

D. Harvey.

952

DA COSTA, A. B. S. Três casos alimentares de trabalhadores africanos. **[Three nutritional studies among African workers.]** *An. Inst. Med. trop.*, 1954, **11**, 581–604. [Inst. Med. Trop., Lisbon.] English and French summaries.

A survey of the diets of workers in 3 places in Portuguese Africa is given as illustration of a discussion of the relative importance of calories and of certain dietary essentials. There were serious deficiencies of animal protein, animal fats and some minerals and vitamins in comparison with the U.S. National Research Council recommended allowances. The possibility of introducing new foods and food habits with a view to improving the diet and health of the labourers is considered.

A. M. Copping.

953

GRANT, F. W. **Nutrition and health of Gold Coast children. 1. Food in four communities. 2. Care and physical status of children.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 685–693; 694–702. [St. Francis Hosp. Sch. Nursing, Evanston, Ill.]

1. The communities and the numbers of households studied in each were, a forest village 5 miles from Kumasi, 4; a coastal village 8 miles from Accra, 4; a community on the edge of the forest and close to the coastal zone, 3; in Accra, 1. The numbers of children of estimated age from under 1 to 16 years studied in these respective households were 23, 16, 12 and 9. Cultivation, use and methods of preparation of foods are described and analytical data are presented on the composition of fish and maizemeal balls and on the calcium and ascorbic acid content of some vegetable foods before and after cooking. Averages are given also for the amounts of raw edible foods provided daily per child in the households.

By calculation from the U.S. National Research Council recommended allowances estimates of requirements were made and it was found that, in general, the diets were inadequate, especially in energy but to lesser degrees in vitamins A and C and in Fe. In the Accra family with its relatively high educational standard nutrients other than Ca and riboflavin were almost adequate.

2. Mothers' diet habits during pregnancy and their attitudes towards weaning and feeding of children are fully described. Clinical findings for 23 children in the first and for 62 in the second of the communities are tabulated with data for height and weight and for Hb and red cell counts in blood. Infestation with malarial and intestinal parasites was common and signs of both undernutrition and malnutrition were frequent. Education would, it is believed, assist mothers to provide such better standards of feeding for their children as are considered possible with the foods available.

D. Harvey.

954

THOMSON, B. P. **Two studies in African nutrition. An urban and a rural community in Northern Rhodesia.** *Rhodes-Livingstone Papers* No. 24, 1954, pp. x + 57. Manchester Univ. Press. Price 8s. 6d.

Of these studies made in 1947 the urban was in the Main Location and in Chilenje, a new suburban township, at Lusaka and the rural was in 3 villages among the Lala on the Serenje plateau. The first took the form of interviews at 187 and detailed surveys of 10 households in the location, at 92 and of 13 in the township and the results are given per man-value; the second, because of exchanges and sharing of food which took place, could not be treated in the same way and findings are reported per head of the group consuming the food.

In the urban survey average income and ranges in the location were £2 19s. 4d. and from £1 5s. to £13 4s. per month, and in the township £3 19s. 11d. and from £1 9s. to £11. In most households income was below £6 per month. Information on length of residence showed that most of the families had been there for from 5 to 10 years and suggested that the urban population was becoming stabilised. All but 7 per cent. of the families grew some food for themselves in what space was available for gardening. Poultry was kept by 54 households in the location and by 27 in the township. Weekly expenditure was estimated to be 11s. 7d. for the location families and 16s. 10d. for those in the township, amounts which both agreed with the findings for the detailed surveys and supported the observation that the township was attracting the better-educated and more prosperous classes. The 2 urban groups were not comparable in composition, the proportion of children to adults being much smaller in the location, 0·59 to 1, than in the township, 1·08 to 1.

On a man-value basis the evidence was that in the urban areas average daily intakes of energy, protein, vitamin A and nicotinic acid were adequate and those of fat, vitamin B_1, riboflavin and Ca

inadequate but these averages concealed the great variations that took place from week to week between the monthly pay days. Towards the end of the month meals were often reduced from 2 to 1 a day, the consistency of cereal dishes changed and meat and bread disappeared from the menus. Changes in the economy to weekly pay days and stricter control of retail prices will be necessary before the Africans can be expected to overcome their present improvidence.

In the rural survey much information of agricultural and sociological as well as of nutritional interest was collected. The foods are described in detail and the importance of small mammals, fish and caterpillars in the diet is indicated. Average intakes of nutrients are tabulated and compared with estimated requirements. For energy in the 3 villages, respectively, intakes and estimated requirements were 1392 and 2298, 1650 and 2212, 1269 and 2268 Cal. Amounts of protein, Ca, riboflavin and ascorbic acid appeared also to be less than estimated needs. It is customary for men to take meals apart from women and children and, in practice, their diets became fairly adequate at the expense of the women and children.

In schools there is no organised supervision of feeding. Some pupils, who were at home only at week-ends and who took with them their supplies for week-days, were probably having enough food, but in quality it was poorer than the ordinary village diet. Recommendations are made for improving the system of agriculture, the quality of livestock and the nutrition of children in schools.

D. Harvey.

955

EYKEL, N. M. (Jr.) Voeding bij de Grieken en Romeinen. [**Diet of the Greeks and Romans.**] *Voeding*, 1955, **16**, 799–809.

See also Absts. 677, 1093.

GENERAL STUDIES: DIET PLANNING: EDUCATION

956

BROCK, J. F. **Nutrition.** *Annu. Rev. Biochem.*, 1955, **24**, 523–542. [Dept. Med., Univ. Cape Town.]

957

MCCANCE, R. A. and WIDDOWSON, E. M. **Old thoughts and new work on breads white and brown.** *Lancet*, 1955, **269**, 205–210. [Dept. Exp. Med., Med. Res. Counc., Univ. Cambridge.]

In ancient Greek and Roman times brown bread carried a social stigma, although it was not without advocates who thought it superior nutritionally. Throughout English history the social stigma became less important and the advocacy of brown bread on nutritional grounds became more so. Ultimately idealistic views on the superior value of brown bread received some support from scientific experiments and in modern times the subject of controversy shifted to the relative value of enriched white bread and brown bread. The most recent experimental work on the subject, the studies of undernourished German children given different kinds of bread (Abst. 2560, Vol. 25), failed to show any superiority of one bread over another. It would seem that both lay and scientific opinion have been wrong in laying so much emphasis on the value of high-extraction flour for all persons under all conditions.—F. C. Aitken.

958

RUSSELL, C. S. **Diet in pregnancy.** *Practitioner*, 1955, **175**, 25–30. [Dept. Obstet. Gynaecol., Univ. Sheffield.]

Evidence of the importance of good nutrition in pregnancy is briefly reviewed and a specimen diet sheet for the pregnant woman is given.

F. C. Aitken.

959

KASIUS, R. V., RANDALL, A. (IV), TOMPKINS, W. T. and WIEHL, D. G. **Maternal and newborn nutrition studies at Philadelphia Lying-in Hospital. Newborn studies. 1. Size and growth of babies of mothers receiving nutrient supplements.** *Milbank Mem. Fund Quarterly*, 1955, **33**, 230–245.

Women coming to the Clinic during the first 16 weeks of pregnancy were allotted to control and supplement groups, regard being paid to race, age and parity. There were 3 supplement groups which received vitamins or protein or both. Full-term single babies were weighed and measured for length and chest girth at birth and at 1, 2 and 3 months of age. The total number of birthweights was 1141; the numbers of other measurements were smaller.

The data obtained showed no significant beneficial effect of supplementing the maternal diet on the size and growth of infants. There were some indications that a vitamin supplement given without a protein supplement had an adverse effect.

F. C. Aitken.

960

BROŽEK, J. **Nutrition and behavior. Psychologic changes in acute starvation with hard physical work.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 703–707. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

The results are briefly reported of psychomotor and intelligence tests on 12 normal young men during a complete fast, except for water as desired, of 4½ days; for the physiological results see Absts. 4692, 4693, Vol. 24.

By the 4th day of fasting there was significant deterioration in the results of tests of speed and

co-ordination and a significant increase in body sway, but strength of grip was not affected, though muscular weakness was one of the chief subjective complaints. Intelligence was not impaired, but personality tests showed changes in the direction of neurosis. The men complained of tiredness and sleepiness, and dryness of the throat although water was allowed ; desire for food was not prominent.—W. M. Deans.

961

SUBRAHMANYAN, V., DESIKACHAR, H. S. R., BHATIA, D. S., SUBBA RAO, G. N. and BAINS, G. S. **Development of a new type of balanced food (tonic food). 1. Process of manufacture. 2. Studies on its nutritive value.** *Indian Food Packer*, 1953, **7**, No. 7, 9 ; 10 ; 21 ; No. 8, 9–10. [Central Food Technol. Res. Inst., Mysore.]

1. The dry ingredients of the invalid food are maize starch, casein, defatted groundnut flour, food yeast, Osborne and Mendel salt mixture, with added vitamin B_1, riboflavin, nicotinic acid, Ca pantothenate and vitamin B_6. The dry mix is made into a dough, and from this are prepared rice-sized grains, semolina or fine flour. After adjustment of moisture content to 9 per cent. the food may be stored in moisture-proof containers.

2. The food, given with 6 per cent. groundnut oil and vitamins A and D to rats, supported good growth, reproduction and lactation, which were only slightly improved by additions of small amounts of milk and green vegetable. Consumer trials with Institute staff showed that the food was palatable and acceptable. The results of feeding trials with children will be reported later.

F. C. Aitken.

962

PILLE, G. Essai d'une politique alimentaire en Afrique noire. (Aspect biologique et scientifique.) [**Sketch of a food policy for native Africa ; biological and scientific aspects.**] *Rev. Élevage Méd. vét. Pays trop.*, 1955, **8**, 217–222. [Sect. Biochim. Nutrit., Org. Recherches Aliment. Nutrit. Africaines, A.O.F.]

The plan which is outlined describes efforts to encourage food conservation by Africans and the use, in such a form as will maintain its vitamin content, of the rice crop which in recent years has come to be widely cultivated. Protein requirements could be supplied from fish flour and groundnuts, minerals from crude sea salt and calcium, in particular, from the traditional sauces containing green leaves. These aims are considered attainable both financially and practically.

D. Harvey.

See also Abst. 937.

FOOD ECONOMICS AND STATISTICS

963

FRAUENDORFER, S. Welternährung und Bevölkerungszuwachs. Ein Literaturbericht. [**World feeding and the growth of population. A review of literature.**] *Bodenkultur*, 1954, **8**, 57–70. [Vienna.]

964

SUBRAHMANYAN, V. **Present trends in food production and outlook for the future. Presidential address.** 41*st Indian Sci. Congress, Hyderabad-Deccan*, 1954, pp. 12. [Central Food Technol. Res. Inst., Mysore.]

965

LANGER, A. and HENSHAW, P. S. **The interacting effects of public health, fertility behavior and general economy on standards of living. 1. Analytical approach leading to development of a country " situation index ".** *Amer. J. Med. Sci.*, 1955, **230**, 119–127 ; 146. [Nat. Committee Maternal Health, Inc., 2 East 103rd St., New York 29.] Interlingua summary.

A " Situation index " has been calculated for 70 countries and territories. This is equal to

$$CEI/N(2^P + 2^D),$$

where C is the daily calorie intake per person $\div 1000$, E is the industrial energy consumed per person per year in tons coal equivalent, I is the income per person per year in U.S. dollars, N is the number of inhabitants per sq. km., P is the crude annual increase of population per cent., and D is the crude annual death rate per cent. The index is thought to express quantitatively the living conditions in the countries and territories from the point of view of public health and " in relation to potentialities for advancement or retrogression ".—A. M. Thomson.

966

MARSDEN, A. W. **The supply of milk and dairy products to the public.** *J. Roy. Inst. Pub. Health Hyg.*, 1955, **18**, 188–206. [Commonwealth Bur. Dairy Sci., Shinfield, near Reading.]

967

SCHULZ, T. **A ' human needs ' diet: spring 1955.** *Bull. Inst. Statistics, Oxford*, 1955, **17**, 239–240.

In March 1955, when supplies of the cheaper foods were plentiful but vegetables were dear, a " human needs " diet cost 63s., a rise of 6d. since

the previous autumn (Abst. 4066, Vol. 25). The view is expressed that " the generally high standard of living benefits the purchaser of small means, since it reduces the demand for many wholesome yet inexpensive foods ", such as the cheaper cuts of meat.—W. M. Deans.

968

PANT, P. **The National Sample Survey Number 6. Survey of Faridabad township March-April 1954.** *Sankhyā, Indian J. Statistics*, 1955, **15,** 35–190.

Because of the failure of industrial development to keep pace with the development of a new town at Faridabad, 17 miles from Delhi, unemployment became serious in the refugee population for which the town catered. In the survey 500 households, about 1 in 11 of the total, were investigated. Unemployment was found not to be associated with illiteracy and to be caused merely by absence of opportunities for employment. In the total population of 23,800, the labour force numbered 6300, of whom 530 had no work, 510 almost none and 1400 others were in need of work providing higher remuneration.

One chapter (pp. 110–117) of the report deals with consumer expenditure. In 23 households with 158 persons, in which total monthly expenditure was Rs. 5 to 10 per head, 80·6 of the expenditure was on food and 49·7 per cent. on cereals. At the other extreme in 25 households with 54 persons spending more than Rs. 61 per head, 39·0 and 7·3 per cent. of total expenditure was on food and cereals, respectively. As income rose it was expenditure on cereals that fell most steeply, while expenditure on milk, vegetables, fish and eggs increased.—D. Harvey.

969

MORNET, P. Les hématozooses animales et la carence protidique des populations humaines. **[Animal diseases due to blood-borne parasites, and lack of protein for human populations.]** *Rev. Élevage Méd. vét. Pays trop.*, 1955, **8,** 277 – 283. [Lab. Féd. Élevage " Georges Curasson ", Dakar-Hann.]

The first half of this article deals with tsetse- and tick-borne diseases of animals in Africa, the second with their effects on human nutrition. These are even more extensive than is generally supposed, since the diseases often exist in a latent unsuspected form and, apart from causing immense losses of meat and milk, reduce the work capacity of draught animals and the supply of manure. Mass destruction of ticks and prevention of trypanosome diseases by drugs and development of resistant breeds of cattle are considered the most promising lines of attack. To illustrate the lack of protein in African diets, some rough 1953 estimates are given of meat consumption, including poultry but not fish, game or insects: French West Africa 6·4, Gold Coast 2·5, Belgian Congo 0·9 kg. per head per annum, compared with over 54 kg. in France. Consumption of sea fish in French West Africa exceeds 50,000, of freshwater fish 25,000 metric tons. Production of milk and milk products is estimated at only 80,000 metric tons in French West Africa, 10,000 in the Cameroons and 50,000 in French territory in East Africa.—W. M. Deans.

See also Abst. 217.

DIET IN ETIOLOGY OF DISEASE

METHODS OF ASSESSING STATE OF HEALTH

970

MONNEROT-DUMAINE, M. L'indice de corpulence et son calcul chez l'adulte. **[The corpulence index and its calculation in the adult.]** *Presse méd.*, 1955, **63,** 1037–1038. [Port Said.]

The corpulence index is defined as the ratio of the actual weight to the ideal weight of the person. For the latter, modification of Broca's formula by inserting the wrist circumference as a measure of the bodily framework is suggested, leading to the simple expression $\frac{1}{2}(T - 100 + 4C)$, where T is the height and C half the sum of the circumferences of the right and left wrists in cm., for the ideal weight in kg. Persons with an actual weight between 95 and 105 per cent. of this, *i.e.*, with a corpulence index between 0·95 and 1·05, are considered normal, apart from exceptional cases, *e.g.*, athletes, who may have a high corpulence index due to muscle and not to fat. The above applies to men and women aged 30 or more; persons of 25 and 20 should weigh 1·5 and 3 kg. less. Possible applications of the corpulence index are discussed.

W. M. Deans.

GENERAL STUDIES

971

LOLLI, G. **Centres for research on nutritional habits and for the prevention and correction of their deviations.** *Quart. J. Studies Alcohol.*, 1955, **16,** 393–396. [Silkworth Mem. Serv., Knickerbocker Hosp., New York.]

A short note outlines the aims and plans of the Silkworth Memorial Service for research into alcoholism and related nutritional, physiological and psychological problems.—A. M. Copping.

972

HALLMAN, N., KUNNAS, M. and VARA, P. Zur Sterblichkeit und Entwicklung der Kinder von Müttern mit überstandener Schwangerschafts-Spättoxämie. [**Mortality and development of children of mothers who have survived toxaemia of late pregnancy.**] *Ann. Paediat. Fenn.*, 1954–55, **1**, 148–165. [2. Frauenklin., Univ. Helsinki.]

A study was made of 288 children born in the Clinic in the period 1945 to 1949 to 271 mothers who had had eclamptic fits or pre-eclampsia; children of 237 healthy mothers served as controls. The children of mothers whose symptoms had lasted for some time tended to be light at birth. Thirty-five per cent. of the children were premature and 11 per cent. stillborn; those who died were all under 2500 g. Mortality was also high during the first week of life but thereafter was similar to that of Finland at the time. An incomplete follow-up of 125 of the children of affected mothers and 91 of those of healthy mothers showed that the former were not in general physically or mentally inferior.—W. M. Deans.

973

SIWE, S. **Considerations on the development of dystrophia infantum.** *Acta paediat.*, 1954, **43**, Suppl. 100, 575–578. [Paediat. Clin., Univ. Lund.]

Energy values of food and excreta were measured for 5 infants with dystrophy but without signs of disorders of the circulation or of nervous or endocrine disturbance, and in 3 control infants. On a diet supplying 110 Cal. per kg. bodyweight losses were similar in the 2 groups and increasing the intake of 1 patient to 140 Cal. per kg. did not alter the rate of loss. The disease, it is concluded, cannot be ascribed to disorder of the digestion or of the absorption of food.—D. Harvey.

974

MCQUARRIE, I., ULSTROM, R. A. and ZIEGLER, M. R. **Random notes concerning the etiological mechanisms and treatment of spontaneous hypoglycemia.** *Acta paediat.*, 1954, **43**, Suppl. 100, 481–494. [Dept. Paediat., Univ. Minnesota, Minneapolis.]

Of 43 infants with low blood sugar, other than normal newborn infants, 26 were classified as cases of idiopathic hypoglycaemia with cause undetermined. All may not have been the same, but from a more intensive study of 12 of them a single clinical entity was thought to exist; it responded to treatment with corticotropin (ACTH) and the name infantile idiopathic hypoglycaemosis is considered appropriate. The danger of brain damage from hypoglycaemia, whatever its origin, emphasises the need for early diagnosis.

D. Harvey.

975

HILL, K. R., BRAS, G. and CLEARKIN, K. P. **Acute toxic hypoglycaemia occurring in the vomiting sickness of Jamaica. Morbid anatomical aspects.** *West Indian Med. J.*, 1955, **4**, 91–104.

Pathological findings are described in 7 fatal cases in children and in 1 adult patient who recovered from vomiting sickness. The low level of sugar in blood was associated with fatty changes in liver and in other organs and with depletion of glycogen in liver. In 2 of the patients who had had glucose by vein but who died there was evidence that storage of glycogen had occurred to a slight extent.—D. Harvey.

976

MARTIN, F. M. **Primiparae and prematurity: an inquiry carried out by the National Birthday Trust Fund in collaboration with Local Health Authorities.** *Med. Officer*, 1954, **92**, 263–270.

From records of births in Greater London and South-East Lancashire 1097 premature first single live births with birthweight $5\frac{1}{2}$ lb. or less and 1875 non-premature controls were studied. More mothers in the premature group were found to be aged 20 or under, and more were in the lower social strata. For further analyses each case of prematurity was matched in terms of maternal age and social class with a control case; the unused controls were discarded. From the matched series there was no evidence that, within social classes, the mothers of premature babies undertook paid work during pregnancy more often, did heavier work or worked longer hours, or stopped working later in pregnancy, nor was there evidence that prematurity was associated with delayed or inferior antenatal care. An association between prematurity and low maternal stature, most marked in the middle classes, was clearly demonstrated.—A. M. Thomson.

977

SCHLESINGER, E. R. and ALLAWAY, N. C. **The combined effect of birth weight and length of gestation on neonatal mortality among single premature births.** *Pediatrics*, 1955, **15**, 698–704. [Div. Med. Serv., State of New York Dept. Health, Albany.] Spanish summary.

The analysis was based on certificates of live single births in New York State, excluding New York City, in the years 1949–51. Infant death certificates were matched with the corresponding birth certificates. The chances of neonatal survival improved with increasing birthweight and length of gestation independently. For example,

at birthweights 1001 to 1500 g., the neonatal death rate decreased from 75 per cent. at 24 to 27 weeks of gestation to 40 per cent. at 36 weeks or more; at 32 to 35 weeks of gestation, the rate fell from 79 per cent. for birthweights under 1000 g. to 4 per cent. for weights of 2501 g. or more. Similar trends were found when death rates for the first day, for the period second to sixth day and for the last 3 weeks of the neonatal period were analysed separately, the relations being clearest for first-day rates.—A. M. Thomson.

978

ZUBIRÁN, S., GÓMEZ-MONT, F. and LAGUNA, J. **Endocrine disturbances and their dietetic background in undernourished in Mexico.** *Ann. Int. Med.*, 1955, **42,** 1259–1269. [Hosp. Enfermedades Nutric., Mexico.]

The concept is advanced that utilisation of hormones by malnourished tissues is reduced. This gives rise to a concentration of hormones in the blood sufficient to inhibit the pituitary and results in decreased production of pituitary hormones. This hypothesis is based on the results, mostly published previously, of histological, clinical, endocrine and dietetic studies of 543 patients with malnutrition of long standing. The diets of the patients were poor in all respects, most notably in animal protein.

A study of endocrine changes in patients given an adequate diet for several months indicated that those due to malnutrition are reversible and that increased excretion of pituitary gonadotropins occurs as a transitory phenomenon in the recovery phase.—F. C. Aitken.

979

VAN HANDEL, E. **Atherosclerosis: overnutrition or malnutrition?** *Amer. J. Digest. Dis.*, 1955, **22,** 206–211. [St. Antoniushove Hosp., Voorburg, Netherlands.]

Atherosclerosis may be due to overnutrition from an excess of cholesterol, fat or energy, or it may be due to malnutrition. These concepts are examined briefly. In support of the deficiency theory, reference is made to experimental evidence that in animals certain dietary nutrients may prevent abnormal lipid disposition, and attention is drawn to the losses of such nutrients which occur in the preparation of certain refined western foods such as cereals and fats.—F. C. Aitken.

980

FULLERTON, H. W. **The role of diet in the pathogenesis of coronary artery disease.** *Proc. Roy. Soc. Med.*, 1955, **48,** 664–667. [Dept. Med., Univ. Aberdeen.]

Coronary thrombosis, which is usually regarded as being secondary to atheroma, has for many years been increasing in incidence in the United Kingdom, and affects professional more than labouring classes. A parallel is found in fat intake which has increased since the early part of this century and rises with income. Further evidences of a link between the incidence of coronary thrombosis and dietary fat intake are reports of a wartime reduction in mortality from circulatory diseases in Norway coincident with a greatly reduced intake of fat and the finding of Keys that there is a strong correlation between the mortality from degenerative heart disease and the percentage of calories derived from fat in national dietaries.

Results of a study of the effects of lipaemia on blood coagulability are presented. From these it is concluded that coagulability of blood is considerably increased as a result of the lipaemia which follows a fat-rich meal and that in most subjects lipaemia of such degree occurs only when the intake of fat is high.

It is suggested that high fat intake leads to intravascular fibrin formation and so to an increase in atheroma. The cessation or great reduction of blood flow in the coronary arteries during the ejection phase of ventricular systole might be expected to allow deposition on the intima of the coronary tree of preformed fibrin which could start the atheromatous process.—F. C. Aitken.

981

EPSTEIN, F. H. and BOAS, E. P. **The prevalence of manifest atherosclerosis among randomly chosen Italian and Jewish garment workers. A preliminary report.** *J. Gerontol.*, 1955, **10,** 331–337. [Res. Dept., Sidney Hillman Health Centre, New York.]

The occurrence of atherosclerosis was investigated in 506 men and 398 women aged 40 and over, who were members of a Garment Workers' Union. Of these men and women 36 and 51 per cent. were of Italian, 54 and 35 per cent. of Jewish parentage; the remainder belonged to other ethnic groups. The condition was found to be as common in women as in men; in both sexes it was more prevalent among Jews than among Italians. The effects of age and ethnic group on patterns of serum lipids are described.—G. F. Garton.

982

STUNKARD, A. J., GRACE, W. J. and WOLFF, H. G. **The night-eating syndrome. A pattern of food intake among certain obese patients.** *Amer. J. Med.*, 1955, **19,** 78–86. [Dept. Med., New York Hosp.-Cornell Med. Centre.]

Observations which included a detailed history and physical examination, routine laboratory and any special tests thought necessary were made on 23 obese women and 2 obese men. The eating pattern of each was studied and in 20 the night-

eating syndrome occurred. It was characterised by the consumption of large amounts of food during the evening and night, sleeplessness and lack of appetite in the morning with negligible intake of food at breakfast. These patients had great difficulty in losing weight and attempts to do so were accompanied by a high incidence of complications. It is suggested that the syndrome represents a type of response to stress peculiar to certain obese subjects and that it is closely related to the pathogenesis of obesity. In 38 non-obese subjects the night-eating syndrome was not present.
G. F. Garton.

983

JARA, A. B. Grau de tolerância para os ancilostomidae na população escolar de Vila Henrique de Carvalho. [**Degree of tolerance of ankylostome infestation in the school population of Vila Henrique de Carvalho.**] *An. Inst. Med. trop.*, 1955, **12**, 43–64. French and English summaries.

Of the 94 boys and 70 girls examined in Vila Henrique de Carvalho, Angola, all but 28 were infested with ankylostomes, a mean of 15·4 ova being found in the faeces of each infested child. The mean Hb value was 81·3 per cent. and the red cell count 4·05 million per c.mm. There was a sex difference, 85·3 per cent. of boys and 77·1 per cent. of girls being infested. There was also a racial difference; 6 of 18 white children, all the 15 of mixed race and 107 of the 131 black children were affected. Hb and red cell count were lowest in the black group, and it was concluded that the most significant cause of the anaemia was poor diet.—D. Duncan.

984

JANZ, G. J., PINTO, G. L., FRANÇA, C. S. and BARBOSA, J. C. L. Estado de nutrição e infecção por ancylostomidae. [**State of nutrition and infestation with ankylostomes.**] *An. Inst. Med. trop.*, 1955, **12**, 35–42. French and English summaries.

The faeces of 100 apparently healthy African subjects were examined for ankylostome eggs. Three groups were selected, consisting of 42 subjects probably without parasites and 55 with parasites, of whom 13 seemed to be most heavily infested. Haematological and biochemical tests gave comparable values for all 3 groups, except that in the most heavily infested group the mean serum Fe was 47·8 mg. per 100 ml., against 112·8 and 104·5 mg. in the other groups.—D. Duncan.

DEFICIENCY DISEASES

General

985

DOUTHWAITE, A. H. **Vitamins in health and disease.** *Practitioner*, 1955, **175**, 16 – 24. [Guy's Hosp., London.]

986

DE HAAS, J. H. **Geographical pediatrics.** *Acta paediat.*, 1954, **43**, Suppl. 100, 374–381. [Dept. Maternal and Child. Health, Netherlands Inst. Prevent. Med., Leyden.]

A general article contrasting child life in East and West, with emphasis on disorders of nutritional origin.—W. M. Deans.

987

SINGH, N. **Nutritional deficiency in children.** *Indian J. Pediat.*, 1955, **22**, 107–112. [Med. Coll., Lucknow.]

Of 46,650 children attending the hospital outpatient department in the 3 years 1952 to 1954, 5 per cent. showed *xerosis conjunctivae*, 1·5 per cent. had clinical rickets; 25 per cent. had a respiratory infection, 40 per cent. had diarrhoea and 28·5 per cent. some other disease. Of 3239 children admitted to the wards, 0·6 per cent. had rickets and 0·4 per cent. had scurvy.

The findings taken with published data on the incidence of malnutrition in schoolchildren show that although a large proportion of the child population are malnourished only a small proportion develop gross anatomical changes requiring hospital treatment.—F. C. Aitken.

988

ALLEN, K. W. **The monotonous diet of the African.** *East African Med. J.*, 1955, **32**, 95–97.

Details of the Kikuyu and Giriama diets are given. It is suggested that investigations should be made into the availability of pleasant yet nourishing African foods, which would supplement the often monotonous and ill balanced diet usually eaten, and that in industrial areas and on large estates restuarants serving such food should be available to workers.—L. Wills.

989

LAWRIE, W. **A medical survey on the Kenya coast twenty-five years ago.** *East African Med. J.*, 1955, **32**, 51–58. [East African Med. Survey.]

At the beginning of the survey more than 1000 young men were examined before 50 were found fit enough to act as porters. Ankylostomiasis proved to be the most important cause of ill health. In an attempt to eradicate it 50,000 people were treated and a random sample of 10,000 was fully investigated. Water supply, sanitation and housing were shockingly bad and the mental and physical state of the people was very poor. The staple diet was maizemeal or cassava, sometimes supplemented with rice, fish, coconuts and bananas; protein and fats were always deficient. In a random sample of 5365 people only 21 per cent. showed a satisfactory state of nutrition. The rate of ankylostomiasis was very high everywhere, even

100 per cent. in some places, and the load of worms carried too was very high. Anaemia and debility were common and severe ; ascariasis, bowel infections, eye disease, hepatic enlargement, malaria and malnutrition in children were also extremely common. Hepatic enlargement was present in 5 per cent. of an unselected group of 10,000 patients. Malaria was the great killing disease. A syndrome resembling kwashiorkor was described as common among children. There was a high incidence of tuberculosis. Syphilis and gonorrhoea were rare except among the Arabs ; yaws was common among the Africans but was never seen among the Arabs.—L. Wills.

990

JACQUOT, R. Relations entre les productions animales et l'équilibre nutritif des populations humaines. [**Relations between animal products and the nutritional balance of human populations.**] *Rev. Élevage Méd. vét. Pays trop.*, 1955, **8,** 209–216. [Lab. Biochim. Nutrit., C.N.R.S.]

The importance of protein of animal origin in the human diet is discussed. Kwashiorkor is considered as a disease of animal-protein deficiency. It is demonstrated that the disease is not common among pastoral peoples in Africa who include milk and meat in their diet. Among agricultural people it is rare where fish is available. In Africa animal husbandry must be extended to eliminate the widespread deficiency of animal protein.

T. D. Bell.

991

WENT, L. N. **Kwashiorkor.** *Doc. Med. geogr. trop.*, 1955, **7,** 139. [Dept. Pathol., Univ. Coll. W. Indies, Jamaica.]

This letter states that Dr. Cicely Williams did not say that kwashiorkor meant " red boy ". She stated (Abst. 910, Vol. 6) that " the name kwashiorkor indicates the disease the deposed baby gets when the next one is born ". Objection to the use of the name kwashiorkor because it has a wrong meaning is, therefore, without foundation.

E. M. Hume.

992

FRONTALI, G. **Lack of proteins in child nutrition.** *Acta paediat.*, 1954, **43,** Suppl. 100, 318–323. [Clin. Paediat., Univ. Rome.]

Experience gained in 9 years of study of the syndrome known variously as kwashiorkor, starchy food dystrophy, or, as it is here called, hypoproteinosis, has enabled the author to separate the essential signs, which disappear after administration of animal protein, from associated signs produced by infection or vitamin deficiency. The importance of essential amino-acids is discussed and treatment by transfusion of plasma and administration of protein hydrolysate or soluble caseinate is described.—F. C. Aitken.

993

GÓMEZ, F., GALVÁN, R. R., CRAVIOTO, J. and FRENK, S. **Malnutrition and kwashiorkor.** *Acta paediat.*, 1954, **43,** Suppl. 100, 336–357. [Dept. Nutrit., Hosp. Infantil, Mexico.]

A comparison of the clinical, biochemical and histopathological pictures of malnutrition in children in Mexico and kwashiorkor in Africa leads to the conclusion that the two names refer to the same disorder. On etymological grounds the term malnutrition is preferred.—F. C. Aitken.

994

TOVAR-ESCOBAR, G. and DE MAJO, B. L. **Multiple deficiency syndromes in infants and children (Venezuelan kwashiorkor).** *Doc. Med. geogr. trop.*, 1955, **7,** 116–129. [Inst. Invest. Pediat., Caracas, Venezuela.] Spanish summary.

The syndrome has been described from many parts of Latin America ; it was found to be widespread in Venezuela among slum dwellers and in impoverished rural districts. Physical and laboratory examinations showed a picture which closely resembled that of kwashiorkor as seen in Africa; the chief difference was the absence of obvious depigmentation of the skin in most of the Venezuelan patients who, owing to their mixed racial origin, are much fairer than the average African. The diet of most of the population consists of bulky carbohydrate foods with very little animal protein, fruit or vegetables ; very little milk is available. No direct relation could be established between infestation with tropical parasites and the syndrome. The condition is considered to be a public health problem which can be dealt with only by improving the socio-economic status of the population.—L. Wills.

995

RAMANATHAN, M. K., VENKATACHALAM, P. S., SRIKANTIA, S. G. and GOPALAN, C. **A follow-up study of hundred cases of nutritional oedema syndrome (kwashiorkor).** *Indian J. Med. Res.*, 1955, **43,** 285–290. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor.]

From records of an earlier study (see Abst. 4088, Vol. 25) 100 children were chosen for re-examination. Of them 20 were not traced, 40 had had no relapse, 11 had had recurrence on one or more occasions and 29 had died. The intervals between the examinations were from 6 months to between 4 and 5 years. Living conditions, diet and economic status were studied. Dire poverty had caused living conditions to remain primitive and insanitary and had prevented improvement of the children's diets, average intakes of energy and

protein being about 105 Cal. and 2·2 g. per kg. bodyweight on both occasions. The good feeding which they received during their stay in hospital seemed to have had lasting effects on some of these children.—D. Harvey.

996

VARKKI, C., VENKATACHALAM, P. S., SRIKANTIA, S. G. and GOPALAN, C. **Study of birth weights of infants in relation to the incidence of nutritional oedema syndrome (kwashiorkor).** *Indian J. Med. Res.*, 1955, **43**, 291–296. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor.]

Records of birthweight were collected for infants born to mothers, 500 in the poorest and 200 in the well-to-do section of the community; of 207 children admitted to hospital with nutritional oedema the hospital records provided the birthweight of 34; a dietary survey with some clinical observations was made of 43 pregnant women in the poorest class. In comparison with the poor mothers' infants the distribution curve of birthweights of infants of well-to-do mothers shows a definite move to the right; the percentages of weights below 5½ lb. were 12·3 and 38·4 in the well-to-do and the poor. The average for infants later developing nutritional oedema was 6·0 lb. and did not differ from that for others of the same socio-economic class. There was no correlation between their birthweight and the age at which the disease appeared. Their mothers' values for Hb, plasma proteins and albumin were typical of poor-class women.

From these 3 lines of study it is concluded that the nutritional status of the mother will affect the birthweight of her infant but will not predispose it to develop nutritional oedema.—D. Harvey.

997

OOMEN, H. A. P. C. **The external pattern of malnutrition in Djakarta toddlers.** *Doc. Med. geogr. trop.*, 1955, **7**, 1–9. [Inst. Nutrit., Djakarta.]

The cause of the malnutrition seen was taken to be insufficiency of protein, energy and vitamin A. The syndrome had the characteristics of kwashiorkor, but the pattern varied. The patients were aged from 1 to 6 years and were typical of the children in the larger towns of Indonesia and possibly of all South-east Asia. The staple food was rice. The condition is common and the 124 children studied were seen in 10 weeks. A detailed external examination was made of each, and further tests of a limited number. The signs noted were those described for kwashiorkor but, in addition, xerophthalmia was present in 66 per cent. and keratomalacia in 41 per cent. Ten signs, subnormal weight, enlargement of the liver, subnormal height, emaciation, oedema, depigmentation of the hair and skin, cutaneous xeratrophy, crazy-pavement dermatosis, xerophthalmia and keratomalacia, and muscular wasting were combined into an index to determine roughly the degree of malnutrition. With the index it was possible to make a reasonable prognosis and to direct treatment. Analysis of the findings showed that the highest incidence of the condition was in the second and third year, that the average index for the different age groups varied only between 11 and 13, that weight deficiency decreased with age, and that the wasting of fatty tissue and liver enlargement were greatest in the youngest children. The incidence of xerophthalmia rose to a maximum in the first half of the third year and was least a year earlier. Xerophthalmia was not considered as part of the kwashiorkor syndrome, and there appeared to be no relation between it and any of the other signs. The diets of those with and without xerophthalmia showed no obvious difference; neither of them contained vitamin A, but both contained some carotene. The degree of liver enlargement varied directly with the malnutrition index in untreated patients but not in those that had been treated; the largest livers occurred in the youngest children. All the livers examined histologically showed definite steatosis, which was more marked in the larger livers.

L. Wills.

998

BROCK, J. F., HANSEN, J. D. L., HOWE, E. E., PRETORIUS, P. J., DAVEL, J. G. A. and HENDRICKSE, R. G. **Kwashiorkor and protein malnutrition. A dietary therapeutic trial.** *Lancet*, 1955, **269**, 355–360. [Dept. Med., Univ. Cape Town.]

Children numbering 135, aged between 8 and 55 months and drawn from 3 centres, Cape Town, Pretoria and Durban, were, in an attempt to discover the constituent of skimmed milk which initiates the cure of kwashiorkor, given one of 4 mixtures. These and the numbers of patients receiving them were (1) dried skimmed milk with vitamins, 28; (2) dried skimmed milk only, 33; (3) vitamin-free casein, minerals, glucose and vitamins, 44; (4) as in (3) without vitamins, 30. Initiation of cure is described in terms of disappearance of mental apathy, weight change with loss of oedema, rise in level of albumin in blood serum, improvement of skin condition and formation of new tissue as shown by gain of weight. The last is attained in the third week, and treatment was not continued beyond 24 days. The results are presented as an arrangement of the patients in 4 groups with numbers as follows, (1) those with none other than the prescribed feeding, 72; (2) those for whom treatment with antibiotics also was necessary, 8; (3) those for whom supportive

treatment with transfusions or a change of treatment became necessary, 28: and (4) those who died, 27.

The findings were that all 4 mixtures initiated recovery and that treatment 4 was no less effective than was treatment 2. It is concluded that deficiencies of known vitamins are not of major importance in the pathogenesis of kwashiorkor and that the nutrient in skimmed milk which is curative is provided by the casein, mineral and trace substances such as factor 3 (see Abst. 1037, Vol. 22).

In an addendum the results are reported of the treatment of 9 more patients with a mixture containing 18 amino-acids, glucose, minerals and vitamins. Recoveries in this admittedly small series were such as to support the view that cure is initiated by the casein in skimmed milk.

D. Harvey.

999

EALES, L., BRONTE-STEWART, B. and BROCK, J. F. **Nutritional oedema in the non-European in Cape Town.** *S. African J. Lab. Clin. Med.*, 1955, **1,** 1–21. [Dept. Med., Univ. Cape Town.]

Nineteen patients with nutritional oedema were treated with only rest in bed and, later, supplements were added to their customary diet. In order the supplements given were vitamin B_1, ascorbic acid and milk protein and finally a full diet was given. Data on bodyweight, degree of oedema, heart size, venous pressure, blood pressure, renal function, electrolyte excretion and plasma protein were recorded. The findings in 4 representative male Bantu are presented graphically, with the case histories. In 2 oedema disappeared with rest alone. In the third a similar response to rest was apparently accelerated by vitamin B_1. The fourth was a case of intractable congestive heart failure and proved fatal.

The pathogenesis of the oedema is discussed.

F. C. Aitken.

1000

KÜHN, H. A. and STEIM, H. Hunger und Leberschaden. [**Starvation and liver damage.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1042–1043. [Med. Univ. Klin., Freiburg i Br.]

From clinical and biopsy studies on a 51-year-old labourer with signs of liver disorder after a diet extremely low in protein it is concluded that cirrhotic changes may occur earlier than has been supposed.—W. M. Deans.

1001

BRÜGEL, H. and PIETZONKA, H. Mangelernährung und Eisenablagerung in der Leber. [**Deficient diet and deposition of iron in the liver.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1002–1005. [Inn. Abt., Städt. Krankenhaus Stuttgart, Bad Cannstatt.]

Of over 700 patients with liver disorders subjected to laparoscopy between 1949 and 1954, 168 were known not to have been undernourished and 73 had been prisoners of war with a history of "wet" or "dry" alimentary dystrophy or were civilians showing a weight loss of over 20 per cent. From these 241 subjects frozen sections of liver tissue preserved in formalin, or paraffin wax sections of liver tissue preserved in alcohol, were examined for deposits of Fe, detected by the Turnbull's blue reaction. There were 4 categories: no Fe deposits or only traces, slight, medium and heavy.

A significant relation between undernutrition and presence of Fe deposits was found; the connection between undernutrition and degree of Fe deposition was less close but still significant at the 0·3 per cent. level. Of the 73 who had been undernourished, 34 were abusers of alcohol, but no significant connection between this habit and Fe deposits was found.

The clinical significance of Fe deposits in the liver is not clear. The authors do not express an opinion whether the liver disorder or the deposition of Fe comes first, or whether deposition of Fe can lead to cirrhosis.—W. M. Deans.

1002

BRAS, G., BROOKS, S. E. H. and DEPASS, E. E. **Data about malignant neoplasms and about the incidence of cirrhosis of the liver in Jamaica.** *Doc. Med. geogr. trop.*, 1955, **7,** 146–153. [Dept. Pathol., Univ. Coll. W. Indies, Jamaica.]

In the 2 years from 1952 to 1954, 372 autopsies were performed in the hospital; a malignant neoplasm was found in 56, but only 1 each of primary liver cell carcinoma and cholangiocarcinoma. Cirrhosis of the liver was present in 3·2 per cent., a proportion the same as was reported among 1632 autopsies at another hospital, and considerably lower than that found in other tropical countries. Comparison with the figures of the Registrar General in Spanish Town showed good agreement. Thus, though hepato-cellular carcinoma, usually arising in a cirrhotic liver, is frequent in countries where malnutrition associated with such diseases as kwashiorkor is found, in Jamaica, where such malnutrition also occurs, primary liver cell carcinoma and cirrhosis of the liver are rare. Toxic conditions, in addition to dietary deficiency, may be important in the production of cirrhosis and carcinoma of the liver; it is considered possible that the absence from the population of such complications as endemic malaria or severe helminthic infestation may account for the low incidence of these liver conditions.—L. Wills.

1003

STUART, K. L. and BRAS, G. **Clinical observations on veno-occlusive disease of the liver in Jamaican adults.** *Brit. Med. J.*, 1955, ii, 348–352. [Dept. Med., Univ. Coll. W. Indies.]

Clinical findings and the results of liver function and biopsy tests and of blood analyses are given for 4 patients, of whom 2 died. The general conclusion is that deficiency of protein has existed in the patient's diet and that " bush teas " have often been consumed. While many patients improve rapidly on a diet rich in protein and containing added vitamins, so little is known about the disease that it becomes difficult to assess accurately the value of any therapeutic treatment.

D. Harvey.

1004

FAWDRY, A. L. **Syndrome of splenomegaly, anaemia, and hepatomegaly often left-lobed, in South Arabia.** *Trans. Roy. Soc. Trop. Med. Hyg.*, 1955, **49**, 387–398.

Clinical observations and some laboratory investigations are summarised for patients who have been living in the more inaccessible parts of Southern Yemen and the Western Aden Protectorate. The syndrome is ill defined and the splenomegaly is generally the sign which causes the patient to seek medical or surgical aid. Diet, based on *Sorghum vulgare* and *Pennisetum typhoideum* with little milk and no other animal food, has generally been very poor in quality. Enlargement of the spleen is almost certainly the result of chronic malaria. This syndrome of which these conditions appear to be the cause is thought to resemble the splenomegaly of unknown origin which has been reported from elsewhere.

D. Harvey.

1005

SCHROEDER, H. and FUCHS, M. Antibiotica und Vitaminstoffwechsel. [**Antibiotics and vitamin metabolism.**] *Klin. Wochenschr.*, 1955, **33**, 278 – 282. [Innere Abt., Luisenhosp., Aachen.]

Vitamins A, B_1 and C and nicotinic acid were estimated in the blood, and riboflavin, vitamin B_1 and nicotinic acid in the urine of 60 patients and healthy people before and after treatment with 1 of 6 antibiotics. Specimen cases are described including some in whom signs of deficiency occurred, especially the Plummer Vinson syndrome, ascribed to lack of riboflavin. Nicotinamide was found most often to fall in the blood and urine ; in the urine riboflavin fell more rapidly than the other vitamins. In the blood, vitamin A fell in a few instances but carotene increased. Vitamin C fell.

E. M. Hume.

1006

BEYER S., V. Vitaminas en la dieta media estadistica nacional. [**Vitamins in the average national diet.**] *Rev. chilena Educ. fis.*, 1954, **21**, 854–856. [Dept. Aliment. Educ., Univ. Chile.]

A diet based on the average Chilean national diet was given to young rats with and without additions of the vitamin B complex and fat-soluble vitamins. There was no significant difference in weight gain between the groups. It was concluded from the experiments that social groups consuming average diets or diets above the average were unlikely to obtain any benefit from additional vitamins. Those below the average level might require some extra vitamins.—A. M. Copping.

1007

KOHN, L. A. and NICHOLS, E. B. **Interference with uptake of radioiodine tracer during the administration of vitamin-mineral mixtures.** *New Engl. J. Med.*, 1955, **253**, 286–287. [Div. Radiation Therap., Dept. Radiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

The amount of radiation was measured over the thyroid gland in 8 subjects after administration of 60 μC. ^{131}I before, during and after from 5 to 9 days of a daily dose of a mineral and vitamin preparation containing 1·0 mg. I. In 3 subjects the preparation blocked the uptake of radio-active I, which recovered when the preparation was discontinued ; in 2 subjects the uptake was slightly reduced, and in 1 it was slightly increased, while the preparation was being taken. One subject had a sharp fall in uptake and was suspected of hyperthyroidism. In the remaining subject the uptake of radio-activity was apparently blocked before the test started. It is concluded that such mineral-vitamin preparations may interfere with the diagnostic use of radio-active iodine.

L. Wills.

1008

SCHNEIDER, J. A. and SANKOWSKY, G. Über die Behandlung von Altersheiminsassen mit Vitaminkombinationen (Protovit). [**Treatment of the inhabitants of old people's homes with mixed vitamins.**] *Münch. med. Wochenschr.*, 1955, **97**, 770–772. [Inn. Abt., Humboldt Krankenhaus, Berlin-Reinickendorf.]

In a trial with mixed vitamin treatment which lasted 6 weeks, the results of standard tests showed a statistically significant increase in physical and mental efficiency, and a general physical improvement, in 53 treated subjects compared with 20 untreated. After an interval without treatment, it was renewed and produced an even more pronounced improvement. It is suggested that the deficiency demonstrated by the treatment arose from faulty gastro-intestinal function.—L. Wills.

1009

KAPLAN, L., LANDES, J. H. and PINCUS, J. **The nutritional status of noninstitutionalized aged**

persons. *Geriatrics*, 1955, **10**, 287 – 290. [Lower East Side Health Centre, New York City Dept. Health.]

A 24-hr. history from memory of food intake was obtained from 53 persons aged over 60 years. They were examined clinically and the blood of 49 of them was analysed for vitamin A, carotene, ascorbic acid, Fe and protein. More than half of them had vitamin intakes inadequate according to the standards of the National Research Council, and almost all showed clinical signs suggestive of vitamin deficiency. Blood ascorbic acid values were low in about half.—F. C. Aitken.

1010

KRUISINGA, R. J. H. De zogenaamde chlorosis tarda met dysphagie. [**So-called *chlorosis tarda* with dysphagia.**] *Nederland. Tijdschr. Geneesk.*, 1955, **99**, 1907–1911. [Acad. Ziekenhuis, Groningen.] English summary.

This syndrome, characterised by atrophy of the mucosa of tongue and pharynx, perlèche, brittle nails, loss of hair, histamine-refractory achlorhydria and Fe-deficiency anaemia, is subject to great variation in its manifestations. Anaemia is by no means always present. In a special study 4 patients with the highest number of signs were investigated for deficiency of riboflavin, folic acid and vitamin B_{12}, without definite result. Nor was there obvious abnormality in excretion of 17-ketosteroids. Always the mouth was small and there was difficulty in swallowing.—I. Leitch.

See also Abst. 952.

Vitamin A

1011

ADAM, A. and GUTHEIL, H. Vitamin A-Bilanzversuche bei Säuglingen. [**Vitamin A balance experiments with infants.**] *Ztschr. Kinderheilk.*, 1955, **76**, 462–475. [Kinderklin., Univ. Erlangen.]

Vitamin A was estimated in the faeces of infants, aged from 2 weeks to 7 months, receiving a diet of cow's milk. In 6 infants with diseases which did not affect their nutritional condition the percentage of the ingested vitamin which was excreted ranged from 0 to 17·5. In 6 dystrophic children the percentage was higher, ranging from 10 to 83. The highest excretion was found in a patient with carbohydrate dystrophy. In 4 premature infants the percentage excreted was, respectively, 3·7, 28, 29·2 and 71. Very small amounts were excreted by 3 infants fed on human milk, which was alleged to be about 3 times as rich in the vitamin as winter cow's milk. When vitamin A was added to cow's milk to bring the content up to 4000 I.U. per litre, the amount in the faeces was usually greater in total amount, but the changes in the percentage excretion after fortification were inconsistent. In a child of 2 years with cerebral palsy and sepsis, no vitamin appeared in the faeces after moderate amounts of vitamin A and only 1 per cent. after high doses. When 50 out of 100 young infants attending the clinic were given vitamin A the percentage incidence of infections was 18 compared with 35 among untreated infants. The average daily weight gain was 21 per cent. higher in the infants given the vitamin than in those not given it.

T. Moore.

1012

NEUWEILER, W. Über die intestinale und placentare Resorption des Vitamins A in Form der wasserlöslichen Arovit-Tropfen " Roche ". [**Absorption of vitamin A in the form of water-soluble Arovit (Roche) from the intestine and placenta.**] *Internat. Ztschr. Vitaminforsch.*, 1955, **26**, 87–91. [Frauenklin., Univ. Berne.] English and French summaries.

Vitamin A and carotene were estimated in the venous blood of mothers, in venous and arterial umbilical cord blood, and in the placenta. For 4 women who were not given vitamin A the average values per 100 ml. were 160 μg. carotene and 202 I.U. vitamin A in maternal blood, 13 μg. and 77 I.U. in venous cord blood, 32 μg. and 50 I.U. in arterial cord blood, and in placenta 12 μg. and 43 I.U. per 100 g. [The values are given as I.U. per cent. in 10 cm^3. or 10 g. but seem about the expected values for I.U. per 100 ml. or 100 g.] In 8 mothers who were given 300,000 I.U. vitamin A as an aqueous preparation a few hours before parturition much higher values were found. The maternal blood averaged 117 μg. carotene and 292 I.U. vitamin A, venous cord blood 14 μg. and 99 I.U., arterial cord blood 44 μg. and 252 I.U. and the placenta 36 μg. and 135 I.U. The values both with and without vitamin A were much higher than those obtained in similar studies by the same author in 1943 (Abst. 1755, Vol. 15). The higher results in those not given vitamin A are ascribed to the improved state of nutrition throughout the population, and the higher results after vitamin A to its administration in aqueous and not in oily medium.—T. Moore.

1013

GONZALEZ OUTON, P. M. Hipervitaminosis A aguda en niños de edad prepuberal. [**Acute poisoning with vitamin A in children before puberty.**] *Medicamenta*, 1955, **24**, 70–71. [San Fernando, Cadiz.]

Two children aged 9 and 11 years presented acute signs of vitamin A intoxication, characterised by headache and flushing of the face, within 2 days of receiving a water-soluble preparation providing 400,000 I.U. vitamin A and 600,000 I.U.

vitamin D. The onset was sudden and recovery occurred spontaneously.—A. M. Copping.

1014

GERMERAAD, W. F. and VASHBINDER, H. (with VERBEEK, A. M. T. A. and VAN DER SIJDE, H. R.) De behandeling van acne vulgaris met vitamine A. [**Treatment of acne vulgaris with vitamin A.**] *Nederland. Tijdschr. Geneesk.*, 1955, **99**, 2358–2363. [Centrale Org. Bestrijd. Huidziekten, Rotterdam.] English summary.

In an outpatient department, 234 patients with acne vulgaris were treated with very large doses of vitamin A. In addition 40 were given dummy treatment, and 60 who had improved with vitamin A were subsequently given dummies. Five different preparations of vitamin A were used; those most efficient in producing a high value for vitamin A in the blood were Arovit-Tropfenlösung (Hoffmann-La Roche) and the authors' own preparation of vitamin A acetate in solution in *iso*propanol. In order to achieve a cure, a vitamin A value of 300 I.U. ml. plasma had to be maintained for from 3 to 9 months, and the preparation had to be taken with absolute regularity. Injections of vitamin A were given to 3 patients, but they did not influence the vitamin A content of the blood. Blood vitamin A was estimated 433 times between 18 October 1950 and 12 April 1952. The test must be completed on the day the blood is drawn, otherwise the vitamin A content decreases. Sixty-three patients continued treatment for 9 months and 41 of them were cured. In the first 2 months the condition sometimes got worse. Hyperkeratosis or fissure of the lower lip sometimes appeared. Of the 40 patients given dummies, one-third had improved after from 3 to 4 months but did not lose their comedones, in contrast with those treated with vitamin A. The amount of vitamin A required to maintain a cure varied widely.

M. Eddison.

Vitamin D

1015

BECKMANN, R. Zur Kritik der alkalischen Serum-Phosphatase und ihres klinischen, diagnostischen Wertes für die Kinderheilkunde. [**Alkaline serum phosphatase and its clinical diagnostic value in paediatrics.**] *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1955, **7**, 14–58. [Kinderklin., Westfälische Wilhelms-Univ., Münster.] English and French summaries.

A general appraisal is made of the test, and the conclusion is reached that the value for alkaline serum phosphatase is of no value as a criterion of rickets.—E. M. Hume.

1016

CREERY, R. D. G. and NEILL, D. W. **Intake of vitamin D in infancy.** *Lancet*, 1955, **269**, 372–374. [Royal Belfast Hosp. Sick Child.]

It was thought desirable to ascertain the amounts of vitamin D regularly given to infants. Health visitors on their routine visit made inquiries about the amount and kind of milk, cereal and vitamin D preparation that were being given to infants aged 3 months in April or May 1955. The survey covered 90·1 per cent. of the babies of that age living in the City of Belfast. The total number included for analysis was 1087. No clinical assessment was made. Of the 1087 infants, 212 were being totally or partly breast fed, 176 were having liquid cow's milk, 351 were having national dried milk, and 348 proprietary brands of dried milk. All the dried milk preparations contained vitamin D. With these milks in the above order, the percentage having a vitamin D supplement was 74, 64·2, 70·9 and 75·6. The supplement most frequently used was Ministry of Food cod liver oil compound. Histograms are given for each type of feeding to show the number of infants receiving vitamin D daily, in amounts increasing by increments of 200 from 0 to 3000 I.U. Of all the infants, 10·8 per cent. had no vitamin D and 15 per cent. had less than 600 I.U. daily; these were almost entirely breast fed or given liquid cow's milk. The percentage getting from 600 to 1000 I.U. daily was 19, and from 1000 to 2000 I.U. daily 51; 4·2 per cent. had more than 2000 I.U. daily.

The daily amount recommended by the British Paediatric Association (*Arch. Dis. Child.*, 1943, **18**, 58, and Abst. 685, Vol. 13) is 700 I.U.; 25·8 per cent. of the babies were having less than that, and 55·2 per cent. were having more. It is suggested that the state of "idiopathic hypercalcaemia in infants with failure to thrive" (Absts. 1179, 1180, Vol. 25) may be associated with such high dosage. The policy is discussed which should be pursued to remedy insufficiency and excess; it is recognised that the second problem is particularly difficult to solve.—E. M. Hume.

1017

KALOUD, H. Vergleichende Untersuchungen über die Wirkung der intramuskulären Stosstherapie mit Vitamin D_2 und D_3 bei der Säuglingsrachitis. [**Comparative study on the efficacy of single-dose intramuscular treatment with vitamin D_2 and vitamin D_3 in infantile rickets.**] *Öst. Ztschr. Kinderheilk.*, 1955, **11**, 216–221. [Kinderklin., Univ. Graz.]

It was previously reported that there was more rapid healing of rickets with a single oral dose of 15 mg. vitamin D_3 than of vitamin D_2 (Abst. 2381, Vol. 24). In the present test the single dose of 15 mg. was given by intramuscular injection in oil

solution. Vitamin D_3 (Actifral D_3, Philips-Chemie, Vienna) was given to 13 children with severe rickets, and vitamin D_2 (Vi-De, Dr. A. Wander, Vienna) to 11. Rate of healing of craniotabes and of the distal ends of the radius and ulna as seen radiographically, and changes in serum Ca, P and alkaline phosphatase values were the criteria. In more rapid healing of craniotabes and in its ability to raise the product of the serum Ca and P values, vitamin D_3 proved superior.—E. M. Hume.

1018

JONXIS, J. H. P. **Some observations on rickets.** *Glasgow Med. J.*, 1955, **36,** 227–237. [Dept. Paediat., Univ. Groningen.]

Report of the Fleming Memorial Lecture, University of Glasgow, 5 May 1955.

1019

SCHLANGE, H. Rachitisprophylaxe und -therapie mit vitaminierter Milch in der Klinik. [**Prevention and treatment of rickets with vitaminised milk in the Klinik.**] *Monatsschr. Kinderheilk.*, 1955, **103,** 217–219. [Kinderklin., Freie Univ., Berlin.]

Vitamin D_3 (Merck, Bayer) was added in alcoholic solution to cow's milk and human milk to give a concentration of 1000 I.U. per litre. In the Klinik, between November 1953 and April 1954, 206 infants received the milk. Of 69 that had previously been treated with Vigantol, 2 had rickets on admission, and of 137 previously untreated, 15 had rickets. Fifty-one of the premature and 121 of the full-term babies were under observation for long enough to make a conclusion possible. Four of those treated prophylactically, 3 of them premature, were not protected, and 1 of those treated curatively did not heal. The use of vitaminised milk is strongly recommended as being without the disadvantages of an oil solution. There was some evidence that rickets was more frequent among babies previously fed on oatmeal gruel (*Haferschleim*).—E. M. Hume.

1020

CATHALA, J. and HENNEQUET, A. Sur la prophylaxie du rachitisme par les laits vitaminés. [**Prophylaxis of rickets with vitaminised milk.**] *Pédiatrie*, 1955, **10,** 215–225 (with discussion 225–226).

The question of providing milk fortified with vitamin D was discussed from the public health standpoint at a session of the Commission de Protection de l'Enfance du Conseil Permanent d'Hygiène Sociale et des Médecins Consultants Régionaux de Pédiatrie. On the basis of the arguments put forward, it was recommended that certified pasteurised milk, labelled as enriched with vitamin D and intended for consumption by infants, should be sold in sealed bottles. The level of fortification suggested was 400 I.U. vitamin D per litre. A variety of opinions was expressed by other members of the Commission and the proposal was rejected by 17 votes to 8.

E. M. Hume.

1021

JESSERER, H. Ergebnisse und Probleme der therapeutischen Anwendung von Vitamin D in hohen Dosen. [**Results and problems in the therapeutic use of vitamin D in large doses.**] *Wien klin. Wochenschr.*, 1955, **67,** 326–330. [1. Med Klin., Univ. Vienna.]

The article reviews the dosage, mode and vehicle of administration most suitable for vitamin D_2, vitamin D_3 and dihydrotachysterol in different circumstances, especially with reference to the speed of reaction desired. Treatment of rickets, osteomalacia, parathyroid tetany, and lupus and other skin diseases is considered.—E. M. Hume.

1022

ROMANI, L. and ROSSONI, C. Intossicazione da vitamina D_2 in dose urto (contributo clinico su due casi). [**Intoxication with vitamin D_2 in massive doses. Clinical note on two cases.**] *Pediatria*, 1954, **62,** 897–912. [Osp. Bambino Gesù, Rome.] French, English, German and Spanish summaries.

The 2 patients were children of 8 months and 2 years. Their state was typical of vitamin D excess.—E. M. Hume.

1023

HALLMAN, N., TÄHKÄ, H. and AHVENAINEN, E. K. **High plasma calcium and influencing factors in interstitial plasma cell pneumonia in infants.** *Ann. Paediat. Fenn.*, 1954–55, **1,** 34–49. [Child. Clin., Univ. Helsinki.]

A series of 59 infants with interstitial pneumonia, 22 full-term and 37 premature, were grouped according to birthweight. Their plasma Ca values ranged from over 15 to 11·9 mg. per cent., but only 6 had values below 12·0, of whom 5 died; the highest values were in the infants with the lowest birthweights. All but one of the infants had been treated with 1 or more large intramuscular doses of vitamin D, followed by oral doses, to prevent rickets. High values for plasma Ca were found in infants that had received one or several large doses of vitamin D. Plasma P was always and alkaline phosphatase usually high. Differential diagnosis from vitamin D excess was based on X-ray examination of bones, blood chemistry, and the fact that blood Ca might fall while intensive treatment with vitamin D was in progress. Further, other premature infants that

had received the same high doses of vitamin D as the sick children had normal plasma Ca values.

L. Wills.

1024

UEHLINGER, E. D-Avitaminose und renale Osteomalacie. **[Vitamin D deficiency and renal osteomalacia.]** *Schweiz. med. Wochenschr.*, 1955, **85**, 521–527. [Pathol. Inst., Univ. Zürich.]

An exhaustive post-mortem examination was made of 2 elderly, female patients, both dying with very severe osteomalacia, one of renal and one of nutritional origin. The latter had not left her room for 4 years and had lived chiefly on bread and tea without butter, and a little milk and small amounts of tinned meat and vegetables. She died before any treatment could be given. The patient with renal osteomalacia received considerable amounts of vitamin D before her death.

Anatomically the skeletal changes were identical. Both skeletons showed osteomalacia and *osteitis fibrosa*; fibro-osteoclasis was widespread. The similarity in the histological pictures too was remarkable. Hyperplasia of the parathyroid gland was present in the patient with renal osteomalacia but not in the other, and it is therefore concluded that fibro-osteoclasis can arise from causes other than parathyroid overactivity. Differential diagnosis of the two kinds of osteomalacia must depend on blood and urine tests.—E. M. Hume.

1025

SAVILLE, P. D., NASSIM, J. R., STEVENSON, F. H., MULLIGAN, L. and CAREY, M. **The effect of A.T. 10 on calcium and phosphorus metabolism in resistant rickets.** *Clin. Sci.*, 1955, **14**, 489–499. [Metabol. Unit, Inst. Orthopaedics, Royal Nat. Orthopaedic Hosp., Stanmore, Middlesex.]

Balance studies of Ca and P were made on 2 boys 5 and 9 years old, 2 girls of 6 and 12, a girl of 15, sister of the boy of 5, and a woman of 41, mother of the 2 last mentioned, all with resistant rickets, in order to assess the efficiency of A.T. 10 (dihydrotachysterol) in controlling the condition.

Administration of A.T. 10 in doses of from 1 to 10 mg. daily caused a rapid decrease in faecal Ca and P. In 4 of the patients there was no corresponding increase in the urinary excretion, so that the balance of Ca and P became strongly positive. In one patient rickets was already healing before the test; Ca and P in the urine increased but, even so, a more positive balance was established. In the sixth patient urinary Ca and P increased so rapidly that the balance was hardly changed. Addition of sodium phosphate to the diet raised serum P to about 5 mg. per 100 ml. and depressed serum Ca by about 0·5 mg. per 100 ml.; urinary Ca decreased and the balances for Ca and P became more strongly positive. Faecal Ca was not increased; if anything, it was reduced.

When one patient was given calciferol instead of A.T. 10, there was no difference in the balance. It is concluded that the action of A.T. 10 and calciferol is the same when the metabolic state of the patient is the same.

For adequate treatment of resistant rickets and to secure normal growth, it is recommended that phosphate be given as well as A.T. 10 or calciferol in order to maintain serum P at the level normal in childhood. Such treatment would have the further advantage of more easily keeping serum Ca below the toxic level.—E. M. Hume.

1026

SCHLESINGER, B., LUDER, J. and BODIAN, M. **Rickets with alkaline phosphatase deficiency: an osteoblastic dysplasia.** *Arch. Dis. Childhood*, 1955, **30**, 265–276. [Hosp. Sick Child., Great Ormond St., London.]

Three infants with signs of gross bone disorder resembling rickets are described. Radiographic differentiation from true rickets was based on the raising of the periosteum caused by early irregular formation of bone and the absence of cupping at the growing ends of the bones.

In the skull calcification was very poor and the growth of bone did not keep pace with that of the brain so that there was a bulging fontanelle and wide open sutures, which later showed premature fusion. In all 3 infants the alkaline phosphatase was much reduced and, in the one examined for bone phosphatase, activity was low. Serum Ca was raised in 2 of the infants; their kidney function was impaired and their blood urea was high. Serum P was moderately reduced. Histological examination of biopsy material from the skull and tibia showed disorganised architecture in the osteoid seams and few osteoblasts or osteoclasts at the margins of the trabeculae; the osteocytes also were reduced in number. Ethanolamine phosphate was found in the urine of one and in that of a sibling who at 6 weeks was found to have low serum alkaline phosphatase.

Treatment with large doses of vitamin D led to some improvement of calcification but did not affect the serum phosphatase level. Renal function improved as the value for serum Ca fell. All the parents appeared healthy. The few cases reported in the literature are reviewed. It is suggested that the condition may be familial and that the primary fault may be in osteoblast formation.—L. Wills.

Vitamin E

1027

GOUNELLE, H., FRANÇOIS, A., MARNEY, C. and ROBEY, M. Les variations de la vitaminémie

E au cours de la gestation et l'incidence du facteur saisonnier. [**Variations in vitamin E in blood during gestation and the effect of season.**] *C.R. Soc. Biol.*, 1955, **149**, 288–291. [Hôp. Bretonneau.]

Tocopherol was estimated 214 times in the blood of 178 pregnant women during the years 1951–54. When the results were grouped according to the period of pregnancy the average value in mg. per 100 ml. was for the first trimester 0·66, for the second trimester 0·75 and for the third 0·88. When the results were grouped according to the month of the year, irrespective of the period of pregnancy, evidence of seasonal variation was found, with the values at their lowest in spring and early summer.—T. Moore.

1028

KRAMER, M. Der Vitamin-E-Spiegel des Blutes während der Gravidität. [**Vitamin E values in the blood in pregnancy.**] *Internat. Ztschr. Vitaminforsch.*, 1955, **26**, 58–65. [Inst. Ernährungswissensch., Budapest.] French and English summaries.

Vitamin E was estimated, by a method which uses the Emmerie and Engel reaction, in the blood serum of pregnant and non-pregnant women. For 86 non-pregnant women the average value per 100 ml. serum was for vitamin E 0·99 mg., s.d. $\pm$ 0·25, and for carotene 131 μg, s.d. $\pm$ 49. Values for vitamin E rose as pregnancy progressed. One hundred women during the first trimester showed an average value for vitamin E of 0·96, s.d. $\pm$ 0·20, and for carotene of 132. Sixty-five women in the second trimester had an average value for vitamin E of 1·28, s.d. $\pm$ 0·28 and for carotene of 145. In the final trimester for 82 women the average value was for vitamin E 1·79, s.d. $\pm$ 0·30, and for carotene 180.—I. M. Sharman.

1029

FINZI, M. Vitamine e senescenza. (La vitamina E.) [**Vitamins and senescence: vitamin E.**] *Acta gerontol.*, 1955, **5**, 217–221. [Bologna.]

A review.

1030

BÄUMER, A. and BECKMANN, R. Zur Bedeutung einer Vitamin E-Erniedrigung im Serum bei Leberkrankheiten. [**The meaning of low vitamin E values in the serum in liver diseases.**] *Klin. Wochenschr.*, 1955, **33**, 431–434. [Med. Klin., Univ. Münster.]

Tocopherol was estimated 173 times in the blood serum of 54 patients with liver diseases. The normal value was taken as about 1500 μg. per cent. with range from 1200 to 2000. In all the patients except 2 with primary carcinoma of the liver, the value was low, the highest value found at any time being below 1200. The lowest values were in patients with obstructive jaundice and jaundice of Meulengracht's type. In 10 patients the urinary excretion of 17-ketosteroids was measured before and after treatment with tocopherol. As the serum tocopherol value rose, the amount of ketosteroids excreted rose also and the patients felt much better, but the changes were not maintained if tocopherol was withdrawn.

E. M. Hume.

1031

OSTEN, W. Soll eine Vitamin-E-Behandlung mit Kalzium oder Magnesium kombiniert werden? (Eine klinische Studie zur Behandlung peripherer Gefäss-schäden.) [**Should treatment with vitamin E be combined with calcium or magnesium? A clinical study on the treatment of damage to peripheral blood vessels.**] *Internat. Ztschr. Vitaminforsch.*, 1955, **26**, 19–31. [Chirurg. Abt., Rudolf Virchow Krankenhaus, Berlin.] French and English summaries.

Twenty-one men and 3 women, mostly aged from 41 to 60 years and suffering from arteriosclerosis and other vascular abnormalities, were divided into 3 groups. All were treated with *dl*-α-tocopheryl acetate, orally or by intramuscular injection, in doses from 100 mg. daily to 600 mg. 3 or 4 times a week. One group in addition was given an intravenous injection of 1 g. calcium gluconate 3 or 4 times a week, and another had injections of the same amount of magnesium ascorbate. Progress was studied for 3 months by oscillography, skin thermometry, capillaroscopy and measurement of tolerance of heparin and thrombin, and from subjective reports. Weekly estimations were made of free and esterified cholesterol and of total phospholipins in the blood serum. The patients, classified as definitely improved, improved and uninfluenced, numbered 2, 4 and 2 in the group treated with tocopherol only, 0, 3, and 2 in the group treated with calcium also, and 6, 3 and 2 in the group treated with magnesium also. The ratio of total phospholipins to esterified cholesterol in the serum appeared to increase during treatment to a greater extent in the group given magnesium than in the other groups.—T. Moore.

Vitamin B Complex

1032

ORTAÑEZ, J. and PALILLO, L. **Better health through better rice.** *J. Philippine Med. Assoc.*, 1955, **31**, 33–36. [Manila.]

There are still 25,000 deaths annually from beriberi in the Philippines.

By the Dr. J. Ortañez process (patient pending), whole rice is soaked in a 0·1 per cent. suspension of $CaCO_3$ for 5 min. It is then steamed for 30 min. under 15 lb. pressure and dried in hot air.

When dry it can be milled in the ordinary way with little loss of minerals or vitamins. The retention of vitamin B_1 on milling is reported by the Public Health Research Laboratory to be 90 per cent., and the loss on washing is said to be only 3 per cent. The rice keeps well, swells more than ordinary rice when cooked and tastes as good. At present, rice thus treated costs 25 per cent. more than ordinary rice, but with increased production the cost should not be more than 5 per cent. greater. The economic importance is stressed of using a natural product instead of importing synthetic vitamin B_1 for fortification at the cost of dollars.—E. M. Hume.

1033

LIMBOS, P., BURETTE, E. and ROGOWSKY, M. Sur une forme particulière de béri-béri observée à Stanleyville. [**On a particular form of beriberi seen at Stanleyville.**] *Ann. Soc. belg. Méd. trop.*, 1954, **34**, 963–979. [Hôp. Congolais, Stanleyville, Belgian Congo.] Flemish summary.

It is reported that beriberi seems to have become more frequent in the Belgian Congo since the last war, particularly in military camps. From 1950 to 1953, 70 patients were seen; only one was seen in the first 8 months of 1954. All except 2 were males under middle age; two-thirds were soldiers. Six came from the school at Stanleyville. None of the patients was very poor. Dysentery, Flexner or amoebic, was often present. Oedema and nerve signs were relatively slight though pretibial oedema was usually present. Heart changes shown in the electrocardiogram and by X-ray were the most important signs. The condition responded well to intravenous injection of from 100 to 200 mg. vitamin B_1 daily, but there was often relapse when the vitamin was withdrawn. No death occurred. The diet was abundant in calories and did not appear to be notably deficient in vitamin B_1; carbohydrate as rice, manioc and bread was excessive. Contributory causes were probably dysentery and the drugs and antibiotics used to counteract it. An examination was made of all the 79 boys in the school where beriberi had been found in 6, and the conclusions drawn were confirmed.—E. M. Hume.

1034

TRINCÃO, C., PINTO, G. L., NOGUEIRA, A. R., GOUVEIA, E. and PARREIRA, F. A eliminação urinária da tiamina pelos indígenas da Guiné Portuguesa, normais ou doentes de ancilostomiase filariose e tripanosomiase. [**Loss of vitamin B_1 in the urine of natives of Portuguese Guinea, normal or suffering from ankylostomiasis, filariasis or trypanosomiasis.**] *An. Inst. Med. trop.*, 1955, **12**, 29–33. French and English summaries.

The excretion of vitamin B_1 was investigated in 6 normal subjects, 11 with ankylostomiasis, 7 with filariasis and 17 with sleeping sickness. Wide variations in the amount per ml. urine or per hour were recorded with no apparent difference between the different groups. There was no indication for treatment with vitamin B_1.—A. M. Copping.

1035

DUSCHL, H. Über die unterstützende Behandlung der Intoxikation mit Cocarboxylase. [**Supporting treatment of toxic states with cocarboxylase.**] *Monatsschr. Kinderheilk.*, 1955, **103**, 236–238. [Städt. Kinderklin., Dortmund.]

Treatment with cocarboxylase is reported for infants in severe toxic states arising from nutritional upsets. In many such infants accumulation of pyruvic acid in the blood was a sign of general toxicosis with extreme dehydration due to diarrhoea and vomiting, and was difficult to relieve. Intravenous injection of cocarboxylase was preferred, since absorption from subcutaneous injection might be too slow in severe cases. The effect of cocarboxylase in restoring normal metabolism is discussed. Of 79 infants treated with it 10 died within the first few hours and were considered too ill to have responded. During the first 36 hr. only 8 others died, which was a low mortality rate for infants with severe toxic disturbances. The rapid initiation of treatment with cocarboxylase is recommended in all such conditions.—A. M. Copping.

1036

ORSINI, M. and PAOLINI, A. Azione della cocarbossilasi sulla piruvemia nelle sindromi chetonemiche dell'infanzia, spontanee e provocate. [**Effect of cocarboxylase on the pyruvic acid content of the blood in children with spontaneous or experimentally produced ketonaemic syndromes.**] *Arch. ital. Pediat. Puericolt.*, 1955, **17**, 183–200. [Ist. Clin. Pediat., Univ. Rome.] French, English and German summaries.

See Abst. 4114, Vol. 25.

Pyruvic acid and ketone bodies were estimated before and for 4 hr. after a single intravenous injection of from 25 to 100 mg. cocarboxylase in 19 children aged from 5 months to 12 years, 5 of them with essential hyperketonaemia, 3 with diabetic ketosis, 2 with hyperketonaemia induced by diet, and the rest with secondary ketosis. The mean value for pyruvic acid in the blood for 10 normal subjects was 0·64 mg. per cent., with range 0·38 to 1·05. The values for the patients before treatment ranged from 0·8 to 3·6. A

small reduction of the blood value for pyruvic acid took place in 7 of the 19 subjects ; there was even less effect on the concentration of ketone bodies. The reduction of both values was greatest in 2 patients with carbohydrate dystrophy, in whom some degree of vitamin B_1 deficiency might have existed.—E. M. Hume.

1037

MARTEN, G. Über Vorkommen und Verhalten des Thiamindisulfids im Stoffwechsel. [**Occurrence and behaviour in metabolism of vitamin B_1 disulphide.**] *Naturwissenschaften*, 1955, **42,** 443–444. [Anst. Vitaminforsch., Potsdam-Rehbrücke.]

Significant amounts of vitamin B_1 disulphide might occur in urine. After intravenous injection of 30 mg. of the substance an equilibrium with vitamin B_1 in the blood was established. Total excretion of vitamin B_1 took longer to reach its initial value after injection of vitamin B_1 disulphide than after injection of vitamin B_1.—D. Duncan.

1038

SAMRUATRUAMPHOL, S. and PARSONS, H. T. **An anti-thiamine effect produced in human subjects by bracken ferns.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 790–793. [Dept. Foods Nutrit., Sch. Home Econ., Univ. Wisconsin, Madison.]

In view of recommendations that bracken fronds be used as human food, the effect of eating young fern was studied in 2 groups of subjects having diets that supplied 1·6 or 1·25 mg. vitamin B_1 daily. The urinary excretion of the vitamin decreased when raw bracken fronds were eaten in salads, which was attributed to a decrease in its availability owing to enzymic breakdown into fragments not available to the human organism. Investigation *in vitro* showed the antivitamin B_1 factors in fern to be of two types, one heat-stable and the other heat-labile. The amount of the former varied little, but that of the latter increased as the fern crosiers began to unfold, and then decreased as the fronds matured.—A. M. Copping.

1039

ERBSLÖH, F. Die polyneuritischen Krankheitsbilder in der Inneren Medizin. [**The picture of polyneuritic diseases in internal medicine.**] *Münch. med. Wochenschr.*, 1955, **97,** 753–756 ; 785–788. [2. Med. Klin., Univ. Munich.]

A review.

1040

ARMSTRONG, R. W. and GOULD, J. **The nature and treatment of delirium tremens and allied conditions.** *J. Mental Sci.*, 1955, **101,** 70–84. [Dept. Psychiat., Univ. Oxford.]

Fourteen patients were treated with B vitamins combined with vitamin C and glucose. The most rapid improvement followed the administration every 4 hr. of 1000 mg. vitamin B_1 hydrochloride, from 100 to 200 mg. nicotinamide and 1500 mg. ascorbic acid, preferably by vein. The effect of pyridoxine, riboflavin or pantothenic acid was less obvious. Delirium tremens may, it is suggested, be considered to result from vitamin deficiency which disturbs the carbohydrate metabolism of the brain and from the abnormal substitution of alcohol for glucose as the oxidisable substrate in the brain.—L. Wills.

1041

SCHÖNBAUER, E. Schwere Dünndarmveränderungen bei Vitamin B-Mangelerscheinungen. [**Severe changes in the small intestine in presence of vitamin B deficiency signs.**] *Wien. klin. Wochenschr.*, 1955, **67,** 383–384. [Zentral-Röntgeninst., Allg. Krankenhaus, Univ. Vienna.]

A man of 54, an alcoholic, had severe ulcerative changes of the skin and of the mucous membrane of the mouth and gastro-intestinal tract, with loss of weight and blood in the stools. A barium meal showed great delay ; movement, secretion and tone of the gut were all impaired. Pellagra was suspected and treatment with B vitamins was given ; the response to a barium meal became normal in 4 days. An account of treatment and its results is to be given elsewhere. The object of the present contribution is to describe the behaviour of the gut after the barium meal.

E. M. Hume.

1042

GREGORY, I. **The role of nicotinic acid (niacin) in mental health and disease.** *J. Mental Sci.*, 1955, **101,** 85–109. [Ontario Hosp., London. Canada.]

A review with 127 references.

1043

GOLDSMITH, G. A., ROSENTHAL, H. L., GIBBENS, J. and UNGLAUB, W. G. **Studies of niacin requirement in man. 2. Requirement on wheat and corn diets low in tryptophan.** *J. Nutrition*, 1955, **56,** 371–386. [Nutrit. Res. Lab., Sch. Med., Tulane Univ., New Orleans, La.]

In a continuation of previous work (see Abst. 856, Vol. 23), 3 white female subjects received a mixed " wheat " diet providing 1600 to 2100 Cal. daily, containing 140 g. wheat flour products and providing approximately 5 mg. nicotinic acid and 200 mg. tryptophan. The only signs shown in 3 months were in 1 subject herpes on the lip and a slight redness of the tongue and in a second, lassitude and depression. In the third, characteristic signs

of deficiency of nicotinic acid were first seen after 80 days. In the earlier trials this subject and 2 others, receiving a "corn" diet which contained 89 g. maize products and 35 g. wheat flour and provided about 4·7 mg. nicotinic acid and 190 mg. tryptophan daily, had signs of deficiency in about 50 days.

On the wheat diet the excretion of N^1-methylnicotinamide decreased gradually throughout the experiment and that of the 6-pyridone of N^1-methylnicotinamide more rapidly; the decrease in excretion of the former was slower than had been noted on the maize diet.

One subject, a negro woman aged 46 years, received the wheat and maize diets alternately for periods of 20 days each. No constant difference was apparent between the 2 diets in their effects on the excretion of nicotinic acid metabolites.

Six subjects received the maize diet supplemented with extra nicotinic acid so that the total ranged from 4·6 to 21·2 mg. daily. Up to the amount of from 8 to 10 mg. daily, about 0·2 mg. nicotinic acid metabolites was excreted for each mg. of the vitamin ingested; above that value the amount was about 0·6 mg. It is suggested that an intake of from 8 to 10 mg. nicotinic acid daily will "prevent depletion of body stores when the diet contains corn and furnishes 200 mg. tryptophan".

With both the wheat and the maize diet the time in which pellagra developed seemed to be related to the intake of nicotinic acid and tryptophan per unit of body size, but it is concluded that the relationship "may not explain completely the differences in clinical and laboratory findings between the two regimens", and that the presence in maize of an inhibitory factor influencing the requirement of nicotinic acid cannot be ruled out.

H. Chick.

1044

TOMABECHI, K. **The conversion of L- and D-tryptophan to niacin in human body.** *J. Vitaminol., Japan,* 1954, **1,** No. 2, 18–23. [Dept. Nutrit., Inst. Pub. Health, Minato-ku, Tokyo.]

Excretion of N^1-methylnicotinamide, nicotinic acid and methylnicotinamide-6-pyridone was measured in a healthy young man having a diet containing 0·98 g. tryptophan and 23·9 mg. nicotinic acid. A marked increase in excretion of nicotinic acid and its derivatives occurred within 24 hr. of a dose of 2 g. L-tryptophan. When D-tryptophan was given the rise in the amount of nicotinic acid derivatives was smaller and the maximum excretion was delayed until the second day. If nicotinamide was given a rapid increase of excretion followed. It thus seemed that man could utilise D-tryptophan, which it had previously been thought could not be converted into nicotinic acid.—A. M. Copping.

1045

EICHINGER, O., KEMMERER, G. and MEINERS, S. Kardiale Störungen bei Alactoflavinose. [**Heart lesions in riboflavin deficiency.**] *Klin. Wochenschr.*, 1955, **33,** 397–405. [Med. Abt., Städt. Krankenhaus, Aschaffenburg.]

Since signs of riboflavin deficiency are frequently associated with signs of cardiac insufficiency the existence of a causal relationship between the 2 conditions was investigated. An intensive study was made of 14 patients with mild cardiac insufficiency in whom major signs were lacking: tests such as electrocardiography were used to assess any improvement from treatment. Improvement in the heart condition as well as the disappearance of any sign of riboflavin deficiency followed the administration of the vitamin. Certain patients were given glucosides either before or after the vitamin treatment, and it appeared that their mode of action was not the same as that of riboflavin. Riboflavin deficiency may in itself cause cardiac lesions, and cardiac insufficiency by its secondary effects on the intestinal function may produce vitamin deficiency, so establishing a vicious circle.—L. Wills.

1046

RUSSO, G. L'elettrocardiogramma nelle sindromi da carenza prevalentemente riboflavinica, consecutive ad enteropatie diarroiche. [**The electrocardiogram in deficiency syndromes, chiefly of riboflavin, after diarrhoeal disease.**] *Pediatria,* 1954, **62,** 676–709. [Clin. Pediat., Univ. Palermo.] English, French, German and Spanish summaries.

The study was made on 22 children from 3 to 24 months old. The clinical findings, which were suggestive of riboflavin deficiency, are tabulated. The condition of 6 babies resembled kwashiorkor. Characteristic changes in the electrocardiogram were present in almost all. Administration of riboflavin brought about some improvement, but aureomycin was more effective.—E. M. Hume.

1047

IINUMA, S. **Synthesis of riboflavin by intestinal bacteria.** *J. Vitaminol., Japan,* 1954, **1,** No. 2, 6–13. [Biochem. Lab., Kitasato Inst., Minato-ku, Tokyo.]

Studies of urinary and faecal excretion of riboflavin were made with a human subject who ate a normal diet in weeks alternating with a week on a vegetable diet and one on a meat diet. Excretion on a normal diet was fairly constant. With a vegetable diet the amount of riboflavin in the faeces increased fivefold but that in the urine increased only slightly. When meat predominated there was less riboflavin in the faeces and more in the urine.—A. M. Copping.

1048

BERGER, H., WEBER, J. R., ANTENER, I. and PFÄNDLER, U. Schwere Ariboflavinose, Spätrachitis und Amindiabetes bei chronischer erblicher Koproporphyrie. [**Severe deficiency of riboflavin, late rickets and loss of amino-acids in chronic, hereditary coproporphyria.**] *Internat. Ztschr. Vitaminforsch.*, 1955, **26**, 96–129. [Kinderklin., Univ. Berne.] French and English summaries.

A boy of 8 years was seen with stunted growth, signs of riboflavin deficiency and severe rickets; bilateral cataract and hyperkeratosis suggested vitamin A deficiency. Serum and saturation tests suggested multiple vitamin deficiency which was asymptomatic in spite of the deficiencies mentioned above. There was no evidence that the vitamin deficiencies were due to faulty absorption. The rickets healed normally when vitamin D was given. The response to riboflavin was subnormal and to prevent relapse continuous treatment was necessary. The excretion of coproporphyrin III in the stools and urine was 50 to 100 times the normal. There was also a great increase in the excretion of amino-acids in the urine, especially of glycine, and oxalic acid was always present. Both parents, who were cousins, and an aunt on one side of the family and an uncle on the other excreted coproporphyrin III in excess of normal and had a moderate increase in the amount of amino-acids in the urine. The pathogenesis and etiology are discussed at length. It is suggested that the marked and persistent riboflavin deficiency was the result of the increased synthesis of coproporphyrin since riboflavin is necessary for the formation of the porphyrins. The need for continuous treatment with riboflavin supported the view and the relationship was shown also by the finding that during treatment with riboflavin the urinary output of the vitamin increased while that of the porphyrins decreased and vice versa. The possibility that the severe rickets might be related to interference with growth by deposition of porphyrin in the calcifying zones of the bones is discussed; such a deposit of the isomers of uroporphyrin I has been reported in patients with chronic porphyria. With symptomatic treatment and continuous administration of riboflavin, growth and general condition were maintained at a satisfactory level.—L. Wills.

1049

BEAN, W. B., HODGES, R. E. and DAUM, K. (with BRADBURY, J. T., GUNNING, R., MANRESA, J., MURRAY, W., OLIVER, P., ROUTH, J. I., SCHEDL, H. P., TOWNSEND, M. and CHU TUNG, I.) **Pantothenic acid deficiency induced in human subjects.**

THORNTON, G. H. M., BEAN, W. B. and HODGES, R. E. **The effect of pantothenic acid deficiency on gastric secretion and motility.** *J. Clin. Invest.*, 1955, **34**, 1073–1084; 1085–1091. [Metabol. Unit, Dept. Med., State Univ. Iowa.]

The diet used to produce deficiency contained granulated sugar, maize starch, vitamin-free casein, water, maize oil, cystine, a salt mixture and added vitamins other than pantothenic acid, and was free from cholesterol and cholesterol esters. Three healthy subjects were maintained on the diet, which was given by stomach tube, for the following times: 12 days' control period during which a daily supplement of 30 mg. pantothenic acid was given; 25 days on the basic diet with the addition of 500 mg. ω-methylpantothenic acid, an antagonist to pantothenic acid; 6 days on the same regime with the addition of 4000 mg. pantothenic acid; 10 days on a well balanced diet with the addition of 1000 μg. vitamin B_{12} for 2 days, double the quantity of the other vitamins and, in addition, cortisone to combat the deterioration in the subjects' condition; and finally 14 days on the basic diet with the daily addition of 2000 mg. pantothenic acid.

During the period of deprivation there was no change in the skin or mucous membranes, but great mental depression developed; by the 13th to 16th day there was numbness and tingling of the hands and later paraesthesia became severe. One of the subjects showed weak dorsiflexion of the feet; all had hyperactive deep tendon reflexes and weakness of the extensor muscles and the interossei of the hands; they were unable to walk on tiptoe. All these motor changes cleared up slowly when the deficiency ended. The gastrointestinal changes are reported separately below. Signs of cardiovascular instability developed. All subjects while deficient had repeated upper respiratory infections which cleared up immediately when pantothenic acid was given. Biochemical investigation showed acetylation of excreted *p*-aminobenzoic acid to be nearly normal, but in a previous experiment with 1 subject a fall in acetylation to 50 per cent. from 70 to 80 per cent. occurred. The insulin tolerance test showed increased sensitivity, liver function appeared normal, α_1- and α_2-globulins rose in 2 men, the normal decrease in eosinophils caused by adrenocorticotropic hormone was impaired, cholesterol and its esters in the blood fell but the diet was devoid of cholesterol, urinary excretion of 17-ketosteroids decreased, vitamin C in the plasma and urine fell and excretion of vitamin B_1 and nicotinic acid rose. The eosinophil count rose. The addition of pantothenic acid to the diet did not correct all these abnormalities in the 6 days for which it was given before the clinical condition of the

subjects necessitated the change to a well balanced diet and administration of cortisone. There was considerable individual variation in the response to deprivation. Adrenal cortical function could not be tested, as consumption of large amounts of water caused diarrhoea.

An exhaustive examination was made of gastric function. Details of the methods used are included. In 2 of the subjects given Hunt's sucrose phenol red test meal, secretion of both parietal and non-parietal components of the gastric juice was greatly reduced during the period of pantothenic acid deficiency, and gradually recovered during the 3 following periods when pantothenic acid was being administered; the secretion of pepsin was unaffected. After histamine and insulin, secretion of both components and pepsin was low during the deficiency period, and there was a gradual recovery later. The changes in gastric secretion in the third subject were similar but less marked. Gastric motility showed no significant change. It is suggested that the decrease of gastric secretion may result directly from the effect of coenzyme A deficiency on the parietal cells or indirectly through altered adrenal cortical activity.—L. Wills.

1050

PELLEGRINI, U. and CHIARI, G. La determinazione microbiologica dell'acido pantotenico. Il tasso della vitamina nel latte di donna. [**Microbiological estimation of pantothenic acid. Concentration of the vitamin in human milk.**] *Internat. Ztschr. Vitaminforsch.*, 1955, **26,** 32–58. [Ist. Clin. Pediat., Univ. Parma.] German, French and English summaries.

After an extensive review, values for pantothenic acid in human milk and in cow's milk and colostrum are collected from the literature and tabulated.

Pantothenic acid was estimated with *Lactobacillus arabinosus* 17/5 by the method of Skeggs and Wright (Abst. 3207, Vol. 14) in the samples of milk, in some of them after enzymic digestion. From 37 women in the first to 47th week of lactation attending hospital in Parma, 101 samples of milk were obtained. The mean values for individuals in μg. per ml. ranged from 1·18 to 2·80 without enzymic digestion, and from 1·54 to 3·55 with it. The values were lowest in colostrum and rose gradually during the first week to a level which was then maintained, with fluctuations, throughout.—E. M. Hume.

1051

ZARTMAN, E. R., BARNES, A. C. and HICKS, D. J. **Observations on pyridoxine metabolism in pregnancy.** *Amer. J. Obstet. Gynecol.*, 1955, **70,** 645–649. [Dept. Obstet. Gynaecol., Ohio State Univ., Columbus.]

The degree of pyridoxine deficiency was judged by the amount of xanthurenic acid excreted in the urine in 10 hr. beginning 2 hr. after an oral dose of 10 g. tryptophan. In all, 48 subjects were studied. The average excretion in men and non-pregnant women was 17 mg. and in normal pregnant women at all stages of pregnancy and immediately after delivery it was 251 mg. After an oral dose of 50 mg. pyridoxine given 7 to 10 hr. before the test, similar pregnant women and 4 of those previously tested excreted on the average only 13 mg.; when 4800 mg. aspirin was given to pregnant women instead of pyridoxine, excretion of xanthurenic acid was variable but in no instance was it depressed to within the normal range. Nicotinic acid had no effect on the excretion of xanthurenic acid. No deficiency was detected in the newborn infant but the results were inconclusive.

L. Wills.

1052

SMALL, M. D., ZAMCHECK, N., VITALE, J. J., LONGARINI, A. and FISHER, B. **The effect of pyridoxine hydrochloride in acute alcoholic intoxication.** *J. Lab. Clin. Med.*, 1955, **46,** 12–20. [Long Island Hosp., Boston, Mass.]

In 5 normal males and 6 chronic alcoholics the intravenous injection of 0·5 to 2·0 g. pyridoxine had no consistent effect on the degree of alcoholic intoxication as judged by the general clinical condition and the results of certain psychological and physiological tests.—L. Wills.

1053

LIVINGSTON, S., HSU, J. M. and PETERSEN, D. C. **Ineffectiveness of pyridoxine (vitamin B_6) in the treatment of epilepsy.** *Pediatrics*, 1955, **16,** 250–251. [Dept. Paediat., Johns Hopkins Sch. Med., Baltimore, Md.]

Pyridoxine in doses increasing from 40 to 100 mg. daily was given to 31 children with cryptogenic or secondary epilepsy of varying severity. In all but 1 of 6 children tested the tryptophan load test was normal. None of the children treated showed any improvement though in 21 of them the fits were later controlled by orthodox treatment.—L. Wills.

1054

SHVEDSKII, V. P., TEPLYAKOVA, Z. G. and KOSTINA, A. K. Letzenie spru folievoi kislotoi v komplekse s drugimi metodami terapii. [**Treatment of sprue with folic acid in combination with other methods.**] *Klin. Med., Mosk.*, 1955, **33,** No. 2, 38–46. [Inst. Perelivan. Krovi, Tashkent.]

Under treatment with folic acid, 0·02 g. 3 times daily for 20 days, signs and symptoms of sprue disappeared and normal blood regeneration

occurred. In patients with sprue and anaemia resembling pernicious anaemia reduction of mitotic activity and maturation of red and white cells improved; hyperchromic changes disappeared and the blood picture became normal. Folic acid, therefore, should always be given in addition to routine treatment, which consists in a prescribed diet, blood transfusion and injections of liver.

E. S. Fountain.

1055

FOGHT-NIELSEN, K. E., FRIIS-HANSEN, B. and PLUM, P. **Folic acid antagonists and ACTH in the treatment of leucemia in children.** *Acta paediat.*, 1954, **43,** Suppl. 100, 285–295. [Dept. Paediat., Univ. Clin., Rigshosp., Copenhagen.]

In the series of cases of acute leucaemia in children reported, survival time increased after the introduction of treatment with folic acid antagonists and ACTH. There was no appreciable difference between the results of treatment with either alone and those with both. The best results were obtained in a small series treated initially and at each relapse with ACTH and given a maintenance dose of amethopterin during remissions.

L. Wills.

1056

RALLI, E. P., BARBOSA, F. X., DUMM, M. E., BECK, E. M. and LAKEN, B. **Prolonged administration of vitamin B_{12}, folic acid and calcium pantothenate in patients with diabetes mellitus.** *J. Clin. Endocrinol.*, 1955, **15,** 898. *Proc.* [Dept. Med., Coll. Med., New York Univ.-Bellevue Med. Centre.]

1057

HAUSMANN, K. Die Bedeutung der Darmbakterien für die Vitamin B_{12}- und Folsäure-Versorgung der Menschen und Tiere. [**Importance of the intestinal bacteria for supplying vitamin B_{12} and folic acid to man and animals.**] *Klin. Wochenschr.*, 1955, **33,** 354–359. [1. Med. Abt., Allg. Krankenhaus St. Georg, Hamburg.]

A review.

1058

TASKER, P. W. G. **Correlation of serum-vitamin B_{12} levels and urinary folic acid in nutritional megaloblastic anaemia.** *Lancet*, 1955, **269,** 61–63. [Inst. Med. Res., Kuala Lumpur, Malaya.]

In 29 patients with uncomplicated nutritional megaloblastic anaemia, vitamin B_{12} was estimated in the serum, and folic acid in the urine, after a single dose of 5 mg. folic acid had been given subcutaneously, and again after 15 days during which the patients received 15 mg. folic acid parenterally daily; the 5 mg. test dose was then given by mouth. The value for vitamin B_{12} in the serum was low in 10 of the patients. In a series of 15 patients with a similar degree of normoblastic anaemia the range of urinary folic acid was estimated to establish a norm. In the patients with megaloblastic anaemia the excretion of 8 was low after the subcutaneous dose of folic acid and of 11 after the oral dose. There was a close and significant correlation between the value for vitamin B_{12} in the serum and the amount of folic acid in the urine after the subcutaneous but not after the oral dose. When the serum vitamin B_{12} was low the excretion of folic acid was, in many cases, low also; in such patients there may have been deficiency of both vitamins.—L. Wills.

1059

BOGER, W. P., WRIGHT, L. D., STRICKLAND, S. C., GYLFE, J. S. and CIMINERA, J. L. **Vitamin B_{12}: correlation of serum concentrations and age.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 375–378. [Dept. Res. Therap., Norristown State Hosp., Pa.]

Vitamin B_{12} was estimated microbiologically in serum from 528 apparently healthy persons of all ages with *Lactobacillus leichmannii* as test organism. Agreement with results obtained with *Euglena gracilis* was good and recovery of added vitamin B_{12} was satisfactory. Though the variation in each age group was considerable the results for both men and women showed a significant trend towards lower serum values in old age. The mean serum vitamin B_{12} for all the subjects was 560 $\mu\mu$g. per ml., the 95 per cent. confidence limits being 70 and 1060 $\mu\mu$g. per ml., respectively. Exceptionally, very high values occurred for which no explanation could be found.—L. Wills.

1060

LEVY, W. and WIDROW, S. A. **A case of megaloblastic anemia associated with steatorrhea and the celiac syndrome.** *J. Pediat.*, 1955, **47,** 100–104. [Paediat. Serv., Morrisania City Hosp., New York.]

Severe megaloblastic anaemia associated with signs of coeliac disease in a child of 2 years responded haematologically to 15 mg. folic acid given parenterally but treatment with a modified coeliac diet was required to improve the bowel signs. There was no relapse over 7 years, so it was concluded that the coeliac syndrome was a manifestation of the anaemia. The case was the first one of megaloblastic anaemia in a child in about 23,000 admissions during 26 years.—L. Wills.

1061

SWAN, H. T., REISNER, E. H. (Jr.) and SILVERMAN, M. **The effect of various metabolites on the growth of marrow cells in vitro.** *Blood, J.*

Hematol., 1955, **10**, 735–752. [Div. Haematol., Dept. Med., Post-Grad. Med. Sch., Univ. New York.]

Cultures of megaloblastic marrow cells from patients with pernicious anaemia were grown on chick plasma clots, on glass slivers and in suspension in different media, including human serum and various additions. Cell growth was stimulated by vitamin B_{12} in cultures on plasma clots in pernicious anaemia serum. In cultures in pernicious anaemia serum on glass, addition of vitamin B_{12} converted megaloblastic into normoblastic haemopoiesis. In normal serum the glass cultures showed maturing normoblasts. In suspensions in pernicious anaemia serum folinic acid, but not vitamin B_{12}, caused an increase in nucleated cells. Combination of intrinsic factor with vitamin B_{12} did not enhance the effect of the vitamin. Colchicine inhibited the effect of folinic acid on suspensions of megaloblastic cells, and inhibited growth of normoblastic marrow suspensions in autologous serum. Amethopterin, too, inhibited growth of normoblastic marrow suspensions; the inhibition was reversed in presence of folinic acid. The observations seemed to suggest that the effect of folinic acid was to stimulate mitosis in suspension cultures. Normoblasts grown in pernicious anaemia serum diluted with saline produced megaloblastic cells; amethopterin had the same effect on suspensions in normal serum.—A. M. Copping.

1062

NEAL, M. P. **Pernicious anaemia: an evaluation of its diagnostic features.** *Southern Med. J.*, 1955, **48**, 238–243 (with discussion 244). [Dept. Pathol., Sch. Med., Univ. Missouri, Columbia.]

1063

BINGOLD, K. Die Behandlung der perniziösen Anämien. [**Treatment of pernicious anaemia.**] *Münch. med. Wochenschr.*, 1955, **97**, 877–878. [1. Med. Klin., Univ. Munich.]

A short list is given of the usual preparations.

1064

UNGLAUB, W. G. and GOLDSMITH, G. A. **Oral vitamin B_{12} in the treatment of macrocytic anemias.** *Southern Med. J.*, 1955, **48**, 261–268 (with discussion 268–269). [Div. Nutrit., Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

In 5 patients with pernicious anaemia in relapse and in 2 untreated patients with nutritional macrocytic anaemia, a satisfactory initial haematological response followed a single oral dose of 3000 μg. vitamin B_{12} in aqueous solution. The vitamin was given to the patient fasting, and no food was allowed for the following 4 hr. Another patient with pernicious anaemia in relapse was given only 500 μg.; there was a submaximum but sustained response. Maintenance treatment with 3000 μg. in aqueous solution once every 4 weeks or 1000 μg. in tablet form once a week gave a satisfactory haematological and clinical state in most of the 14 patients treated, but for some the dose had to be adjusted, as with parenteral treatment. Oral therapy was effective also in treating neurological signs when they were present. Two patients with nutritional macrocytic anaemia relapsed when treatment was withdrawn although their diet was apparently adequate. Low serum values for vitamin B_{12} were found in all the untreated patients, but they returned to normal after oral treatment.—L. Wills.

1065

YAVORKOVSKII, L. L. Blizhaishchikh rezultatakh lecheniya vitaminom B_{12} pri bolezni Addison-Birmera. [**Short-term results of treatment of Addison-Biermer's disease with vitamin B_{12}.**] *Klin. Med., Mosk.*, 1955, **33**, No. 2, 22–26. [Gematol. Otdel, Rizhsk. Respublik. Klin. Bolnit., Riga.]

The effect of vitamin B_{12} in patients with Addisonian pernicious anaemia was equal to that of an active liver preparation. A starting dose of 15 to 30 μg. induced normoblastic transformation of the bone marrow, usually in 48 hr. Reticulocytes reached their peak on the fourth to the sixth day and rapid improvement, chiefly of the red cells, followed; the rise of Hb was less until Fe was given. As a rule 150 to 195 μg. vitamin B_{12} taken over 2 to 3 weeks induced a remission which was incomplete in regard to erythropoiesis; further treatment with liver preparations improved the red cell count. Moderate symptoms of funicular myelosis with paraesthesia and defects of sensation disappeared or diminished after treatment. Although further trial is required to assess the optimum dosage of vitamin B_{12} and to find a rational method of combined long-term treatment and to prevent nervous system changes, there is good reason to believe that this drug merits a place in the treatment of pernicious anaemia.

E. S. Fountain.

1066

CHERNTSOVA, T. A. and EIDINOVA, M. B. [**The use of vitamin B_{12} in the treatment of anaemias and neuro-anaemic syndrome.**] *Klin. Med., Mosk.*, 1955, **33**, No. 2, 31.

1067

PANKRATOVA, N. F. [**Anaemia treated with vitamin B_{12}.**] *Klin. Med., Mosk.*, 1955, **33**, No. 2, 28.

1068

ROSENBLUM, C., WOODBURY, D. T., GILBERT, J. P., OKUDA, K. and CHOW, B. F. **Comparative absorption of vitamin B_{12} analogues by normal humans. 1. Chlorocobalamin vs. cyanocobalamin.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 63–66. [Res. Labs., Merck and Co., Rahway, N.J.]

Absorption of vitamin B_{12} was measured by the excretion test of Schilling (Abst. 3675, Vol. 24) in subjects receiving by mouth 2 μg. chlorocobalamin or cyanocobalamin labelled with ^{60}Co. Chlorocobalamin was less well absorbed than cyanocobalamin, but both compounds, when injected in massive doses, were equally effective in liberating absorbed labelled cobalamins into the urine. It is suggested that differences in the rate of absorption of the analogues might be caused by differences in their electrolyte properties.—A. M. Copping.

1069

BLACKBURN, E. K., COHEN, H. and WILSON, G. M. **Oral treatment of pernicious anaemia with a combined vitamin B_{12} and intrinsic factor preparation.** *Brit. Med. J.*, 1955, ii, 461–463. [Dept. Haematol., Sheffield Royal Infirmary.]

The preparation used contained 6 μg. crystalline vitamin B_{12} and 30 mg. intrinsic factor per tablet. For the treatment of patients in relapse 5 tablets daily were given; the maintenance dose was 1 tablet daily. Four out of 5 previously untreated patients responded well to the treatment; one failed to respond, although she responded well to the same dose of vitamin B_{12} given parenterally. After 12 months of maintenance treatment with the oral preparation, 11 out of 12 patients previously maintained at a satisfactory level with vitamin B_{12} given parenterally showed a significant fall in the Hb and red blood cell values. Another patient while taking the tablets developed signs of subacute combined degeneration which disappeared when vitamin B_{12} was given parenterally. On clinical grounds and on account of the relatively high cost of oral compared with parenteral treatment, the latter remained the treatment of choice.

L. Wills.

1070

GLASS, G. B. J., BOYD, L. J., LUHBY, A. L. and STEPHANSON, L. (with JONES, E. L., ROSEN, S. and LAUGHTON, R. W.) **Assay of intrinsic factor preparations: comparison of the hepatic uptake of radio-active Co^{60}-B_{12} with the hematopoietic response in pernicious anemia.** *J. Lab. Clin. Med.*, 1955, **46**, 60–73. [Gastroenterol. Res. Lab., Dept. Med., New York Med. Coll., Flower and Fifth Avenue Hosps.]

The potency of 14 different preparations of intrinsic factor from pig's stomach was tested independently by measuring the uptake by the liver of vitamin B_{12} containing ^{60}Co (see Abst. 1215, Vol. 25) in 8 patients with pernicious anaemia in remission and, with the help of other investigators, by the classical haemopoietic response method in 20 patients in relapse. On 3 of the latter, 5 preparations were tested by both methods. With 11 preparations where the isotope method showed definite positive or negative activity the haemopoietic response method gave similar results, but with 3 preparations where the isotope method gave only slightly positive results the correlation with the haemopoietic response was unsatisfactory. Possible explanations for the discrepancies are suggested. The usefulness of the isotope method was thus clearly shown and its advantages are discussed. It is particularly stressed that it could be used on patients in remission.

L. Wills.

1071

SCHILLING, R. F., CLATANOFF, D. V. and KORST, D. R. **Intrinsic factor studies. 3. Further observations utilizing the urinary radioactivity test in subjects with achlorhydria, pernicious anemia, or a total gastrectomy.** *J. Lab. Clin. Med.*, 1955, **45**, 926–934. [Dept. Med., Med. Sch., Univ. Wisconsin, Madison.]

For previous parts see Absts. 1115, 3675, Vol. 24.

Tests for the presence of intrinsic factor were based on the appearance of radio-activity in the urine after radio-active vitamin B_{12} had been given by mouth (see Abst. 3675, Vol. 24). In the work now reported gastric juice was used as source of intrinsic factor. In 18 subjects with no evidence of pernicious anaemia the mean radio-activity of the 24-hour urine was 14·2 per cent. of the test dose with range from 7 to 22. In 31 patients with achlorhydria but no suggestion of pernicious anaemia the corresponding value was 11·6 with range from 2·2 to 29·5; 9 of these subjects excreted less radio-activity than the smallest amounts excreted by the subjects with no evidence of pernicious anaemia. Duplicate estimations in 11 subjects showed satisfactory agreement, so that any difference in excretion after administration of intrinsic factor or other single substance was attributed to the effect of that substance. In 35 patients with pernicious anaemia the mean activity of the 24-hr. urine was only 0·6 per cent. of the radioactivity of the test dose, with range 0 to 2·3. When intrinsic factor was added to vitamin B_{12} the mean value was 10·0 per cent. with range 3·1 to 30·0. The low values for some of the patients when given intrinsic factor were tentatively explained as due to an insufficient dose of intrinsic factor or to low intestinal permeability. The findings in 13 patients who had been subjected to total gastrectomy were like those in patients with pernicious anaemia; 2 of them had had an end-to-end oesophago-duodenostomy so that there was no

blind loop to account for the pernicious-anaemia-like blood picture, which suggested that in human subjects the stomach is the only site for production of intrinsic factor.—L. Wills.

1072

CALLENDER, S. T. and EVANS, J. R. **Observations on the relationship of intrinsic factor to the absorption of labelled vitamin B_{12} from the intestine.** *Clin. Sci.*, 1955, **14,** 387–393. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

The absorption of ^{60}Co-vitamin B_{12} was measured by the amount of radio-activity in the faeces after a standard oral dose of less than 0·02 μC. of activity. In 4 control patients with free HCl in their gastric juice the amount of radio-active vitamin B_{12} absorbed increased with increasing doses of vitamin B_{12} up to about 1·0 μg.; above that dose further increase did not increase absorption. In 4 patients with pernicious anaemia in remission and 1 untreated, the absorption of vitamin B_{12} increased in proportion to the size of the dose of intrinsic factor up to 100 mg. but doses from 200 to 1000 mg. did not increase the absorption. When 4000 mg. of intrinsic factor was given with the standard dose of radio-active vitamin B_{12} to patients with pernicious anaemia or control subjects, absorption of the radio-active vitamin was less, probably because of the considerable amount of vitamin B_{12} present in most intrinsic factor preparations. In the pernicious anaemia patients when the amount of vitamin B_{12} and of intrinsic factor was increased concurrently, the absorption of the vitamin increased only to about the same extent as in the control subjects. In patients with steatorrhoea and defective absorption, much larger doses of intrinsic factor than those effective in pernicious anaemia were necessary to increase absorption. In a patient who had suffered removal of the proximal half of the jejunum amounts of intrinsic factor up to 1000 mg. did not increase the absorption of the test dose of radio-active vitamin B_{12}.—L. Wills.

1073

ELLENBOGEN, L., WILLIAMS, W. L., RABINER, S. F. and LICHTMAN, H. C. **An improved urinary excretion test as an assay for intrinsic factor.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 357–362. [Nutrit. Physiol. Sect., Amer. Cyanamid Co., Pearl River, N.Y.]

The 24-hr. urinary excretion of radio-activity was measured after a single oral dose, given fasting, of 2 μg. ^{60}Co-vitamin B_{12}. No food was given for 2 hr. Immediately after the dose a flushing dose of from 1 to 4 mg. unlabelled vitamin B_{12} was given parenterally and repeated daily while urinary collections were being made.

The mean amount of ^{60}Co-vitamin B_{12} excreted in the urine during the first 24 hr. in 22 healthy subjects was 11·7 per cent. of the dose, and significant amounts were excreted during the second and third days. In 35 patients with pernicious anaemia in remission only 0·17 per cent. was excreted on the first day and there was no significant excretion on the second or third day, but when 50 mg. of an intrinsic factor preparation known to be active curatively in a daily dose of 25 mg. was given with the radio-active vitamin B_{12} the mean excretion during the first 24 hr. rose to 6·1 per cent. and significant amounts were excreted on the second and third days. To test the activity of an intrinsic factor preparation the excretion of active vitamin B_{12} was first estimated with a preparation of known potency and then with the preparation under test; the tests must be made on pernicious anaemia patients, who need not be in relapse. When large doses of inactive vitamin B_{12} were used for flushing, the excretion of radio-activity was greatly reduced in normal subjects but not in patients with pernicious anaemia. In 2 patients when 500 mg. of intrinsic factor preparation containing only negligible amounts of vitamin B_{12} were used instead of 50 mg., more radio-activity was excreted than after the small dose; in one of these patients the maximum excretion after either dose of intrinsic factor was delayed. The flushing method enables several tests to be made consecutively on the same patient.—L. Wills.

1074

SPRINGER, G. F. and GYÖRGY, P. Über Beziehungen zwischen Castles Intrinsicfaktor und Blutgruppenmucoiden. [**Relation between Castle's intrinsic factor and blood group mucoids.**] *Klin. Wochenschr.*, 1955, **33,** 627–628. [Dept. Paediat., Hosp. Univ. Pennsylvania, Philadelphia.]

1075

HALSTED, J. A., SWENDSEID, M. E., GASSTER, M. and LEWIS, P. M. **Effect of antibiotics on intestinal absorption of vitamin B_{12} in disorders of the gastrointestinal tract.** *Amer. J. Med.*, 1955, **19,** 297 – 298. *Proc.* [Los Angeles, Calif.]

1076

JOSKE, R. A., FINCKH, E. S. and WOOD, I. J. **Gastric biopsy: a study of 1,000 consecutive successful gastric biopsies.** *Quart. J. Med.*, 1955, **24,** 269–294. [Clin. Res. Unit, Walter and Eliza Hall Inst. Med. Res., Melbourne.]

Biopsy samples were obtained from 623 subjects, mostly patients for investigation for possible gastro-intestinal disease, with some healthy subjects. Histological examination showed a

continuous graduation from a normal mucosa through all grades of gastritis to complete atrophy. Good correlation was found between the clinical diagnosis and the histological picture. Atrophy was generally symptomless and any degree of gastritis might be present without symptoms. Apart from patients with carcinoma the frequency of gastritis increased with age but a normal mucosa was found in 13·4 per cent. of patients over 70 years of age. Of 100 patients examined with pernicious anaemia, none was without some degree of atrophic gastritis, classified as severe in 35 and as gastric atrophy in 40. No relation could be established between the presence of gastritis and nutritional status.—L. Wills.

1077

HELLE, J. and OHELA, K. **Treatment of herpes zoster neuralgia with massive doses of vitamin B_{12}.** *Ann. Med. exp. Biol. Fenn.*, 1955, **33,** 116–121. [Dermatol. Clin., Univ. Helsinki.]

Three similar groups, 2 of 19 and 1 of 9, patients with severe pain from herpes zoster were treated by local therapy alone or with 10 intramuscular doses of 1000 μg. vitamin B_{12} or 10 intramuscular doses of 150 mg. vitamin B_1. There was no significant difference between the 3 groups in the time the pain persisted.—L. Wills.

1078

HAMPP, H. Vitamin-B_{12}-Behandlung in der Neurologie vornehmlich bei Schmerzzuständen. [**Treatment with vitamin B_{12} in neurology, especially in painful conditions.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1139–1140. [Nervenklin., Univ. Munich.]

In 33 patients suffering from diseases of the nerves associated with pain, such as trigeminal neuralgia, herpes and tabes, treatment with vitamin B_{12} relieved or removed the pain. The duration of treatment ranged from 1 to 7 weeks and the total dose ranged from 2500 to 20,000 μg., with a mean dose of 9380 μg., according to the severity and duration of the disorder.—L. Wills.

1079

MONTOYE, H. J., SPATA, P. J., PINCKNEY, V. and BARRON, L. **Effects of vitamin B_{12} supplementation on physical fitness and growth of young boys.** *J. Appl. Physiol.*, 1955, **7,** 589–592. [Phys. Fitness Res. Lab., Michigan State Coll., Lansing.]

Two groups of 16 boys aged from 12 to 17 years living in an institution were given daily for 7 weeks a capsule containing 50 μg. vitamin B_{12} or a dummy capsule. A comparable group of 19 boys had no supplement. The boys in the first 2 groups were paired on their ability to run for half a mile. Age, height and weight and results of the Harvard step test were recorded before and after the 7-week period. Wetzel grid records were kept. Competitive running of the half mile three times a week resulted in a weight loss in comparison with a group of boys who did not run. Vitamin B_{12} had no effect on the capacity to run, but in some thin subjects the weight loss was greater in those who received dummy capsules.—A. M. Copping.

1080

SOMESWARA RAO, K., RAMANATHAN, M. K., TASKAR, A. D. and PHANSALKAR, S. V. **The failure of vitamin B_{12} to promote growth in undernourished Indian children.** *Indian J. Med. Res.*, 1955, **43,** 277–283. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

Two trials of the effect of vitamin B_{12} on growth were made with 26 destitute Indian girls, once when the diet taken was grossly insufficient in energy value and protein as well as in Ca, vitamin A and the vitamin B complex, and once after 12 months of an improved diet, the energy value of which was still slightly below the girls' needs. Administration of 25 μg. vitamin B_{12} daily by mouth for from 14 to 15 weeks to half the children in each trial produced no demonstrable effect on growth, and nitrogen retention was not increased. In experiments by other workers food was given to appetite, but in the present trials the energy intake was both fixed and low.—L. Wills.

Vitamin C

1081

DODIN, A. Parasitoses intestinales et avitaminoses C. [**Intestinal parasite infestation and vitamin C deficiency.**] *Méd. trop.*, 1955, **15,** 322–328. [Groupe Mobile d'Hygiène, Corps de Santé Colonial.]

Observations on the native schoolchildren of the east coast of Madagascar showed a high incidence of gingival haemorrhage and of cramp on exertion. Vitamin C excretion tests and examination of the stools for parasites in 51 of the children showed that of 38 children infested with intestinal parasites all failed to excrete a normal amount of the vitamin after a test dose and that 3 in whom parasites were not found also failed to do so. Ten children who excreted a normal amount of the vitamin were all free from intestinal parasites. Ascaris and other parasites were found to destroy vitamin C *in vitro* and the larger the worm, the greater the degree of destruction.—L. Wills.

1082

FINZI, M. Vitamine e senescenza (la vitamina C). [**Vitamins and senescence: vitamin C.**] *Acta gerontol.*, 1955, **5,** 34–39. [Bologna.]

A review.

1083

HOITINK, A. W. J. H. Vitamin C en arbeid. Onderzoekingen over den invloed van arbeid en van vitamine C-toediening op het menschelijk organisme. [**Vitamin C and work. Studies on the influence of work and of vitamin C intake on the human organism.**] *Verhandeling Nederlands Inst. Praevent. Geneesk.*, 1946, No. 4, pp. 176. English summary.

The work was exercise on a bicycle ergometer (to be described) against a known resistance, at constant speed, to exhaustion, the measure of performance being resistance in watts × time in minutes. Each experimental subject was tested 3 times: (1) before being given vitamin C, (2) after taking, usually, 300 mg. vitamin C (Redoxon Roche) daily for a week, sometimes after 2 weeks and a somewhat higher total of vitamin C and (3) again, usually after 1 or 2 weeks. Blood was taken before and after the exercise for biochemical and haematological studies, and urine after an interval. The results are presented in summary tables and the statistical analysis in similar detail.

The effects of vitamin C and of work are described separately. The effect of vitamin C was to increase the amount of work done. It increased also the vitamin C concentration of blood and urine; it reduced blood sugar, blood red cell count, blood Hb, pulse rate, respiration rate and systolic blood pressure. There was no effect on blood glycogen, inorganic P of blood and urine, blood Ca, blood lactic acid, creatine in urine, number and distribution of leucocytes in blood, diastolic blood pressure or pulse pressure. The effect of work, independent of vitamin C administration, was to increase vitamin C in blood and urine, blood sugar and lactic acid, inorganic P in blood and urine, creatine in urine, blood leucocytes with a change in distribution, pulse rate, respiration rate, and pulse pressure (followed by a fall); to reduce haematocrit and blood pressure, systolic and diastolic; other measurements showed no change.

It is argued that saturation with vitamin C improves performance, as training does. In general, performance increased with haematocrit readings.—I. Leitch.

1084

WINSEMIUS, W., JANSSEN-VAN DER SCHOOT, E.R.B., DONATH, W. F. and DE WAART, A. Vitamine C en geestelijke arbeid. [**Vitamin C and mental work.**] *Verhandeling. Nederlands Inst. Praevent. Geneesk.*, 1954, No. 25, pp. 45. English summary.

To complete the investigation begun by Hoitink (see previous Abst.) on the effect of vitamin C on physical work, a study was made in similar circumstances of the effect of 300 mg. vitamin C daily for 4 weeks, on performance in 2 trials, a modified Bourdon Wiersma test, and a proof reading test. Before each trial vitamin C was estimated in blood, and in morning urine for which it was expressed as mg. per g. creatinine.

There were 3 groups of 11, 12 and 12 healthy male medical students, without tablets, with dummy tablets and with vitamin C tablets. Tests were made 4 times, the initial, and at intervals of 2 weeks, the last 2 weeks being without tablets. On the average all the groups were unsaturated with vitamin C at the beginning; the group given vitamin C tablets was saturated at the second and third but not at the fourth test.

There was great improvement with practice in the Bourdon Wiersma test; none in the proof reading. Vitamin C had no effect on performance of either test. The statistical analysis of the results is reported in detail.—I. Leitch.

1085

ČOP, D. **ACTH (small doses) and C-vitamin in the treatment of chronic rheumatic inflammations.** *Bull. sci. Yougoslav.*, 1955, **2**, 60. [Central Municip. Inst. Rheumatism, Zagreb.]

Daily doses of from 6 to 10 mg. adrenocorticotropic hormone, to a total of from 300 to 600 mg., with from 4 to 6 g. ascorbic acid daily, to a total of from 100 to 600 g., were given to 50 rheumatic patients. Twelve of 14 with ankylosing spondylitis and 26 of 35 with rheumatoid arthritis improved.—A. Hepburn.

1086

CHEKIN, V. YA. Obmen vitamina C pri travma. [**Metabolism of vitamin C in injuries.**] *Sovet. Med.*, 1955, No. 4, 70–71. [Bolnit. Vorkutsk, Komi ASSR.]

In an attempt to clarify the problem of vitamin C metabolism in subjects with delayed wound healing, 25 patients admitted to the surgical ward 30 min. to 3 hr. after injury were the subject of a special study of the vitamin C content of plasma and urine. In most of them the level of ascorbic acid in plasma fell in the first 24 hr. and large quantities were excreted in the urine. After 6 days the level of vitamin C in the plasma rose, but so did urinary excretion; of 2 patients with normal levels of vitamin C in plasma excretion in the urine was 3 times normal in one and one and a half times in the other. All patients were given 3500 mg. ascorbic acid intravenously; after 7 days the plasma level rose only slightly in 6 and did not reach normal values. Excretion in the urine remained high. In 8 patients the plasma level was below that immediately after their injury, and excretion in the urine was higher. In the remaining patients the plasma level had returned nearly to normal but urinary excretion was above

normal. The results obtained suggest that the retention of vitamin C administered intravenously is poor. Losses in the urine were especially great after severe injuries of the central nervous system, which suggests that the central nervous system plays an active part in vitamin C metabolism.

E. S. Fountain.

Other Vitamins

1087

PASSARO, G. and MAZZARELLA, A. Il fattore VII nel neonato dopo trattamento con vitamina K_1 sintetica. [**Factor VII in newborn infants after treatment with synthetic vitamin K_1.**] *Arch. ital. Pediat. Puericolt.*, 1955, **17,** 216–226. [Ist. Clin. Pediat., Univ. Rome.] French, English and German summaries.

In continuation of previous work (Abst. 4166, Vol. 25) which demonstrated the presence of very low values in the newborn, Factor VII was estimated immediately after birth and on the 5th day of life in 50 normal infants, an oral dose of 10 mg. synthetic vitamin K_1 as Konakion Roche being given daily in the interval. The mean value for Factor VII, as percentage of the normal adult value, was at birth 25·7 with range 11 to 42, and after 4 days' treatment 54·9 with range 40 to 69.

E. M. Hume.

1088

LANCIANO, O. and MAGNANELLI, P. Azione dell'inositolo e della rutina sulle modificazioni del quadro capillariscopico prodotte dalla ialuronidasi. [**Effect of inositol and rutin on the changes produced by hyaluronidase on the capillariscope picture.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30,** 972–974. [Clin. Pediat., Univ. Rome.]

Hyaluronidase injected subcutaneously had the effect of increasing the number and width of the capillaries and of causing petechial haemorrhages.

Hyaluronidase was injected subcutaneously into 8 children simultaneously with 5 mg. inositol, into 7 children with 1 mg. rutin, and into other children separately or with water. The capillaries at the site of injection showed the changes characteristic of hyaluronidase and, up to 24 hr., rutin or inositol had very little power to counteract them.

E. M. Hume.

1089

SAELHOF, C. C. **The capillary syndrome in haemorrhagic cystitis. Therapeutic evaluation of bioflavonoids.** *Amer. J. Digest. Dis.*, 1955, **22,** 204–206. [Chicago, Ill.]

In 19 patients with infective haemorrhagic cystitis, treatment with 100 mg. citrus flavonoids and 100 mg. ascorbic acid daily for 4 or 5 days gave sterile urine and complete clinical relief; in 7 similar patients treatment with a sulpha preparation produced the same result in from 5 to 7 days but side effects were common. [Contents list of the journal gives Sokoloff, B. as joint author.]

L. Wills.

1090

DIBENEDETTO DELL'AQUILA, M. and MINERVA, V. "Vitamina T" ed assorbimento intestinale del ferro. Ulteriore contributo sull'azione esercitata dall'acido folico e dalla vitamina B_{12}. [**"Vitamin T" and absorption of iron from the intestine. A further study of the action of folic acid and vitamin B_{12}.**] *Acta vitaminol.*, 1955, **9,** 121–127. [Ist. Clin. Med. Gen., Univ. Bari.] French, English German and Spanish summaries.

Nine subjects, normal from the haematological standpoint, were given 1 g. reduced iron by mouth. Two days later the dose was repeated with 5 ml. of a vitamin T preparation given by mouth at the same time and 5 ml. 2 hr. later. After another 2 days the test was repeated with 6 of the subjects, given 20 mg. folic acid in place of vitamin T. Blood was taken every 2 hr. up to 6 hr. after the dose of Fe, and serum Fe was estimated. In all the subjects but one the values increased more with vitamin T than without it. The increase with folic acid was more than without it in 4 of the 6 subjects but was usually less than with vitamin T.

When Fe was given intravenously as ferrous gluconate to 2 subjects, and the rest of the procedure was the same, the rise in serum Fe was less with vitamin T or folic acid than without them.

The preparation of vitamin T is stated to contain vitamin B_{12}, folic acid, folinic acid, *Lactobacillus helveticus* factor and deoxyriboside.—E. M. Hume.

DENTAL DISEASES

1091

DAVIES, T. G. H. and PEDERSEN, P. O. **The degree of attrition of the deciduous teeth and first permanent molars of primitive and urbanised Greenland natives.** *Brit. Dent. J.*, 1955, **99,** 35–43. [Royal Dent. Coll., Copenhagen.]

The degree of dental attrition was recorded in Greenland in 4 communities graded according to the extent of their urbanisation. The amount of wear was classified in 4 grades and mean values are presented for all deciduous teeth examined in children in age groups 2 to 3, 4 to 5, 6 to 7 and 8 to 9 years. They ranged from 0·78, 1·50, 1·77 and 1·91 in the most primitive to 0·00, 0·00, 0·25 and 0·26 in the completely urbanised community. In these 2 extreme areas, upper first permanent molars also were examined at older ages and although attrition increased with age in both groups its inverse relation to degree of urbanisation again appeared.

Possible causes are discussed, but no completely satisfactory explanation of the variation could be offered.—D. Harvey.

1092

HURTARTE E., A. and SCRIMSHAW, N. S. **Dental findings in a nutritional study of school children in five Guatemalan highland villages.** *J. Dent. Res.*, 1955, **34**, 390–396. [Inst. Nutrit. Central America and Panama (INCAP), Guatemala.]

Dental examination of 442 schoolchildren aged from 6 to 14 years in 5 villages at altitudes between 4700 and 6800 feet within an hour's drive of Guatemala City showed that their teeth were relatively good despite complete absence of dental care and retardation of height and weight (Abst. 2361, Title 4980, Vol. 24) and of bone development by U.S. standards. The diets are stated to be very low in animal protein and fat and in vitamin A and riboflavin, but are thought to be adequate in energy, vitamin B_1 and nicotinic acid. Ca intake is from 520 to 810 mg. daily, much from tortillas, which supply nearly 65 per cent. of the protein and 70 per cent. of the energy.

Caries was mostly in the deciduous teeth; in the permanent teeth there was a slow increase with age, but the average incidence as found by dental explorer was still under 2 per child at age 13. Differences between boys and girls did not reach significance. By U.S. standards permanent teeth were at least a year late in appearing. The incidence of gingivitis ranged from 3·7 per cent. at age 7 to 9·8 [7·8 in Table 1, p. 393] at age 13; it was ascribed to poor dental hygiene, not to nutritional deficiency. No significant difference was found in total protein, riboflavin, ascorbic acid, carotene, vitamin A, vitamin E and alkaline phosphatase contents of the serum of children with or without caries or gingivitis. The F content of the water was 0·4, 0·5 and 0·7 p.p.m. in 3 of the villages. No mottling due to fluorosis was seen. Sunshine is plentiful. The low incidence of caries is possibly due to the small amounts of refined carbohydrate consumed. The teeth of the adults were not investigated but were obviously bad.—W. M. Deans.

1093

PEACOCK, B. **Observations on the oral conditions of native races in British North Borneo.** *Brit. Dent. J.*, 1955, **99**, 87–89; 129–132; 207–208.

The first and second instalments of this article by one who recently spent 3 years as the only qualified dentist in the little-known colony of British North Borneo include matter of nutritional interest; the third deals with dental treatment only.

The country is about the size of Ireland but the population is thought to be only about 360,000. Indigenous peoples are the Dusuns, in the plains wet-rice farmers, in the hills growers of dry rice, but not settled, and the Muruts, primitive hunters with the blow-pipe and growers of dry rice on the shifting system. Malay fishermen live on the coasts and lower reaches of the rivers, and Chinese tradesmen and craftsmen in and about the towns. The staple food of all races is rice, flavoured with broth or small pieces of vegetable, fish or meat. Sago and tapioca also are popular. Protein intake is low by Western standards. Milk could be produced but little is used; "most natives do not regard it as a food and some regard it as an abomination", yet condensed milk, preferably sweetened, finds a ready sale even in remote parts. Little meat is used, usually that of the water buffalo, though in some areas cattle are numerous. The Malays live mainly on rice and fresh fish. Inland, fish is mostly sun-dried and may be months old. The Muruts eat jungle game, fish, crocodile and even rats and mice. The Chinese are by far the best cooks, but their food, though tasty, is all cut up into small pieces and requires little mastication. They use the water in which rice has been boiled as a drink or as medicine. All races eat coconut and use the oil and milk. Fruit is eaten to quench thirst rather than as a food, and taboos are frequent, *e.g.*, some tribes abhor pine-apple. Vegetables, the usual tropical kinds, are not very abundant. Sweet foods are popular with all; most of the sugar is imported. Certain Dusuns, especially pregnant women, eat earth from special patches of ground, thought to contain fuller's earth. All but the Malays, who are Moslems, brew liquor from rice, and sometimes thereby run short of food.

The Dusuns and Muruts mutilate the teeth and chew betel. They are fairly free of caries, but gingivitis is common. The condition of the deciduous teeth is variable; the best seen were on an inland plateau with basalt subsoil, which may indicate the presence of fluorine. On the whole the Malays have the best teeth, with little caries in the temporary dentition. The teeth of the Chinese children are very bad; this is ascribed to poor nourishment of the mothers, coupled with lots of sweet sticky food.—W. M. Deans.

1094

SCHMIDT, H. J. Warum Fluor ins Trinkwasser? [**Why fluorine should be put into drinking water.**] *Münch. med. Wochenschr.*, 1955, **97**, 665–666. [Obere Weinsteige 5, Stuttgart-Degerloch.]

The favourable results on the incidence of dental caries obtained, especially in America, by adding fluorine to drinking water are briefly summarised, and reasons are given for extending the practice.

E. M. Hume.

POISONS: PATHOGENIC ORGANISMS: FOOD LAWS

1095

LINDBERG, Z. YA. O soderzhaniya ftora v khozyastvenno-pit'evoi vode ochaga fluoroza. [**On the content of fluorine in household drinking water—the focus of fluorosis.**] *Gigiena Sanit.*, 1955, No. 3, 44.

A short note on fluorosis occurring in the neighbourhood of a superphosphate factory. It was thought to be caused by residues from the factory, as the amount of F in the drinking water in the area was very small.—H. Scherbatoff.

See also Abst. 896.

IMMUNITY

See Abst. 1081.

THERAPEUTIC AND PREVENTIVE DIETETICS

GENERAL

1096

La alimentication en los hospitales dependientes del Ministerio de Asistencia Social y Salud Publica. 2. Las variantes de la alimentacion de accion dietoterapica. [**Diet in hospitals supported by the Ministry of Social Aid and Public Health. 2. The adaptation of therapeutic diets.**] *Inst. Nac. Nutricion, Argentina*, 1954, Publ. Cient. C.N.P. 34, pp. 138.

For part 1 see Abst. 2274, Vol. 24.

This second booklet deals with adaptations of diets for specific purposes; the bland diet, the low-residue diet and diets low in fat, carbohydrate, protein, purines or Na. The composition and energy value of each diet is given, then a list of foodstuffs with the net and crude requirements per patient daily, suggestions for preparation and daily menus. Local food preferences are taken into account.

Part 3 will deal with the diet in tuberculosis.

D. Duncan.

1097

BADR EL DIN, M. K. **Management of food intolerance in infantile wasting.** *J. Egypt. Med. Assoc.*, 1955, **38,** 93–101. [Fac. Med., Univ. Alexandria.]

Wasting from undernutrition, caused by poverty and ignorance, accounted for 16·5 per cent. of the total admissions to Alexandria University Hospital for sick children in 1952. Methods of treating the condition are discussed, and a trial is described in which 41 infants that had lost at least 30 per cent. of weight were divided into 4 groups. All were given the same dietary management, which aimed at supplying a complete diet, and one received in addition repeated blood transfusions, another had the same with 4 doses daily of from 15 to 25 mg. aureomycin, another had the aureomycin only, and another had no additional treatment. With no supplement progress was slow and 2 patients made none. Blood transfusions were of little help, but aureomycin either with or without blood transfusions promoted rapid gain of weight.—E. M. Hume.

1098

TALLERMAN, K. H. **The diet of the child in illness and convalescence.** *Practitioner*, 1955, **175,** 31–36. [Child Dept., London Hosp.]

A general account is given of the treatment by diet of children in acute and chronic illness and in convalescence. Particular aspects of treatment in kidney disorders, infective hepatitis, fibrocystic disease of the pancreas, diabetes, obesity, cyclical vomiting, threadworm infestation and coeliac disease are discussed. Recipes are given for bread, biscuits and cakes free from gluten and suitable for children with coeliac disease.

F. C. Aitken.

1099

SNYDER, C. H. **Practical scheme for fluid and electrolyte therapy in children.** *J. Amer. Med. Assoc.*, 1955, **158,** 1004–1006. [Ochsner Clin., New Orleans, La.]

In the scheme described 5 different solutions are used: 5 per cent. glucose, 10 per cent. invert sugar, 3*M* NaCl, 3*M* KCl and 1*M* sodium lactate. Once each day a suitable mixture of these solutions is prepared to provide for the patients' needs for 24 hr. The amounts of fluid and electrolytes for daily maintenance, correction of dehydration and replacement of current abnormal losses are expressed in terms of surface area, bodyweight and volume of fluid loss, respectively.—F. C. Aitken.

1100

MANTZ, J. J. C. Iets over dieetvoorschriften. [**On prescribing diets.**] *Voeding*, 1955, **16,** 606–619. [Voorlichtingsbur., Voedingsraad, The Hague.] English summary.

This general article pleads for greater accuracy in the prescription of diets. The National Research Council's recommended allowances for healthy persons should be kept in mind and varied according to the patient's nutritional state and circumstances. His dietary habits and financial position should be considered and emphasis laid on permitted rather than on forbidden foods. Full use of milk, if necessary salt-free, should be made.

M. Eddison.

1101

ROBINSON, C. H. **The sodium-restricted diet.** *Amer. J. Clin. Nutrit.*, 1955, **3,** 339–343. [Dept. Food Nutrit., Coll. Home Econ., Drexel Inst. Technol., Philadelphia, Pa.]

Details are given of foods permitted and forbidden in diets in which Na, not just table salt, is to be restricted; a suggested meal pattern and a sample menu are provided. It is emphasised that diets restricted in Na are often inadequate in Ca, riboflavin, protein, Fe and vitamins of the B group, and suggestions are made to avoid this and to provide variety. The nutritive values of the foods used in the basic diet and the way in which the Na content of the basic diet can be modified without difficulty are shown.—G. F. Garton.

1102

OLMSTEAD, E. G., CASSIDY, J. E. and MURPHY, F. D. **The use of beer in the low salt diet with special reference to renal disease.** *Amer. J. Med. Sci.*, 1955, **230,** 49–53. [Sch. Med., Marquette Univ., Milwaukee, Wis.] Interlingua summary.

Hospital diets containing 250 and 500 mg. Na were replaced in the treatment of 9 patients by diets with the same Na content but containing 1150 and 1530 ml. beer, respectively. As judged by clinical condition and renal function, treatment with the beer diets for 5 or 10 days, and in one case for 1 year, had no adverse effect. The beer diets were more palatable than the usual low-Na diets.—F. C. Aitken.

1103

RENOLD, A. E. and THORN, G. W. **Clinical usefulness of fructose.** *Amer. J. Med.*, 1955, **19,** 163–168.

An editorial review with 40 references.

1104

BARTELHEIMER, H. Klinische Erfahrungen mit Kationenaustauschern. [**Clinical experiences with cation-exchange resins.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1021–1023. [1 Med. Klin., Städt. Krankenhaus, Berlin-Moabit.]

A review.

1105

LE QUESNE, L. P. **Nutrition in surgery.** *Practitioner*, 1955, **175,** 45–50. [Dept. Surg. Studies, Middlesex Hosp., London.]

1106

SEILLÉ, G. and KIRSCH, F. Role du foie et des acides aminés dans la maladie post-opératoire. Essai thérapeutique. [**Role of the liver and of amino-acids in post-operative disorders. A therapeutic trial.**] *Presse méd.*, 1955, **63,** 913–914. [Serv. Chirurg., Hôp. Beaujon, Clichy.]

Injections of a concentrated liver extract with a small amount of a hydrolysate of plasma proteins were given before and after operation to 26 surgical patients. Blood proteins and urea were estimated before and after operation. There was an average increase of 2·9 g. protein and an average decrease of 53·8 mg. urea after operation compared with a decrease of 3·2 g. protein and an increase of 105 mg. urea in a control group of 9 surgical cases.

F. C. Aitken.

1107

BLOCKER, T. G. (Jr.), LEVIN, W. C., NOWINSKI, W. W., LEWIS, S. R. and BLOCKER, V. **Nutrition studies in the severely burned.** *Ann. Surg.*, 1955, **141,** 589–597 (with discussion 597). [Dept. Surg., Univ. Texas Med. Branch, Galveston.]

Forced feeding of burned patients with high-energy, high-N mixtures given by intragastric drip has been adopted as a method of combating negative N balance. Case reports illustrate the success of the procedure.—F. C. Aitken.

See also Absts. 144, 145.

DIABETES

1108

SOMERSALO, O. **Studies of childhood diabetes. 1. Incidence in Finland.** *Ann. Paediat. Fenn.*, 1955, **1,** 239–249. [State Med. Board.]

From replies to a questionnaire sent to all physicians in Finland it is estimated that there is at least 1 diabetic to each 1500 children and 1 new patient to 8000 children each year.—F. C. Aitken.

1109

WOLFF, O. H. and MADDISON, T. G. **Insulin zinc suspension in childhood diabetes.** *Brit. Med. J.*, 1955, ii, 413–415. [Dept. Paediat. Child Health, Univ. Birmingham.]

1110

SPIESS, H. Lang wirksame Insuline beim Diabetes mellitus des Kindes. [**Long-action insulins in diabetes mellitus in children.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1170–1172. [Kinderklin., Univ. Göttingen.]

Satisfactory control was achieved in 14 of 21 diabetic children between 5 and 13 years of age by a single daily morning injection of "Lente" or "Long" insulin, generally from 20 to 40 units, combined with a diet supplying, according to age, protein 1 to 3, fat 1 to 2 and carbohydrate 4 to 7 g. per kg. bodyweight daily, the carbohydrate being taken mostly at the mid-day and afternoon meals. Hypoglycaemic attacks were rare. Careful medical

supervision is necessary. Children with diabetes not easily controlled by the older types of insulin were excluded from the trials.—W. M. Deans.

1111

DE TONI, G. La croissance de la taille chez les enfants atteints par le diabète sucré. Le Nanisme insulaire ou syndrome de Nobécourt. [**Growth in height of diabetic children. Islet dwarfism or Nobécourt's syndrome.**] *Acta paediat.*, 1954, **43,** Suppl. 100, 594–607. [Clin. Méd. Infant. "G. Gaslini", Univ. Genoa.]

The growth pattern of 32 children, in whom diabetes was diagnosed at the clinic between 1942 and 1953, was studied by the author's system (Title 1457, Vol. 20). For the dwarfism which, for some unknown reason, appears in some the name Nobécourt's syndrome is proposed. Details are given of 2 well-defined cases.—D. Harvey.

1112

ELZAS, M. De behandeling van diabetes. [**The treatment of diabetes.**] *Nederland. Tijdschr. Geneesk.*, 1955, **99,** 2808–2814. [Rotterdam.]

A review.

1113

COLWELL, A. R. **Selection of therapy in diabetes mellitus with illustrative case reports.** *Med. Clins. N. Amer.*, 1955, **39,** 39–54. [Dept. Med., Northwestern Univ. Med. Sch., Chicago, Ill.]

1114

ENGLESON, G. **Studies in diabetes mellitus.** *Acta paediat.*, 1954, **43,** Suppl. 97, pp. 162. [Paediat. Clin., Univ. Lund.]

Possible causes of the late complications of diabetes were studied in 217 adults and 42 children. These observations, with the evidence gleaned from an extensive review of the literature, suggested that the development of late complications is influenced by impairment of liver function and by endocrine factors and that unrestricted diet contributes to these.—F. C. Aitken.

1115

GOODMAN, J. I. **Etiology of the diabetic neuropathies.** *Amer. J. Digest. Dis.*, 1955, **22,** 236–239. [Cleveland Heights, Ohio.]

Atherosclerosis, vitamin deficiency and diabetes are discussed as possible causes; it is believed that the last plays the dominant part in the etiology of diabetic neuropathies.—F. C. Aitken.

See also Absts. 648, 1056.

GASTRO-INTESTINAL CONDITIONS

1116

KELLER, W. and MARGET, W. Untersuchungen zur Ätiologie und Pathogenese der akuten Durchfallserkrankungen mit Ernährungsstörung. 1. [**Etiology and pathogenesis of acute diarrhoeal disorders with disturbance of nutrition. 1.**]

KELLER, W. and BIESALSKI, P. Untersuchungen zur Ätiologie und Pathogenese der akuten Durchfallserkrankungen mit Ernährungsstörung. 2. [**Etiology and pathogenesis of acute diarrhoeal disorders with disturbance of nutrition. 2.**] *Ztschr. Kinderheilk.*, 1953, **74,** 95–118; 1955, **76,** 514–530. [Kinderklin., Univ. Freiburg i. Br.]

An attempt is made in these papers to clarify the relations of digestive disturbance in infants to infections and to feeding. (See Keller's classification of "akute Ernährungsstörungen", Abst. 4959, Vol. 23.)

1. Bacteriological examination of stools of 582 infants in hospital showed that, after *Bacteria coli* infections were accounted for and allowance was made for other pathogenic bacteria and viruses, there was a residue of diarrhoeal disorder to be ascribed to feeding. The term "akute Durchfallserkrankung mit Ernährungsstörung" is proposed instead of "akute Ernährungsstörungen".

2. A 3-year study of infection with fever showed that dyspepsia occurred much more frequently with "influenzal infection" than with other, even severer infections. Droese's work (Abst. 2408, Vol. 22) and further work to be published has shown that fat absorption is impaired in infants with influenzal infection. The possible sequence of events leading to diarrhoeal disorder is discussed. Even if infection is the primary cause, feeding is still of the greatest importance.—I. Leitch.

1117

POLAK, M. and PONTES, J. F. Zur Diagnostik der Steatorrhoe. [**Diagnosis of steatorrhoea.**] *Gastroenterologia*, 1955, **83,** 224–233. [Hosp. das Clin., Med. Fak., São Paulo.] English and French summaries.

Comparison of the results of studies of fat balance over 4 and 12 days in normal subjects and in patients with steatorrhoea showed that in most a 4-day period was adequate for the diagnosis of steatorrhoea. Estimations of the fat content made after the stools had been stored on ice for 4 days agreed well with those made on the day of collection. Estimations based on the Nile blue reaction or microscopical examination did not agree well with the results obtained from the balance studies.—L. Wills.

1118

WALLENSTEN, S. **The relation between sideropenia and anemia and the occurrence of postcibal symptoms following partial gastrectomy for peptic ulcer.** *Surgery*, 1955, **38**, 289–297. [Dept. Surg., Serafimerlassarettet, Stockholm.]

Postcibal signs and symptoms such as fatigue, pallor, nausea, palpitation, epigastric pain and diarrhoea are common after removal of part of the stomach. They were found to be positively correlated with the presence and degree of anaemia or low serum Fe values, especially the latter. Treatment with intravenous Fe gave improvement in 20 and complete disappearance of the signs and symptoms in 14 out of 21 patients with low serum Fe, and dramatic but temporary improvement in one man with normal Hb value, red cell count and serum Fe.—D. Duncan.

1119

KILLING, F. Sekundäre Sprue nach subtotaler Dünndarmresektion. [**Secondary sprue after subtotal resection of the small intestine.**] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselkr.*, 1955, **15**, 113–122. [Inn. Abt., Krankenhaus "Huyssens-Stiftung", Essen.]

Report of a case.

See also Abst. 1075.

THYROID DISEASE

1120

DE WIJN, J. F. Vergelijkend onderzoek naar de lichamelijke groei en ontwikkeling van struma- en struma-vrije schoolkinderen. [**Comparative study on the bodily growth and development of schoolchildren with and without goitre.**] *Maandschr. Kindergeneesk.*, 1955, **23**, 132–143. [Sectie Kinderhyg., Afd. Gezondheidszorg, Nederlands Inst. Praevent. Geneesk., Leyden.] English summary.

Examination was made in 1953 of 63 boys and 61 girls without goitres, and of 59 boys and 65 girls with goitres, all aged from 9 to 12 years, from different social levels [location not stated]. The proportion of well nourished children was higher among those with goitres than among those without. There was no difference in height, weight, or skeletal development between the groups. Both groups were below standard in weight but not in height. The development of secondary sex characters was retarded by about one year in both boys and girls with goitre. Systolic blood pressure was higher in the boys with goitre, but not in the girls. There was no difference in Hb values. The levels of inorganic P and alkaline phosphatase in serum were higher in children with goitre than in those without.

E. M. Hume.

1121

DONOSO, F., JADRESIC, A., LOPEZ C. E., CARCIA DE LOS RIOS, M. and ATRIA, P. Encuesta de bocio de las escuelas del Departamento de Melipilla. [**Enquiry on goitre in the schools of the Department of Melipilla.**] *Rev. méd. Chile*, 1955, **83**, 246–249. [Dept. Endocrinol., Hosp. San Juan de Dios.]

The incidence of goitre in 3167 children at 41 schools in the Department of Melipilla was 530, or 14·65 per cent. In the isolated region of Alhué, 100 of 280 pupils were affected. The goitre was usually of diffuse type.

A plea is made for more widespread examinations of this sort in Chile.—D. Duncan.

1122

JÄRVINEN, K. A. J. and LEIKOLA, E. **Non-toxic or simple goitre. Frequency among patients in wards for internal diseases at Helsinki.** *Ann. Med. int. Fenn.*, 1955, **44**, 31–40. [3. Med. Clin., Univ. Helsinki.]

Clinical examination for goitre was made in 10,557 patients over 15 years of age in hospital in Helsinki for internal diseases. The validity of the clinical assessment was checked at autopsy in 440 of the patients who died not more than 6 months later. The clinical assessment was correct in 398 of them. The tendency was almost always to underestimate the size of the goitre, and in 43 cases it was missed altogether. Nodules at least as large as a pea were found *post mortem* in the thyroid glands of 104 patients, in only 43 of whom they had been detected in life. It is concluded that the clinical examination recognised rather more than half (52·5 per cent.) of the existing goitres.

Of the total patients examined in life 6137 were female and 3980 male; the number of goitres found was 684 and 187, respectively. On the basis that only about half the goitres that exist are clinically recognised, the percentage incidence was 16 for both sexes, 22 for women and 10 for men. Very many of the patients were not born in Helsinki, but the proportion with goitre of those born there was greater than of those born elsewhere.—A. M. Copping.

1123

HERNÁNDEZ FELICIANO, M. El bocio endemico en la Isla de San Miguel de la Palma. [**Endemic goitre on the island of San Miguel de la Palma.**] *Rev. clín. española*, 1955, **57**, 162–174. English German and French summaries.

Goitre is prevalent on the island of La Palma in the Canaries. The report describes 274 cases, 95·2 per cent. of them women. The syndrome is predominantly hyperfunctional, with nervousness, high B.M.R. and exophthalmos. The goitre was

diffuse in 73 per cent. and nodular in the rest. There was one cretin without goitre. In affected areas the water supply is exceptionally low in I, with from 0·11 to 0·22 μg. per litre, and contains 1·7 to 11·5 mg. Ca per cent.—D. Duncan.

See also Abst. 610.

ANAEMIA

1124

GAISFORD, W. and JENNISON, R. F. **Intramuscular iron in infancy.** *Brit. Med. J.*, 1955, ii, 700–704. [St. Mary's Maternity Hosp., Manchester.]

Imferon, an iron-dextran complex, given intramuscularly, has been used successfully in treating over 100 infants with anaemia, in preventing anaemia of prematurity, and for infants before or after operations. No side effect was noticed.

F. C. Aitken.

1125

WEGELIUS, R. and KUNNAS, M. **Incidence of anaemia in a Finnish children's hospital.** *Ann. Paediat. Fenn.*, 1954–55, **1,** 166–170. [Child. Clin., Univ. Helsinki.]

In one year anaemia was diagnosed in 306 children, 6·5 per cent. of those admitted to hospital. In 44 per cent. of cases it was independent of other disease ; in 58 per cent. it was associated with acute infection. When infection had been of short duration and the anaemia was present on admission the anaemia was regarded as a primary condition. Of the primary anaemias all except 2 were of Fe-deficiency type.—F. C. Aitken.

1126

KIRSCHENFELD, J. J. and TEW, H. H. **Prevalence and significance of anemia as seen in a rural general practice.** *J. Amer. Med. Assoc.*, 1955, **158,** 807–811. [Fort Deposit, Ala.]

The criterion of anaemia was an Hb level below 11 g. and 12 g. per 100 ml. in women and men, respectively. Of 300 consecutive new patients 18 per cent. were anaemic. The anaemia was of Fe-deficiency type in 61 per cent. and of normochromic, normocytic type in 39 per cent. Principal causes of anaemia were pregnancy 24·1, inadequate diet 20·4, rheumatoid arthritis 18·5, acute and chronic infections 16·7 and excessive blood loss 11·1 per cent. of cases. Similar results were obtained when the study was extended to include 200 more patients.—F. C. Aitken.

1127

ADAMS, E. B. **Management of the anaemic patient in general practice.** *S. African Med. J.*, 1955, **29,** 651–654. [Dept. Med., Univ. Natal.]

1128

BHATT, J. M. **Some observations on anaemias and their treatment.** *Antiseptic*, 1955, **52,** 461–462. [Irwin Hosp., Jamnagar, India.]

1129

O'SULLIVAN, D. J., HIGGINS, P. G. and WILKINSON, J. F. **Oral iron compounds. A therapeutic comparison.** *Lancet*, 1955, **269,** 482–485. [Dept. Haematol., Manchester Royal Infirmary.]

Eighty cases of hypochromic, microcytic, Fe-deficiency anaemia were treated in 4 groups for 6 weeks with ferric hydroxide or ferrous sulphate, succinate or gluconate in amounts giving 210 mg. Fe daily. Ferric hydroxide at that level was not satisfactory. The other salts were about equally effective. Treatment with ferrous sulphate was cheapest.—F. C. Aitken.

1130

COLEMAN, D. H., STEVENS, A. R. (Jr.) and FINCH, C. A. **The treatment of iron deficiency anemia.** *Blood, J. Hematol.*, 1955, **10,** 567–581. [Dept. Med., Sch. Med., Univ. Washington.]

A review.

1131

THOMPSON, R. B. and UNGLEY, C. C. **Megaloblastic anemia associated with anatomic lesions in the small intestine.** *Blood, J. Hematol.*, 1955, **10,** 771–787. [Royal Victoria Infirmary, Newcastle upon Tyne.]

Report of 6 cases.

1132

DESAI, N., BHENDE, Y. M. and DIXIT, C. V. **Inefficacy of oral crystalline penicillin G in nutritional megaloblastic anemia in Indians.** *J. Postgrad. Med., Bombay*, 1955, **1,** 155–159. [Dept. Med., Civil Hosp., Ahmedabad.]

The treatment, reported successful for megaloblastic anaemias in Africans, was a failure in the 6 Indian subjects studied.—F. C. Aitken.

1133

SUBRAMANIAM, R. and CHINNASWAMI, M. **Liver extract in macrocytic anaemias.** *Antiseptic*, 1955, **52,** 591–596. [Govt. Gen. Hosp., Madras.]

The object of the study was to test the efficacy of liver extract made in India. All of 13 patients treated responded well.—F. C. Aitken.

See also Absts. 548, 983, 1058, 1060, 1063–7, 1069–72.

OTHER CONDITIONS

1134

TAMPAN, R. K. K. (with RAMAMURTHY, I.) **Review on toxaemias of pregnancy.** *Indian J. Med.*

Res., 1954, **42,** Suppl., pp. 76. [Govt. Hosp. Women and Child., Madras.]

1135

HERKEN, H. Pharmakologische Grundlagen der Therapie mit Kationen-Austauschern. [**Pharmacological basis of treatment with cation-exchange resins.**] *Ztschr. Kinderheilk.*, 1955, **76,** 440–453. [Pharmakol. Inst., Freie Univ., Berlin.]

A documented article on the mode of action of cation-exchange resins and their use to remove Na from the body and hence to relieve oedema, with a diagram of the Na and K balances and weight loss in an illustrative case of liver cirrhosis with ascites. The amount of Na reaching the gut through the digestive secretions may far exceed that from the food, and the normal dose of 40 to 60 g. resin daily can bind only about 1·5 g. Na, so that the amount supplied by the diet must be kept well below this. The risks of producing K depletion or acidosis are discussed.—W. M. Deans.

1136

NÖCKER, J. Therapie der Lebererkrankungen. 1. Die allgemeinen therapeutischen Grundlagen. [**Treatment of liver disorders. 1. General therapeutic principles.**] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselkr.*, 1955, **15,** 122–129. [Med. Klin., Univ. Leipzig.]

A review with 113 references.

1137

GRÜNEIS, P. Diät bei Leberkrankheiten. [**Diet in liver disorders.**] *Wien. klin. Wochenschr.*, 1955, **67,** 262–263. [1. Med. Abt., Städt. Allg. Poliklin., Vienna.]

1138

DEN HARTOG, C. Voeding en alcohol. [**Diet and alcohol.**] *Voeding*, 1955, **16,** 810–817.

The influence of dietary deficiencies in possibly increasing the craving for alcohol and the greater needs for some nutrients which arise in alcoholism are discussed. The prescription of diets rich in energy and in vitamins is recommended.

M. Eddison.

1139

LEEVY, C. M., CUNNIFF, C. L., WALTON, D. and HEALEY, M. **Organization and function of a clinic for the alcoholic patient with liver disease. 1. Effect of rehabilitation on hepatic abnormalities.** *Quart. J. Studies Alcohol*, 1954, **15,** 537–544. [Liver Clin., Dept. Med., Med. Centre, Jersey City, N.J.]

A study is reported of 167 patients with severe liver disease associated with alcoholism. In 76 abstinence from alcohol and consumption of an adequate diet caused the disease to disappear in those with fatty liver and prevented its progress in those with moderate cirrhosis. Patients who failed to maintain a good diet showed progressive deterioration leading to irreversible liver damage. It was found necessary to make periodic examinations of the patients in order to control their diet and general progress.—A. M. Copping.

1140

SCHWARTZ, R., PHILLIPS, G. B., SEEGMILLER, J. E., GABUZDA, G. J. (Jr.) and DAVIDSON, C. S. **Dietary protein in the genesis of hepatic coma.** *New Engl. J. Med.*, 1954, **251,** 685–689. [Thorndike Mem. Lab., Boston City Hosp., Mass.]

The case of a patient with alcoholic cirrhosis is described in whom signs of impending coma were seen on 3 occasions when protein intake was raised from 50 to 75 g. daily. On each occasion protein restriction caused remission of the signs. Two cases of alcoholic cirrhosis are described in which high intake of protein may have had an adverse effect.—F. C. Aitken.

1141

KALLAI, L. and CERLEK, S. Traitement des hépatopathies par un extrait de foie total. [**Treatment of liver diseases with an extract of whole liver.**] *Acta gastro-enterol. belg.*, 1955, **18,** 603–619. [Clin. Med., Univ. Zagreb.] Dutch, English and German summaries.

Ripason, a whole liver extract, was given in doses up to 5 ml. by vein daily for 8 to 12 weeks to 40 patients in hospital with chronic liver disease and receiving a high-protein, high-carbohydrate diet. Improvement was judged subjectively and on gain of weight, decrease of the size of the liver, improvement of liver function tests and disappearance of ascites if present and, when biopsies were performed, on the histological changes in the liver.

There was improvement in 26 of the patients; in 14 of them, including 5 with chronic hepatitis and 5 with compensated cirrhosis and all 3 with fatty degeneration, the results were excellent; in 12, including 4 with chronic hepatitis and 7 with compensated cirrhosis, they were good. In 11 patients, including 6 with compensated cirrhosis, there was no improvement, and of 7 with decompensated cirrhosis, 3 died. Myocarditis was present in 3; their electrocardiograms returned to normal under treatment. Histological examination showed improvement after treatment of chronic hepatitis, compensated cirrhosis and fatty degeneration; periportal and intralobular infiltration decreased or disappeared and fatty infiltration also disappeared, but in decompensated cirrhosis the more advanced changes were not altered.

L. Wills.

1142

CHALMERS, T. C., ECKHARDT, R. D., REYNOLDS, W. E., CIGARROA, J. G. (Jr.), DEANE, N., REIFENSTEIN, R. W., SMITH, C. W. and DAVIDSON, C. S. (with MALONEY, M. A., BONNEL, M., NIIYA, M., STANG, A. and O'BRIEN, A. M.) **The treatment of acute infectious hepatitis. Controlled studies of the effects of diet, rest, and physical reconditioning on the acute course of the disease and on the incidence of relapses and residual abnormalities.** *J. Clin. Invest.*, 1955, **34,** 1163–1235. [Thorndike Mem. Lab., Boston City Hosp., Mass.]

All the 450 patients were male members of the United States armed forces, the course of whose illness was strictly defined and on whom comprehensive clinical observation and liver function tests were made regularly; the criterion of normality was a value 99 per cent. of that obtained in liver function tests on 279 "normal" soldiers stationed in Japan.

In the first study, with 260 patients, several analyses were made of the effects of diet and rest on the duration of the acute illness. The removal of 7 of the subjects which was later thought necessary did not affect the results. Patients who were allowed out of bed at will but who were confined to a hospital ward had a slightly shorter duration of illness than those kept strictly at rest in bed. Patients forced to eat a diet with a minimum of 3000 Cal. and 150 g. of protein and supplemented with choline and Multivitamin capsules had an illness 6 days or 22 per cent. shorter than others allowed the regular hospital diet to appetite; this difference was highly significant. There was no relation between the effects of diet and those of rest on the duration of illness.

In the second study of 200 patients, of whom 11 were removed during its course, analyses were made of the effects of intakes of energy and protein and of supplements of choline and vitamins on the duration of the disease. Patients given throughout their illness a diet with 19 per cent. of calories as protein had a mean duration of illness 14 per cent. shorter than patients given a diet with 11 per cent. calories as protein. For those on a diet with 4000 Cal. duration of illness was no shorter than in those on a diet of 3000 Cal. Patients given supplements of choline and a Multivitamin preparation did not have a shorter illness than patients who were given placebos. There was no demonstrable interaction among the 3 dietary components.

In 88 patients there was no evidence that strenuous exercise early in convalescence might precipitate a clinical relapse of infectious hepatitis.

In the fourth study 188 patients were selected at random from the original 450 for re-examination about 1 year after their initial treatment. Although there was no difference between patients in the first study who were forced to eat a nutritious diet and those who ate only as much as they desired, the repeat study indicated that in patients who received the high-protein, high-calorie diet in the second study the incidence of mild residual abnormalities was slightly higher than in the group on a normal diet.—G. F. Garton.

1143

OLDHAM, J. B. **The problem of obesity.** *Nutrition*, 1955, **9,** 108–113. [David Lewis Northern Hosp., Liverpool.]

A lecture.

1144

JONES, F. A. and MURLAND, E. **The dietary control of obesity.** *Practitioner*, 1955, **175,** 12–15. [Gastro-Enterol. Dept., Central Middlesex Hosp.]

The dietary control of obesity is discussed and a 1000-Cal. reducing diet is given, with a list of forbidden foods.—F. C. Aitken.

1145

EGOROV, M. N., LEVITSKIĬ, L. M. and PROSTYAKOV, K. M. Lechebnoe pitanie pri ozhirenii. [**Therapeutic dieting in obesity.**] *Vop. Pitan.*, 1955, **14,** No. 4, 17–26. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

Tables are presented showing dietary constituents, chemical composition and energy values of foods, and a sample menu. A clinical assessment of the results of treatment is given.—D. W. Taylor.

1146

PEMBERTON, H. S. **Clinical aspects of obesity.** *Practitioner*, 1955, **175,** 5–11. [United Liverpool Hosps.]

A short article, with references.

1147

DEWAR, H. A. **Diet and arterial disease, with special reference to coronary occlusion.** *Practitioner*, 1955, **175,** 37–44. [Royal Victoria Infirmary, Newcastle upon Tyne.]

1148

WOHL, M. G., SHUMAN, C. R. and ALPER, C. **Nutritional and metabolic aspects of congestive heart failure.** *Arch. Int. Med.*, 1955, **96,** 11–18. [Nutrit. Project, Philadelphia Gen. Hosp. Pa.]

1149

NEWBORG, B. and KEMPNER, W. **Analysis of 177 cases of hypertensive vascular disease with papilledema. One hundred and twenty-six**

patients treated with rice diet. *Amer. J. Med.*, 1955, **19,** 33–47. [Dept. Med., Sch. Med., Duke Univ., Durham, N.C.]

This long-term study shows that advanced renal impairment and lack of strict adherence to the diet affect adversely the chances of successful treatment with the rice diet of malignant hypertensive vascular disease.

Of 100 cases for whom eye-ground photographs were available papilloedema disappeared in 92 within 5 months of treatment with the rice diet.

F. C. Aitken.

1150

TASELAAR, J. A. Dystrophia musculorum progressiva; het effect van hormonale behandeling. [**Progressive muscular dystrophy; the effect of hormone treatment.**] *Nederland. Tijdschr. Geneesk.*, 1955, **99,** 2496–2499. [Acad. Ziekenhuis, Leyden.] English summary.

Twenty male patients with progressive muscular dystrophy were studied. Graphs are given showing the amounts of creatine and creatinine excreted by 8 patients of different ages, who had diets successively rich and poor in protein, combined with injections of vitamin B_{12} or di*iso*propylfluorophosphate or testosterone propylpropionate. None of these preparations caused creatine excretion to fall; it rose with an increase of protein in the diet. The testosterone derivatives improved the general condition of the patients and prevented further deterioration of the muscles. There was no relation between general condition and amount of creatine excreted.—M. Eddison.

1151

OJI, K., IKEGAWA, K., IMOTO, S. and YOSHIDA, T. **Treatment of muscular atrophies with amino acid mixtures.** *Med. J. Osaka Univ.* (*Engl. Ed.*), 1955, **6,** 291–308. [1. Dept. Int. Med., Med. Sch., Univ. Osaka.]

A mixture of 100 to 200 ml. of 5 per cent. enzymic hydrolysate of casein, 20 to 40 ml. of 2 per cent. DL-methionine, 20 to 40 ml. of 10 per cent. glycine and 40 ml. of 20 per cent. glucose solution was given intravenously at the rate of 60 drops per min. to 8 adult and 5 infant patients with progressive muscular dystrophy, 4 patients with neural muscular atrophy and 6 with amyotrophic lateral sclerosis. This treatment daily for from 3 to 12 weeks was found to be more effective in adults than in children and in patients treated soon after the onset of disease; it was most effective in muscular dystrophy. It gave rise to increases in limb circumference, muscular strength and bodyweight and to an improved sense of well-being. Abnormalities in chronaxie disappeared as a result of the treatment. Two types of response in creatine excretion to treatment were seen, one showing an immediate reduction and the other an increase 2 weeks after the treatment. Creatinine metabolism also was improved. Abnormalities in carbohydrate and protein metabolism were corrected by the treatment; the recovery was greatest in patients with muscular dystrophy. Creatine tolerance was increased significantly in patients treated with casein hydrolysate and added methionine and glycine over that in patients treated without additional glycine.—G. F. Garton.

1152

FONTAN, A. and MARTIN, C. Hypoprotéinémie idiopathique de l'enfant avec hyperaminoacidurie. [**Idiopathic hypoproteinaemia in infants with hyperaminoaciduria.**] *Pédiatrie*, 1955, **10,** 515–525. [50, Rue Saint-Genès, Bordeaux.]

A detailed report of a case is followed by a full discussion of the clinical features, progress, possible etiology and treatment of the syndrome.

L. Wills.

1153

VAN DER WERFF, J. T. Enkele therapeutische ervaringen met radio-actieve isotopen. [**Therapeutic results with radio-active isotopes.**] *Nederland. Tijdschr. Geneesk.*, 1955, **99,** 2706–2716. [St. Canisius Ziekenhuis, Nijmegen.] English summary.

In addition to the use of radio-active I in the treatment of cancer of the thyroid a study was made of the effects of radio-active gallium in the treatment of bone disorders. The cheaper and non-poisonous isotopes ^{66}Ga and ^{77}Ga took the place of ^{72}Ga, but neither had a therapeutic value. *Polycythemia vera* was the only one of the diseases studied which responded to radio-active P; in reticulosis, Hodgkin's disease, carcinoma of the uterus and lymphatic leucaemia radio-active Au or Bi was effective.—M. Eddison.

1154

ALIMUDDIN, M. **Treatment of vernal conjunctivitis.** *Brit. J. Ophthalmol.*, 1955, **39,** 540–544. [Army Med. Coll., Rawalpindi, Pakistan.]

Fourteen per cent. (142) of the 1050 patients blamed foods for making the condition worse; onions came first, next spices, and other foods mentioned were beef, eggs, tamarind, citrus beverages and brinjal.—W. M. Deans.

1155

VALENZUELA RAVEST, F. Introduccion al estudio de las enfermedades del colageno. [**Introduction to the study of the collagen diseases.**] *Rev. méd. Chile*, 1955, **83,** 131–139. [Cat. Med., Univ. Chile.]

A review.

See also Absts. 720, 934, 935, 1014, 1040, 1053–5, 1077, 1078, 1102.

6. FEEDING OF ANIMALS

GENERAL, INCLUDING DIGESTIBILITY TRIALS

1156

CLAWSON, A. J., REID, J. T., SHEFFY, B. E. and WILLMAN, J. P. **Use of chromium oxide in digestion studies with swine.** *J. Animal Sci.*, 1955, **14,** 700–709. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

In a trial with 10 groups of 8 pigs, 5 different rations, all containing 0·5 per cent. chromium oxide, were used. The pigs were fed free choice. Digestibility of the dry matter was estimated from samples collected over 24 hr., grab samples taken at 6 a.m. and 5 p.m., and in addition pooled samples taken at 5.30 a.m., 10.30 a.m., 3.30 p.m. and 8.30 p.m., and the results were compared with those obtained by the conventional method of 7-day collection periods.

It was first demonstrated that excretion of Cr_2O_3 reaches equilibrium with that in the feed 3 to 4 days after it is first given. The results by all methods were in close agreement. The most accurate was by 24-hr. collections, followed by 4 daily samples. For constituents of the ration which were highly digestible the coefficients of digestibility found by the Cr_2O_3 methods were nearer to those found by the conventional method than for the less digestible constituents.

Weight increases and efficiency of feed conversion were not affected by the inclusion of 0·5 per cent. Cr_2O_3 in the ration. Wide variation was found in the digestion coefficients between individual pigs on the same ration, but this was not related to the individual weight gain or efficiency.

T. D. Bell.

1157

FONTENOT, J. P., GALLUP, W. D. and NELSON, A. B. **Effect of added carbohydrate on the utilization by steers of nitrogen in wintering rations.** *J. Animal Sci.*, 1955, **14,** 807–817. [Dept. Animal Husb., Oklahoma Agric. Exp. Stat., Stillwater.]

Rations of hay, maize and minerals with 8, 10 and 12 per cent. protein were used in 3 digestibility and N balance trials with bullocks. To the low-protein ration carbohydrate was added as 350, 700 and 1050 g. cerelose and to the other 2 rations as 700 and 1050 g.

On the low-protein ration N retention was progressively depressed by increasing amounts of cerelose. The apparent digestibility of all constituents except N-free extract was reduced. In the rations with 10 and 12 per cent. protein, N retention was increased by addition of cerelose, and the apparent digestibility of crude protein and crude fibre was reduced, but that of organic matter was not affected, and that of N-free extract was increased. At all levels of protein the biological value of the N increased progressively with increasing cerelose.—T. D. Bell.

1158

SULLIVAN, J. T. **Cellulose and lignin in forage grasses and their digestion coefficients.** *J. Animal Sci.*, 1955, **14,** 710–717. [U.S. Reg. Pasture Res. Lab., Field Crops Res. Branch, U.S. Dept. Agric., State College, Pa.]

Cellulose and lignin in 36 samples of grass and one each of alfalfa and ladino clover were estimated, and the percentage digestibilities were estimated with sheep. Digestibility of cellulose was higher than was found for crude fibre in previous investigations of the same samples (Absts. 4385, Vol. 20; 2983, Vol. 22). The variation between samples was also as great as that of crude fibre. The percentage of cellulose was sometimes higher, sometimes lower than that of crude fibre. The digestibility of lignin was very variable, sometimes greater than 10 per cent. There was a significant correlation between percentage lignin and digestibility coefficient of cellulose and of dry matter. Further improvement in the method of estimating lignin is necessary before there would be any advantage in analysing grasses for cellulose or lignin or both instead of crude fibre.

T. D. Bell.

1159

NELSON, A. B., MACVICAR, R. W., ARCHER, W. (Jr.) and MEISKE, J. C. **Effect of a high salt intake on the digestibility of ration constituents and on nitrogen, sodium, and chloride retention by steers and wethers.** *J. Animal Sci.*, 1955, **14,** 825–830. [Dept. Animal Husb., Oklahoma Agric. Exp. Stat., Stillwater.]

In 2 trials with 4 bullocks the digestibility of the nutrients was not significantly affected by high salt intake. In 2 further trials with 6 wethers the digestibility of organic matter and N-free extract was reduced by high salt intake. N retention decreased slightly and sodium and chloride retention increased significantly in both species on high salt intake.—J. C. Gill.

1160

DIJKSTRA, N. D. and BRANDSMA, S. Over de verteerbaarheid en voederwaarde van verse lucerne. [**Research on the digestibility and feeding value of fresh lucerne.**] *Versl. Landbouwk. Onderzoek.*, 1955, No. 61.5, pp. 19. English summary.

Tests were made with first-cut lucerne at Hoorn, from a field in the Wieringermeerpolder, both cut in May and June 1954, and from a field at Wijdenes (North Holland) cut in May 1951, and a late cut from the Hoorn field in September 1953.

Digestible nutrients and feeding value decreased rapidly with age of the lucerne. Tables and graphs show the relations between crude and true protein, crude protein and fibre, crude fibre and starch equivalent, true protein and digestible true protein, and they are also expressed as equations.

I. Leitch.

1161

LLOYD, L. E. and CRAMPTON, E. W. **The apparent digestibility of the crude protein of the pig ration as a function of its crude protein and crude fiber content.** *J. Animal Sci.*, 1955, **14,** 693–699. [Dept. Nutrit., Macdonald Coll., McGill Univ., Que.]

In digestibility trials with pigs of about 90 lb. liveweight rations of maize alone and with malt sprouts, linseed oilmeal, wheat bran or maize starch and oat groats were used. The rations were designed to give different levels of protein and of crude fibre. Statistical analysis of the results showed that the percentage crude fibre and the percentage protein in the ration affected the percentage digestibility of the protein equally.

T. D. Bell.

1162

CRAMPTON, E. W., MACKAY, V. G. and LLOYD, L. E. **The biological value of the protein and the apparent digestibility of the crude fiber of malt sprouts.** *J. Animal Sci.*, 1955, **14,** 688–692. [Dept. Nutrit., Macdonald Coll., McGill Univ., Que.]

Digestibility trials were made with pigs of about 90 lb. liveweight to compare the protein of linseed oilmeal and malt sprouts and the fibre of wheat bran and malt sprouts. When 45 per cent. of the protein of the ration was supplied by malt sprouts or linseed oilmeal, the former had only 84 per cent. of the value of the latter. When only 27 per cent. of the protein was so supplied, the 2 were about equal. The digestibility of the fibre was only 8 per cent., compared with 20 per cent. for wheat bran. This was thought to be the reason for the low apparent digestibility of the protein of malt sprouts.—T. D. Bell.

1163

ERIKSSON, S. **Digestibility and metabolizable energy of poultry rations at different levels of nutrition.** *Acta Agric. scand.*, 1955, **5,** 201–214.

In 72 experiments with laying hens the digestibility and the metabolisable energy of 2 feeds, each given at high, medium and low levels, were estimated. It was shown that only the digestibility of protein was affected by the level of feeding, increasing at the higher levels. When corrections were made for the constant amount of metabolic nitrogen in the faeces, these differences in digestibility of protein were eliminated. The method of estimating crude fibre in the faeces is not standardised, and this causes discrepancies in estimations of digestibility. Since this coefficient of digestibility is not essential for estimating the nutritive value of feeds for poultry it is considered better to estimate only the digestibility of total carbohydrates, and not divide them into N-free extract and crude fibre. The percentage of metabolisable energy was not affected by the level of feeding. Comparison of the amount of metabolisable energy found directly in the experiments with calculated values showed significant differences. Calculation from existing data is not recommended.—T. D. Bell.

1164

DIJKSTRA, N. D. De verteerbaarheid en voederwaarde van sorghumglutenvoer. [**Digestibility and feeding value of sorghum gluten feed.**] *Landbouwk. Tijdschr.*, 1955, **67,** 555–557. [Rijkslandbouwproefstat., Hoorn.] English summary.

Sorghum gluten feed, like maize gluten feed, is the dried residue from the manufacture of starch. Its digestibility was estimated in 10-day tests with 3 wethers. Composition and digestible nutrients per cent., to the nearest whole number, were as follows: moisture 12, crude protein 23, true protein 19, crude fat 5, N-free extract 53, crude fibre 4, ash 3; digestible crude protein 18 and digestible true protein 15. With the same "value" as for maize gluten feed, namely, 96, starch equivalent was computed to be 72.—I. Leitch.

1165

NOLAND, P. R., FORD, B. F. and RAY, M. L. **The use of ground chicken litter as a source of nitrogen for gestating-lactating ewes and fattening steers.** *J. Animal Sci.*, 1955, **14,** 860–865. [Univ. Arkansas Agric. Exp. Stat., Fayetteville.]

In feeding trials with 36 gestating-lactating ewes those given ground chicken litter to replace the normal protein concentrates performed as well as those getting soya bean meal. As a source of supplementary nitrogen ammoniated molasses was inferior to both these feeds. On equal feed intakes fattening bullocks given cottonseed meal made faster gains than those on ground chicken litter, but gains were similar when the feed intake of the latter was increased by 15 per cent. No digestive upset occurred in either trial.

J. C. Gill.

1166

ERIKSSON, S. Oxalsyrans halt i rotfruktsblast och dess betydelse i utfodringen. [**Oxalic acid content of root tops and its significance for animal feeding.**] *Kungl. Lantbruksakad. Tidskr.*, 1955, **94**, 111–118. English summary.

In 50 samples of root tops, sugar beet, fodder sugar beet and fodder beet contained on the average 7 per cent. of water-free oxalic acid in the dry matter. About half of this was soluble in water. Tops from swedes, turnips and marrow-stem kale contained no oxalic acid or only a trace.

After 3 wethers were given oxalic acid and its K salt, 12·5 per cent. of the dose was recovered in the faeces and urine. With 2 wethers receiving K and Ca oxalates it was calculated, assuming a destruction of soluble oxalate similar to that in the previous experiment, that 32 per cent. of the Ca oxalate had been destroyed during digestion.

A. Hepburn.

1167

BRUNE, H. Experimentelle Untersuchungen am Wiederkäuer zur alimentären Wirksamkeit der nativen Oxalsäure. Beitrag zur Fehlernährung mit Zuckerrübenblatt, Rübenblattsilage, Trockenblatt, Troblako und Trockenschnitzel. 1. [**Experimental studies with the ruminant on the nutritional effects of naturally occurring oxalic acid. Contribution to explain the low nutritive value of sugar-beet leaves, beet leaf silage, dried leaves, Troblako and dried slices. 1.**] Beitrag zur Fehlernährung mit Zuckerrübenblatt, Rübenblattsilage, Trockenblatt, Troblako und Trockenschnitzel. 2. [**Contribution to explain the low nutritive value of sugar-beet leaves, beet leaf silage, dried leaves, Troblako and dried slices. 2.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10**, 102–122; 127; 147–192. [Inst. Tierphysiol. Tierernährung, Univ. Göttingen.]

1. A review of the literature on oxalic acid metabolism includes many references and occupies half the paper.

The experimental animals were six 2-year-old Leineschaf wethers and six 1- and 2-year-old Württemberger Landschaf wethers. They were kept in metabolism cages for experiments lasting 100 days, divided into 10-day periods. The control diet was meadow hay. Drinking water was distilled.

Two wethers were fed on fresh beet leaves for 14 days and were then killed. The rumen contained soluble oxalic acid, but the proximal part of the small intestine contained no soluble oxalic acid, nor did the faeces of the experimental animals. The percentage of the total oxalic acid of the feed recovered in the faeces varied with the feed, from 32 with fresh leaves to 80 with one kind of Troblako. The percentage recovered in the faeces was always high at the beginning of a study and then fell. With different diets there occurred positive or negative correlations between the percentage of oxalic acid recovered and the percentage of dry matter in the faeces.

2. Balances of total and water-soluble oxalic acid and Ca and of total Mg and P were studied in wethers given the different beet products alone or with Ca salts, potato starch or cellulose.

Less oxalic acid was recovered in the faeces than the difference between intakes of total and water-soluble oxalic acid. This is interpreted as a sign of microbial breakdown of insoluble calcium oxalate. Up to 50 per cent. of the insoluble oxalic acid intake failed to appear in the faeces. On the other hand, when the fodder was rich in water-soluble oxalic acid and contained excess Ca, insoluble oxalic acid in faeces might exceed that in fodder. $CaCO_3$ produced this effect more readily than $CaHPO_4$. When *bolus alba* was given no oxalic acid was found in the faeces, but oxalic acid excretion was increased by supplements of starch or cellulose. When digestibility of crude fibre, crude protein and N-free extract of the diet was low, oxalic acid excretion was high. This is considered to be related to low bacterial activity.

Even with a large excess of oxalic acid over Ca the wethers might be in positive Ca balance. It is concluded that Ca oxalate is available to the sheep. Ca balances were also sometimes negative in the presence of a large Ca excess. Ca retention was better with fresh than with dried beet leaves. Mg retention tended to parallel Ca retention, but the P balance was strongly dependent on the dry matter content of faeces.

When sheep received Ca salts with oxalate-rich fodders and drinking water to appetite they had a high output of urine which could not be traced either to high oxalic acid intake or high alkali intake.

In the first 10 days of feeding on dried beet leaves serum Ca and phosphatase always rose slightly, but later they tended to fall, though they remained within the limits of normal variation. Serum P showed some changes in the opposite direction.

It is concluded that the oxalic acid is not solely responsible for the poor results obtained from sugar-beet leaves used as fodder.—D. Duncan.

1168

JARL, F., NORDFELDT, S. and HELLBERG, A. Utfodringsförsök med ensilage framställt med användande av Reymersholms ensileringsfosfat. [**Feeding experiments with silage made with Reymersholm silage-phosphate.**] *Kungl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 109, 1955, pp. 15.

The making of silage with $NaH_5(PO_4)_2 . NaHSO_4$ and its quality were described in a report in 1954 (see Abst. 4238, Vol. 24). The results of feeding experiments are now briefly reported. Digestibility trials were made with 3 cows at one centre and at another with 4 wethers in which phosphate silage was compared with silage made with beet or molasses. Digestibility was good. Milk production tested with 4 groups each of 6 cows at the one centre and 3 groups of 6 at the other showed no difference in either yield or quality as compared with production on hay or other silages.

An account of the effect of phosphate silage on retention of P was published earlier (see Abst. 3887, Vol. 24). The effect on composition of the urine was tested with 3 cows with a mean yield of about 20 kg. milk daily. There was no effect on volume of urine. With increasing amounts of silage, 2·6, 5·1 and 9·7 kg. daily each for one week, Ca and P in urine increased and *p*H fell from 8·8 to 7·8.—I. Leitch.

1169

PACI, C. L'utilizzazione alimentare della paglia di riso. [**The use of rice straw in feeding.**] *Riv. Zootec.*, 1955, **28,** 215–218.

The rice straw available for feeding is generally not all used. After threshing it soon rots, since it is still green, with a high moisture content, and the harvest is too late in the year for drying by the sun. There is the added disadvantage that it has a very high ash content, 15 per cent. of the dry matter, and two-thirds of this is silica. When used as a roughage for livestock it has to be combined with 3 or 4 times its weight of clover or lucerne hay. The mixture is then comparable to meadow hay. Silage in experimental silos was made of rice straw with the addition of mineral acids. It was analysed after 98 days, with the following results : dry matter 31·20, crude protein 1·60, ether extract 0·59, crude fibre 11·37, N-free extract 12·59 and ash 5·05 per cent. The composition was almost the same as that of the straw before ensiling. The silage was of good colour and smell, with *p*H 3·8, and the ammonia N was only 4·4 per cent. of the total N. No feeding trial was made, but in view of the similarity in composition of silage and straw it is suggested that they could be used in the same way, with the same precautions.—T. D. Bell.

1170

FRENCH, M. H. **The feeding value of sweet potato tubers.** *East African Agric. J.*, 1955, **21,** 18–19. [Joint Animal Indust. Div. E.A.A.F.R.O., E.A.V.R.O.]

Sweet potatoes, purchased from African producers, had the following percentage composition on a dry matter basis : crude protein 5·13, ether extract 1·08, crude fibre 2·30, N-free extract 87·53, ash 3·46, SiO_2 0·36. They were slightly higher in protein and lower in fibre than cassava or edible canna. The average percentage digestibilities of the constituents, obtained with sheep, were : crude protein 37·5, ether extract 51·6, fibre 79·3, N-free extract 95·5, dry matter 85·9, organic matter 92·0.

J. S. Thomson.

1171

SCHARRER, K., SCHREIBER, R. and KÜHN, H. Über den Futterwert von " Giessener Ölrettich ", Sareptasenf " Stamm 40/44 " und " Giessener bunte Platterbse ". [**Feeding value of Giessen radish, Sarepta mustard var. 40/44 and Giessen variegated vetch.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 134–146. [Agrik. Chem. Inst., Justus Liebig Hochsch., Univ. Giessen.]

Digestibility trials were made with wethers on these 3 new fodder plants, given green or as hay.

As green fodder the vetch contained most digestible crude protein, 18·58 per cent. on a dry matter basis ; the other 2 plants had 14·21 and 14·55 per cent. In hay there was little difference in digestible crude protein between them. The vetch when green had the highest starch equivalent, but as hay the mustard was highest. All had about 90 per cent. dry matter as hay. All were readily accepted by the sheep. The digestibility of all the organic constituents, but especially of fibre, was highest in Sarepta mustard hay, which was comparable to very good meadow hay, while the other species were comparable to good meadow hay.

D. Duncan.

1172

GIULIANI, R. Il valore nutritivo e biologico dei foraggi disidratati e loro impiego nell' alimentazione delle varie specie e categorie di animali. [**The nutritive and biological value of dehydrated fodders and their use in the feeding of different species and classes of animals.**] *Riv. Zootec.*, 1955, **28,** 197–202.

1173

FEUNTEUN, L. M. L'élevage en Afrique occidentale française. Son importance économique et sociale. Les conditions de son développement et de son amélioration. [**Animal husbandry in French West Africa: its economic and social importance. Conditions for its development and improvement.**] *Rev. Élevage Méd. vét. Pays trop.*, 1955, **8,** 137–162.

In French West Africa two-thirds of the territory is engaged in animal husbandry, and two-thirds of the animals are in the northern part. Limited rainfall with long dry periods over large areas, and disease which periodically decimates the flocks and herds, prevent the full development

of the animal industry. The ignorance of the people retards progress also.

A programme has been initiated to improve conditions. The first aim has been to improve animal health, and concurrently water supplies have been improved by deep borings, erection of tanks, pumping from deep wells and controlling streams and lakes. Meanwhile investigations are in progress on the possibilities of pasture improvement, and experimental farms for stock improvement by breeding and crossing are being established. Movement and marketing of livestock, meat, milk and hides are being controlled and assisted. The organisation and its progress to date are described.

T. D. Bell.

1174

SPLITTGERBER, H. Was ist von neueren Forschungsergebnissen in die Fütterungsberatung übertragbar ? [**What, of recent results of research, can be used in advisory work on feeding ?**] *Züchtungskunde*, 1955, **27**, 113–120. [Kiel.]

A review

1175

FERRANDO, R. Données récentes touchant à la nutrition et appliquées à l'alimentation animal. [**Recent results on nutrition and their application to animal feeding.**] *Rev. Élevage Méd. vét. Pays trop.*, 1955, **8**, 163–178.

Progress in the study of hormones, chemistry, biology and intestinal flora and their relation to nutrition are discussed.—T. D. Bell.

1176

PRENDERGAST, J. J. and BRADY, J. J. **Animal output of reseeded grassland. 2. Effects of seed strain and nitrogen treatment on the seasonal output and botanical composition of herbage, and on the live-weight gain of animals maintained entirely on the experimental plots throughout the grazing season in 1953.** *J. Brit. Grassland Soc.*, 1955, **10**, 213–228. [Dept. Agric., Dublin.]

1177

SIMONNET, H. L'eau.—Besoins de l'organisme. Métabolisme.—Influence de l'abreuvement sur la production animale. [**Water. Requirements. Metabolism. Effect of watering on animal production.**] *Rev. Élevage Méd. vét. Pays trop.*, 1955, **8**, 179–208. [Ecole Nat. Vét. d'Alfort.]

A review.

1178

GIULIANI, R. Gli antibiotici nell'alimentazione degli animali domestici. [**Antibiotics in the nutrition of domestic animals.**] *Riv. Zootec.*, 1955, **28**, 165–170.

1179

CAIRY, C. F. **Hormones for growing and fattening animals.** *Vet. Med.*, 1955, **50**, 339–346 ; 372. [Dept. Physiol. Pharmacol., Michigan State Univ., East Lansing.]

HORSES

1180

MAGIDOV, G. Kukuruza—tsennaya kormovaya kul'tura dlya loshadei. [**Maize—a valuable fodder crop for horses.**] *Konevodstvo*, 1955, **25**, No. 5, 31–34.

To obtain good results from giving maize to horses it should be accompanied by fodder rich in protein, such as legume hay, bran and oats. Although maize is a valuable feed, its nutrient value being almost 30 per cent. higher than that of oats, its ash content is low, the amount of Ca in maize being only 0·03 per cent., 1/4 of that in oats. The addition of legume hay not only balances the ration with respect to protein but also compensates for the deficiency of Ca. Maize is highly digestible, horses being able to digest up to 90 per cent. of the organic matter. The yellow varieties of maize contain considerable amounts of carotene, up to 9 mg. per kg. If the ration is properly balanced with respect to protein and ash, horses can be given 15 per cent. less maize than oats. Maize should not be moistened or steamed before feeding, as if this is done it ferments rapidly in the horse's stomach.

If maize is given as silage it should replace about half the hay ration. Silage from maize harvested at the milk stage contains 80 mg. carotene per kg.

H. Scherbatoff.

CATTLE

GROWTH AND FATTENING

1181

KOCH, R. M., SCHLEICHER, E. W. and ARTHAUD, V. H. **Weight changes in beef calves following birth.** *J. Animal Sci.*, 1955, **14,** 792–796. [Univ. Nebraska, Lincoln.]

Weights of 218 calves were measured at birth and at 12- or 24-hr. intervals for the 72 hr. after birth. It was shown that during the first, second and third 24-hr. period the average gain was 1·2, 1·5 and 1·8 lb., respectively. The average gain in the first 3 days was the same as the average daily gain from birth to weaning. The variation in one calf within the period when birthweights are normally taken was small compared with the variation between calves. It did not seem to be of practical importance to make adjustments for the differences in times of weighing which inevitably occur in practice.—T. D. Bell.

1182

VOLCANI, R. and EYAL, E. **Rearing calves on limited milk rations.** *Ktavim, Rec. Agric. Res. Stat. Rehovoth,* 1953, **4,** 23–24.

In 2 sets of experiments the effect of rearing calves with limited amounts of milk was studied. In the first series rations of 160 litres whole milk were given in 45 days, and concentrates were allowed to appetite. The growth and health of the calves getting this treatment were not inferior to those of calves on the usual ration of 380 litres milk, and their first lactation performances compared favourably with those of their dams.

In the second set of experiments groups of calves were reared on different combinations of full and reconstituted dried skimmed milk over periods of 25 to 49 days and a control group got 380 litres full milk in 75 days. There was no advantage in giving 100 litres skimmed milk to calves that got 100 litres full milk and concentrates. All the calves on the limited milk rations gained less weight during the first 3 months than those on full milk, but the difference in weight was eliminated during the next month. Consumption of concentrate was greater in the groups getting limited quantities of milk, and in all groups the intake and efficiency of utilisation of total digestible nutrients was the same. From both experiments it is concluded that restricted milk rations given during a short period can be used satisfactorily for rearing calves.—T. D. Bell.

1183

LAMPKIN, G. H. and PARKIN, S. I. J. **Calves reared at grass.** *Agriculture, J. Minist. Agric. Engl.*, 1955, **62,** 255–257. [Animal Breeding Res. Organiz., Cold Norton Farm, Stone, Staffs.]

In trials in 2 years calves were purchased when 1 week old, between April and July, and were kept outdoors on pasture day and night until October. They were given whole milk until 4 weeks old, 21 gal. altogether, and then a milk substitute, 44 gal., until weaning at 12 weeks old. A concentrate, on a scale based on size, rising to a maximum of $2\frac{3}{4}$ lb. at 266 lb. liveweight, was also given. The calves gained on the average 10·2 lb. per week each. Similar calves reared indoors and getting hay and silage to appetite instead of pasture gained 7·2 lb. per week. All calves remained in good health, and examination of faeces did not show any excessive parasitic infestation due to rearing the young calves on pasture.—T. D. Bell.

1184

HANCOCK, J. and PAYNE, W. **The direct effect of tropical climate on the performance of European-type cattle. 1. Growth.** *Empire J. Exp. Agric.*, 1955, **23,** 55–74. [Ruakura Animal Res. Stat., Animal Res. Div., Dept. Agric., N.Z.]

Eight sets of identical twins of predominantly Jersey type were used. All twin sets were born and uniformly reared to $7\frac{1}{2}$ months of age in New Zealand. At this stage one member of each set was shipped to the Sigatoka region of Fiji. Feeding and management in the 2 countries were identical, the only difference being climate. Liveweights and body measurements were recorded from $7\frac{1}{2}$ months to 2 years of age.

The Fiji twins lost weight during transit and quarantine, but recovery was rapid during the ensuing months. Growth rates and feed intakes fell during periods of high temperature. As a result maximum weight differences at calving were on the average 84 lb. Body measurements except belly girth were correspondingly reduced. The belly girths of the Fiji twins tended at certain times to be higher than those of their New Zealand mates. This was attributed to drinking more water. Differences in bodyweights and measurements were much less by the end of the first lactation. In view of the small within-set differences at the end of the first lactation it was concluded that the stunted appearance of cattle of European type reared in Fiji is due largely to poor nutrition or management or both and not to climate. Between-set differences in adaptability to environment showed that selection for tropical conditions might be worth while.—J. N. Aitken.

1185

AMSCHLER, J. W., BAUMGARTNER, F. and PAMMER, H. Die Aufzucht von Braunviehkälbern mit Aurofac-2A. [**Rearing Brown calves with Aurofac-2A.**] *Bodenkultur*, 1954, **8**, 34–38. [Inst. Tierzucht, Hochsch. Bodenkultur, Vienna.]

For the first 6 weeks of life 5 Brown autumn calves had Aurofac-2A in their milk, 0·3 g., supplying 2·4 mg. aureomycin per kg. milk, and 4 had none. Both groups had hay from the third week and concentrates [details given] from the fourth.

Mean daily weight gain was almost 50 per cent. greater in the aureomycin group; per kg. gain they consumed whole milk 8·027 kg., concentrates 76 g. and hay 102 g., supplying 276·6 g. digestible protein in 1·263 kg. starch equivalent, as against 11·772 kg., 114 g. and 151 g., supplying 405·9 g. digestible protein in 1·856 kg. starch equivalent, for the controls. The calves given aureomycin were all healthy and lively, whereas all but one of the controls scoured. The cost of the aureomycin supplement was 15·6 groschen per kg. weight gain or on the average 6·45 schilling per calf for the 6-week period.—W. M. Deans.

1186

OWEN, F. G., VOELKER, H. H., JACOBSON, N. L. and ALLEN, R. S. **The comparative effects of various antibiotics and an arsenical upon the growth, health, and certain blood constituents of dairy calves.** *J. Dairy Sci.*, 1955, **38**, 891–900. [Dept. Animal Husb., Iowa State Coll., Ames.]

Two experiments were made. In the first, 3 groups of 8 Holstein calves receiving terramycin or penicillin were compared with a control unsupplemented group. In the second, terramycin, bacitracin, chloromycetin and 3-nitro-4-hydroxyphenylarsonic acid were given. All calves received whole milk for the first 2 weeks and a milk replacement of dried whey reconstituted with water during the first 7 weeks. A calf starter of ground maize, ground oats and soya bean oilmeal was supplied from the 7th to the 12th week. The antibiotics were given at the rate of 40 mg. daily in the milk replacement and at 80 mg. daily in the calf starter. The arsenical was given at the rate of 30 mg. daily during the first 6 weeks and thereafter at 30 mg. per lb. starter.

In experiment 1 the rates of gain of the calves getting aureomycin and terramycin were significantly higher than those of the controls. The gains of the penicillin group were on the average 14 per cent. less than those of the controls. In experiment 2 the gains of all the treated calves were significantly higher than those of the controls. When the antibiotics and arsenical were withdrawn the rates of gain of the penicillin and control groups exceeded those of the other groups. Treatments which stimulated growth also improved efficiency of feed conversion. There was no effect of treatment on erythrocyte, total leucocyte, or differential leucocyte count. Hb, plasma fat and faecal *p*H were not affected by any of the treatments.—J. N. Aitken.

1187

LASSITER, C. A., DENTON, T. W. and RUST, J. W. **The evaluation of an unidentified growth factor and terramycin for young dairy calves.** *J. Animal Sci.*, 1955, **14**, 769–774. [Dairy Sect., Univ. Kentucky, Lexington.]

Thirty-two Jersey and Holstein calves were reared on whole milk, a calf-starter and hay from 2 to 86 days of age. Experimental groups were given, in addition to this basal ration, supplements of crystalline terramycin or a mixture of products from the fermentation of terramycin and streptomycin, or both. The mixture of fermentation products was used as a source of unidentified growth factor. The rations received by all groups were the same in proximate composition, except that the percentage ash when the source of unidentified growth factor was included was higher than in the other rations.

The addition of the supplements did not improve growth rate or efficiency of feed utilisation. Terramycin tended to reduce scouring, and the source of unidentified growth factor to increase it. The latter effect may have been due to the higher ash content.—T. D. Bell.

1188

LASSITER, C. A., DENTON, T. W. and RUST, J. W. **The effects of chlortetracycline and ethomid C/15 on growth, apparent digestibility and blood levels of urea and total non-protein nitrogen in young dairy calves.** *J. Animal Sci.*, 1955, **14**, 760–768. [Univ. Kentucky, Lexington.]

An experiment was made with 18 male Holstein and Jersey calves reared from 2 to 86 days of age on limited milk and concentrates and hay to appetite. The effect was studied of supplements of chlortetracycline and a surface-active agent, Ethomid C/15, (polyoxyethylene cocoamide) on growth rate, efficiency of feed utilisation, scouring, digestibility of nutrients and levels of blood urea and N.P.N.

Both supplements improved growth rate, and the antibiotic was better than the surface-active agent. The chlortetracycline also improved efficiency and reduced scouring. There was no effect on the digestibility of the nutrients or the level of blood urea. Chlortetracycline reduced blood N.P.N. during the first 7 weeks, the period during which growth was stimulated most.—T. D. Bell.

1189

HIESS, H. Praktische Erfahrungen in der Baby-Beef-Mast. [**Practical experience in fattening for baby beef.**] *Bodenkultur*, 1954, **8**, 77–80. [Versuchswirtschaft, Hochsch. Bodenkultur, Vienna, Gr. Enzersdorf.]

The system of indoor rearing of selected dairy calves to from 400 to 500 kg. liveweight at 15 months for baby beef, begun in 1948 as a subsidiary enterprise in connection with the dairy herd at the college farm, is described in detail. Weights at 3-month intervals are tabulated for 12 male and 9 female calves of different breeds and crosses, and the amounts of the different feeds consumed are also given. Male calves did better than female ; crosses did not do better than purebred. Emphasis is laid on uniformity of feeding, to maintain unchecked growth and minimise labour. For this reason no green feed is given. Whole milk rises from 5 litres daily in the first week to 9 in the eighth and then falls by 1 litre each week until it ceases at the end of the sixteenth week. The calves are gradually introduced to other feeds, mainly silage of beet leaves, wet slices, maize or vetch and rye ; dried slices and alfalfa hay are also given. The only concentrates used are groundnut meal, rapeseed meal and wheat bran. Costs are kept down by the use of homegrown feeds.—W. M. Deans.

1190

WINCHESTER, C. F. and HOWE, P. E. **Relative effects of continuous and interrupted growth on beef steers.** *U.S. Dept. Agric. Tech. Bull.* No. 1108, March 1955, pp. 34.

The animals used were 5 pairs of identical twin purebred Aberdeen-Angus steers and 1 pair of Hereford × Guernsey crossbreds. The pairs were split so that one member of each set was given the control ration with a liberal energy content. The remaining 6 co-twins were divided into 3 groups of 2 animals each and given rations containing 50, 62 or 75 per cent. of the energy content of the control ration. Restricted feeding of the animals on the 50 and 62 per cent. rations was begun at 6 months of age ; at 12 months they were again given liberal rations. Of the 2 animals on the 75 per cent. energy ration 1 was restricted at 6 months and the other at 7 months. This ration was given in one case for 10 months and in the other for 8 months. After the period of restriction all animals were fed to appetite. Bodyweights and measurements were recorded. The animals were slaughtered when they reached a weight of 1000 lb.

At the lowest levels of intake there was little or no gain in bodyweight although development in terms of some skeletal measurements continued at a reduced rate. After the period of restriction weight gains were rapid and economical. The retarded animals required 10 to 20 weeks more to finish. At slaughter there was no difference between control and experimental animals in either carcase grade or meat quality. It is concluded that during periods of feed scarcity animals may be maintained at maintenance levels without serious consequences.—J. N. Aitken.

1191

MORRISON, J., SMYTH, W. G., HALE, R. W. and BROWN, W. O. **Fattening of cattle: a comparison of indoor winter fattening with summer fattening on grass.** *Res. and Exp. Rec. Minist. Agric. N. Ireland*, 1952–53 (1955), **3**, 90–97. [Agric. Res. Inst., Hillsborough.]

In a trial with 16 bullocks of Shorthorn type purchased in the autumn, a group of 5 was fattened indoors on silage, a similar group was fattened indoors on silage plus hammer-milled oat sheaves and hay, and the remaining 6 were maintained outdoors during the winter on silage, straw and surplus swedes and then fattened on grass in the summer. The average initial weight of the bullocks was 9½ cwt. The fattening of groups 1 and 2 began on 16 December, group 1 finishing on 2 March and group 2 taking a fortnight longer to attain the same weight. The daily liveweight increases were 2·40 and 1·85 lb. Group 3 was fattened from 26 March to 6 July, with a daily liveweight increase of 2·43 lb.

All the bullocks graded well at slaughter. The costs and returns were estimated, showing the highest profit from group 3, followed by group 1. It should not be considered from these results that winter fattening must be abandoned. Before such a decision is made, availability of grassland and accommodation, and the desirability of keeping meat supplies steady through the year, must be considered.—T. D. Bell.

1192

MORRISON, J., STEPHENSON, W. A., HALE, R. W. and BROWN, W. O. **Winter fattening of bullocks: grass silage compared with arable crop silage.** *Res. and Exp. Rec. Minist. Agric. N. Ireland*, 1952–53 (1955), **3**, 98–105. [Agric. Res. Inst., Hillsborough.]

Silage of peas and oats, dry matter 17·8 per cent. and crude protein 15·5 per cent. of dry matter, was compared with grass silage, dry matter 21·0 per cent. and crude protein 13·9 per cent. of dry matter, for fattening bullocks indoors in winter. There were 2 groups of 5 bullocks of initial liveweight about 9 cwt. They were given 6 lb. bruised oats and good quality hay to appetite and 70 lb. of one or other of the silages daily. The fattening period was from 5 February to 5 May, and the grass silage group gained 2·0 lb. per head daily during this period. The rate of gain of the

other silage group was 1·3 lb. daily. At slaughter the group on pea and oat silage did not grade as well as the grass silage group. The financial results showed that the use of silage of crops on arable land was unprofitable; the grass silage was very satisfactory.—T. D. Bell.

1193

HUEY, J. B. D. **A comparison of the feeding value of grass and arable crop silages for store and fattening cattle.** *Res. and Exp. Rec. Minist. Agric. N. Ireland*, 1952–53 (1955), **3**, 130–141. [Loughry Agric. Coll., Cookstown, Co. Tyrone.]

This experiment was made during 2 successive winter periods. One group of 4 yearling Dairy Shorthorn steers and another of 4 yearling heifers were fed entirely on grass silage. Two similar groups received silage of arable crops. During the intervening summer all animals were at pasture. The arable crop was a mixture of oats and peas and the silage contained 20·35 and 16·16 per cent. dry matter in the 2 periods. The crude protein content of the dry matter was 16·22 and 14·43 per cent., respectively. The grass silages had 20·25 and 18·2 per cent. dry matter and 12·59 and 15·03 per cent. crude protein.

In both winters the steers and heifers on grass silage made substantially greater liveweight gains than those on oat and pea silage. Total silage and dry matter consumption were also greater in the grass silage groups. Liveweight gains were closely related to dry matter consumption. The poor results obtained with the oat and pea silage were partly due to the fact that it was less palatable. Where good grass can be grown, grass silage will be of more value than silage of other green crops.—J. N. Aitken.

1194

GERLAUGH, P., KLOSTERMAN, E. W. and KUNKLE, L. E. **The relative value of three grades of feeder steers when wintered, grazed and fed grain on pasture.** *Ohio Agric. Exp. Stat. Res. Circular* No. 26, September 1954, pp. 10.

In each of 2 successive years 3 groups of 20 steers were selected to represent choice, medium and common grades. In both years the choice steers were Herefords, the medium Shorthorns, and the common Holsteins. All animals were wintered on maize silage, mixed hay and soya bean oilmeal. Grazing was begun in April in each year. Maize was given during the latter part of the summer. There was little difference between the groups during the wintering and early grazing phases of the experiments. The liveweight gains of the Holsteins were greater than those of either the Herefords or Shorthorns when grain was given on pasture. Under the conditions of this experiment the poorer grades proved to be the most profitable, because of the greater margin between purchase and selling price.—J. N. Aitken.

1195

KIRSCH, W. Grundsätzliches zur Fleischgewinnung über das Rind unter besonderer Berücksichtigung der Kälber- und Jungrindermast. [**Principles of meat production from cattle with special reference to the fattening of calves and young cattle.**] *Züchtungskunde*, 1955, **27**, 56–63. [Inst. Tierzuchtlehre, Landwirtsch. Hochsch., Hohenheim.]

From experiments on fattening young animals and studies of market statistics it is concluded that there is no need to change the predominant dual-purpose types of German cattle, but breeders and others should concentrate on extending the milking life of cows.

The best results in practice come from all kinds of milk fattening and with autumn calves started on good pasture. Fattening of young bulls should be considered only under such conditions and with good pasture management and no stall feeding. Spring calves may be successfully fattened where there are plenty of cheap by-products, such as sugar beet products. The practical possibilities for baby beef production are still unknown.

D. Duncan.

1196

GEURIN, H. B., THOMPSON, J. C., WILCKE, H. L. and BETHKE, R. M. **Cob portion of ground ear corn as sole roughage for fattening cattle.** *J. Animal Sci.*, 1955, **14**, 797–806. [Dept. Res., Ralston Purina Co., St. Louis, Mo.]

A ration of ground ears of maize which supplied 20 per cent. of maize cobs as the sole roughage was found to be adequate for fattening bullocks when supplemented with a mixture containing cottonseed oil meal, gluten feed, wheat middlings, urea, soya bean oilmeal, linseed oilmeal, molasses, dehydrated alfalfa meal, minerals and vitamin A.

J. N. Aitken.

1197

SANDAL, P. C. and GAREY, C. L. **Effect of top-dressing pastures with superphosphate on beef yields and distribution of available P_2O_5 in the soil.** *Agronom. J.*, 1955, **47**, 229–231. [Univ. Arkansas, Fayetteville.]

Trials were made on a gravelly silt-loam bearing a pasture of Bermuda grass and legumes. Compared with the control pastures (not topdressed) which produced 61 lb. beef per acre in a year, those which had received 200 lb. of 20 per cent. superphosphate per acre annually for 6 years had considerably higher available P_2O_5 contents in the first 3 in. of soil, but little more between 3 and 6 in. These pastures produced 275 lb. beef per acre. Where topdressing had been at the rate of 600 lb. per acre annually, 382 lb. beef per acre were

obtained. The soil had the greatest amounts of available P_2O_5 at all depths up to 6 in. Soil organic matter and also soil stability were increased almost in proportion to the amount of P_2O_5 applied. It is stated that observations showed that this could be accounted for by increasing growth of the pasture.—J. L. Corbett.

1198

WOODWARD, R. R., QUESENBERRY, J. R. and WILLSON, F. S. **Production and carcass quality in beef cattle.** *Montana Agric. Exp. Stat. Circular* No. 207, December 1954, pp. 11.

The effect on carcase quality of selection for heavier weaning weights and rate and efficiency of gains was studied. Weight, rate and efficiency of gain and carcase records of 635 Hereford steers were analysed. The animals were weaned at 6 months of age and then fattened for 250 days before slaughter. They were reared under typical range conditions.

Birthweight was positively related to weaning weight, final weight and rate of gain, but not to carcase grade. There was no correlation between weaning weight and carcase grade, so that selection for heavier weaning weight did not prejudice the quality of the carcase. Faster gains produced carcases of higher grade, and efficiency and rate of gain were closely and positively correlated. Grading the live animals before slaughter gave a fairly good indication of carcase grade, but was more accurate in the prediction of the thickness of the external fat measured over the eye muscle than of the area of lean of the eye muscle. Selection for rate of gain would not necessarily result in improved conformation, or vice versa, since fleshing quality and rate of gain were not correlated. On the other hand, these 2 characteristics were not antagonistic, and selection for each separately could be made.—T. D. Bell.

1199

ITTNER, N. R., BOND, T. E. and KELLY, C. F. **Environment comparisons and cattle gains in wood and wire corrals.** *J. Animal Sci.*, 1955, **14,** 818–824. [Div. Animal Husb., Univ. California, El Centro.]

See also Absts. 312, 313, 866.

MILK PRODUCTION

1200

PERUCHON DE BROCHARD, J. Revision des formules types modernes alimentaires pour vaches laitières. **[Revision of typical modern feed formulae for dairy cows.]** *Rev. d'Oka*, 1955, **29,** 74–77.

Giving too much protein to dairy cows may do more harm than good. A table of suggested scales and proportions of total feed expressed in feed units and protein are presented for cows from 300 to 650 kg. liveweight giving 10 litres milk of from 3 to 6 per cent. butterfat. The ratio of the dry matter of feed to its value in feed units is important and should be as narrow as possible.—T. D. Bell.

1201

KRÜGER, L. and MÜLLER, W. Über Futteraufnahme und Verzehrleistungen bei Milchkühen. 1. Eine theoretische Betrachtung zum Problem der Sättigung. **[Feed intake and consumption in milk cows. 1. Theoretical consideration of the problem of satiety.]** *Züchtungskunde*, 1955, **27,** 17–37. [Inst. Tierzucht, Justus Liebig Hochsch., Giessen.]

The theoretical discussion is based on 58 references. It is suggested that the feeling of satiety in cattle is controlled primarly by the filling of the reticulo-rumen, and that this in turn depends on the volume of the organ, the time the feed remains in it and the sp. gr. of the feed. The sp. gr. of the feed can be estimated by pyknometer which is described, and the time spent by the feed in the reticulo-rumen is estimated from the total transit time on the assumption that transit time from omasum to rectum is constant. Estimation of the volume of the reticulo-rumen in the living animal is still to be considered. At the moment the animal's requirement for satiety is based empirically on the volume eaten.—D. Duncan.

1202

CONVERSE, H. T. **Calcium requirements of dairy cattle.** *U.S. Dept. Agric. Tech. Bull.* No. 1092, April 1954, pp. 25.

During a 20-year period 4 experiments were made with 51 animals in all. Successive attempts were made to deplete the cows by giving rations low in Ca. In some this was done during growth, pregnancy and subsequent lactation and in others during lactation only. The rations in 3 of the experiments consisted of timothy hays of low Ca content and a suitable grain mixture. In the fourth experiment calves were reared on a ration consisting of 2 to 3 lb. hay and a grain mixture containing only 0·078 per cent. Ca. The average Ca content of the ration was only 0·12 to 0·14 per cent. of the dry matter. The Ca content of the dry matter of the rations used in the other experiments ranged from 0·16 to 0·95 per cent. It was shown that a ration containing only 0·16 per cent. Ca was adequate for growth, pregnancy and lactation and a ration containing 0·14 per cent. Ca was adequate for growth but not for pregnancy. It is concluded that there was no justification for giving a Ca supplement with rations of grain and timothy hay.—J. N. Aitken.

1203

ELLENBERGER, H. B., NEWLANDER, J. A. and JONES, C. H. **Effects of feeding different grades of hay and cod-liver oil concentrate to dairy cattle. 4. From birth through one to three lactations.** *Univ. Vermont Agric. Exp. Stat. Bull.* No. 580, June 1955, pp. 32.

Previous papers (see Absts. 326, Vol. 22; 1725, Vol. 24; 4319, Vol. 25) in this series have described the effect of feeding the rations outlined below on the performance of calves from birth to 360 days of age and of heifers from 361 to 720 days of age. The present paper describes the lactation performance of cows from the first generation of calves and of some of their second and third generation descendants. In all cases the lifetime nutritional status was known. First-generation calves were divided into 4 groups and given good or late-cut poor hay, each with or without cod liver oil supplement. Successive generations were fed in the same way as their parents. All animals received a daily grain ration with added salt throughout their lifetime. No Ca or P supplement was offered. It was concluded that the use of cod liver oil to provide extra vitamins A and D was unnecessary when good hay was given. Vitamin supplements may be necessary when late-cut poor hay is given to young animals. Homegrown hays and silages provide adequate amounts of Ca and P when given along with simple grain mixtures. The practice of adding such items as ground limestone and steamed bonemeal to dairy rations is considered unnecessary.—J. N. Aitken.

1204

BRANDSMA, S. De mineralen in de voeding van het rundvee. [**Minerals in the feeding of cattle.**] *Jaarboek* 1953–54 *van de Algemene Bond van Oud-Leerlingen van Inrichtingen voor Middelbaar Landbouwonderwijs*, pp. 12. [Rijkslandbouwproefstat., Hoorn.]

1205

CARMAN, G. M. **Interrelations of milk production and breeding efficiency in dairy cows.** *J. Animal Sci.*, 1955, **14,** 753–759. [Div. Animal Husb., Iowa State Coll. Agric. Exp. Stat., Ames.]

Data on 1646 lactation intervals of 763 cows were used to estimate statistically the repeatability and heritability of time to first oestrus after calving, time from first service to conception and number of services per conception. It was found that the repeatability and heritability of all 3 measures of breeding efficiency were zero. The period from calving to first oestrus was correlated with level of production in the previous lactation. It is concluded that selection for breeding efficiency cannot be very effective.—J. N. Aitken.

1206

KOSHI, J. H. and PETERSEN, W. E. **Complementary milk and its relationship to lactation.** *J. Dairy Sci.*, 1955, **38,** 788–796. [Dept. Dairy Husb., Univ. Minnesota, St. Paul.]

Complementary milk is here understood to mean the amount of milk obtained after normal milking by hand, and after machine milking followed by hand stripping. The complementary milk was obtained after injection of 10 units oxytocin intravenously and further hand stripping. The cows were tested about once a week over a period of a year.

From 62 cows in over 1300 tests, from 0·1 to 13·3, average 1·7, lb. complementary milk was drawn at a milking: this was 1·2 to 70·9, average 11·3, per cent. of the total milk. The percentage of butterfat was from 6·1 to 22·5, average 13·2, and was positively related to the percentage butterfat of normal milk and the percentage of complementary milk. The amount, but not the percentage, of complementary milk decreased with advance of lactation and consequent decrease in yield of normal milk. The percentage of complementary milk was independent of the age of the animal and the amount of normal milk.

Persistency of lactation was not related to the age of the cow, the highest weekly quantity of milk produced or the trend of butterfat percentage, but the earlier in lactation the peak yield was reached, the poorer was persistency. There was a negative correlation between persistency and percentage of complementary milk.

The weekly injection of oxytocin did not appear to have any effect on total milk production.

T. D. Bell.

1207

TURNER, H. G. **Sources of variation in residual milk and fat in dairy cows: their relation to secretion rates and persistency of lactation.** *Austral. J. Agric. Res.*, 1955, **6,** 514–529. [Div. Animal Health and Prod., C.S.I.R.O., Animal Health Res. Lab., Melbourne.]

The primary and residual milk yields of 12 cows were recorded in both early and late lactation and after milking intervals of 10, 14 and 24 hr. The residual milk was collected after intravenous injection of posterior pituitary extract. Butterfat was estimated in both primary and residual milk. Statistical analysis of the results showed that there was a high positive correlation between the amount of residual milk and total yield. With milking intervals of 10 and 14 hr. the mean residual milk yield was 17·8 per cent. of the total yield and with a 24-hr. interval it was 13·9 per cent. Cows showing low persistency in lactation gave high residual milk yields. There was little difference in milk secretion rate in cows milked at 10- or 14-hr. intervals. Secretion rates were reduced by

15 per cent. when a 24-hr. interval was imposed. Fat percentage increased with increasing length of milking interval.—J. N. Aitken.

1208

TURNER, H. G. **The effect of unequal intervals between milkings upon milk production and diurnal variation in milk secretion.** *Austral. J. Agric. Res.*, 1955, **6**, 530–538. [Div. Animal Health and Prod., C.S.I.R.O., Animal Health Res. Lab., Melbourne.]

Three pairs of identical and 2 pairs of fraternal twins were used. During an experimental period of 16 weeks one member of each set was milked at intervals of 11 and 13 hr. and the pairmates at intervals of 8 and 16 hr. Milk yield and butterfat percentage were recorded and also residual milk and fat. Total milk production was not significantly affected by milking at unequal intervals and fat percentage also was unaffected. There was no definite effect of milking interval on rate of milk secretion.—J. N. Aitken.

1209

ELLIOTT, G. M. and BRUMBY, P. J. **Rate of milk secretion with increasing interval between milking.** *Nature*, 1955, **176**, 350–351. [Ruakura Animal Res. Stat., Hamilton, N.Z.]

The rate of milk and fat secretion was measured in 4 trials in which the experimental design eliminated any possible effect of the length of the preceding milking interval. Residual milk was collected after injection of pitocin. The results showed that there was no diminution in the rate of secretion of milk or fat with increasing length of the milking interval up to 24 hr. It is concluded that milking twice daily at intervals of unequal length has no serious effect on rate of secretion.

J. N. Aitken.

1210

AMSCHLER, J. W. and PAMMER, H. Ersatz des Eiweisses durch Harnstoff bei alpiner Spätweide. [**Replacing protein by urea on late Alpine pastures.**] *Bodenkultur*, 1954, **8**, 50–53. [Inst. Tierzucht, Hochsch. Bodenkultur, Vienna.]

This experiment at an elevation of 950 metres above sea level lasted from 13 August to 4 November 1952. Thirty-six Murboden cows feeding on alpine pasture (supplying in October 25 g. digestible protein in 125 g. starch equivalent) and hay, received from 10 September to 7 October a supplement of urea sprinkled over dried [beet] slices soaked in molasses, urea 150, dried slices 750 and molasses 400 g. per cow daily. Daily milk recording showed that with the urea supplement the decline in milk production due to seasonal deterioration of the high pasture was half that found in the same cows in 1951. During the first week some of the cows were unwilling to take the urea, but it had no ill effect on the health of the cows or on the quality of the milk or butter.—W. M. Deans.

1211

PARHAM, B. T., FRYE, J. B. (Jr.), KILPATRICK, B. L. and RUSOFF, L. L. **A comparison of ammoniated molasses, urea, and cottonseed meal as a source of nitrogen in the ration of dairy heifers.** *J. Dairy Sci.*, 1955, **38**, 664–668. [Louisiana Agric. Exp. Stat., Baton Rouge.]

The value of ammoniated molasses and urea when they replaced cottonseed meal in a normal concentrate ration was studied in a double reversal experiment with 3 comparable groups of dairy heifers. The experiment was continued through 3 periods of 28 days. The control ration was, per cent., oats 30, maize 44·5, cottonseed meal 11·0, cane molasses 12, steamed bonemeal 1·50 and salt 1·00. The 2 experimental rations were adjusted so that the ammoniated molasses and urea replaced 30 per cent. of the protein equivalent in the concentrate ration and supplied 18 per cent. of the protein equivalent in the total ration. There was no significant difference between the groups in rate of liveweight gain. The use of ammoniated molasses and urea did not affect the palatability of the feed. When urea was given more feed was required per unit of gain.—J. N. Aitken.

1212

DAVIS, R. F., WASSERMAN, R. H., LOOSLI, J. K. and GRIPPIN, C. H. **Studies on the availability of nitrogen from various ammoniated products for rumen bacteria and dairy cattle.** *J. Dairy Sci.*, 1955, **38**, 677–687. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

Experiments *in vitro* with rumen bacteria and balance studies with 4 steers of dairy type were made. The ammoniated by-products were the residues from the manufacture of furfural, ammoniated molasses and dried distiller's molasses solubles. The results of both types of study showed that the N in such products was not as freely available to rumen bacteria or to the hest animals as the N in urea or other sources of N. More research is necessary to find a suitable source of N.P.N. for ruminants.—J. N. Aitken.

1213

NEVENS, W. B., HARSHBARGER, K. E., ROLLINS, G. H., BURK, P. C., GARDNER, K. E. and KENDALL, K. A. **High-protein corn as a source of protein for dairy cows.** *Univ. Illinois Agric. Exp. Stat. Bull.* No. 586, March 1955, pp. 21.

The productivity of different strains of hybrid maize was compared in field plot trials. The

strains used were U.S. Hybrid 13, Illinois High Protein and 3 commercial strains. At harvest the loads were weighed and random samples were taken for analysis. The crops were ensiled and later used for feeding and digestion trials. All strains gave good yields of fresh material when grown on productive soil. Illinois High Protein yielded less dry matter per acre but almost as much protein as the other strains harvested at the same time. The protein content of the grain of Illinois High Protein on a dry matter basis was nearly 50 per cent. above that of the grain of other strains grown on the same field.

In digestibility trials with rabbits the digestibility of the protein of Illinois High Protein silage was above that of the other silages. All silages proved satisfactory for milk production in cows. It was concluded that the use of high-protein strains of maize would make it possible to reduce the amounts of protein concentrates normally given for milk production.—J. N. Aitken.

1214

VOLCANI, R. and SCHINDLER, H. **A comparison of cowpeas with maize as feed for dairy cows.** *Ktavim, Rec. Agric. Res. Stat. Rehovoth*, 1953, **4**, 5–8.

In 3 experiments maize and cowpeas were compared as green fodder for dairy cows. When all or half of the maize normally given, about 50 kg. daily, was replaced by cowpeas supplying about the same dry matter the normal decline of milk yield was reduced. The protein content of the cowpeas was higher than that of the maize, and was sufficient to satisfy most of the protein requirement of the cows, thus saving concentrates. The response to cowpeas was immediate and it was thought that protein alone could not be responsible for the improved milk yield.

T. D. Bell.

1215

NEVENS, W. B. and KENDALL, K. A. **Sorghums and soybeans as silage crops for milk production.** *Univ. Illinois Agric. Exp. Stat. Bull.* No. 578, July 1954, pp. 62.

This investigation was planned to obtain information on the value of silages made from different species of sorghum, including sweet sorghum, kafir, milo, broomcorn and Sudan grass, or from soya beans. A further object was to estimate the protein content and protein yields of the forages and to compare the feeding value of sorghum silage with that of maize silage. A study was made also of the optimum stage for harvesting for silage and of the effect on yield when sorghums and soya beans were interplanted. The trials were made during a 5-year period from 1943 to 1947.

Estimates of yield were obtained by sampling the standing crops and by weighing the complete harvest from a block or field. In most of the trials the yields of dry matter exceeded the average yields for similar crops grown under Central Illinois conditions. The forages giving the highest yields were sweet sorghum, kafir, broomcorn and maize; the yield of dry matter from soya beans was comparatively low. The yields of protein in most cases were less than 600 lb. per acre.

Among conditions affecting the yields of forage were length of growing period, date of planting, date of harvest and variety. There was little advantage in interplanting soya beans with sorghums or maize.

Silages made from a mixture of sweet sorghum and kafir or Sudan grass and soya beans were found to be adequate for milk production, although milk yields were not as well maintained as with maize silage. Broomcorn silage was not very palatable and milk yields were below those with maize silage.

Complete data are presented.—J. N. Aitken.

1216

WAUGH, R. K., POSTON, H. S., MOCHRIE, R. D., MURLEY, W. R. and LUCAS, H. L. **Additions of hay to corn silage to maximize feed intake and milk production.** *J. Dairy Sci.*, 1955, **38**, 688–692. [N. Carolina Agric. Exp. Stat., Raleigh.]

Sixty cows were used in 6 trials to determine the amount of hay to be added to a ration of maize silage given to appetite to obtain maximum dry matter intake and milk production. During a 28-day standardising period each cow was offered maize silage to appetite and 1 lb. hay per 100 lb. liveweight, and 1 lb. grain per 4 lb. fat-corrected milk. In a 56-day experimental period the following 4 levels of hay were compared in 15 replicates: 1·00, 0·50 and 0·25 lb. per 100 lb. liveweight, with one group receiving none. Concentrates were reduced by 5 per cent. during this period. The actual levels of hay consumption were 0·83, 0·47 and 0·24 lb. per 100 lb. liveweight. Statistical analysis of the results showed that maximum dry matter intake was achieved by the groups which consumed 0·83 lb. per 100 lb. liveweight. Milk and fat production were highest in the group receiving 0·47 lb. hay.—J. N. Aitken.

1217

SEATH, D. M., BASTIN, G. M., LASSITER, C. A. and ELLIOTT, R. F. **Value of ground hay in the grain mixture of milk cows.** *Kentucky Agric. Exp. Stat. Bull.* No. 607, February 1954, pp. 12.

The effect on milk production of adding 23 to 37 per cent. ground alfalfa or soya bean hay to simple grain mixtures was studied in 2 double reversal trials each with 3 groups of 6 cows. When the grain ration contained from 23 to 27 per cent. ground hay, grain had to be increased by 8 per cent. and when it contained 37 per cent. hay an additional 13 per cent. of grain was required. Giving hay did not affect the palatability of the mixtures either way. Digestibility of the dry matter of the whole ration was reduced slightly by the addition of hay.—J. N. Aitken.

1218

HALLEY, R. J. **Certain pasture variations and their effect upon the dairy cow.** *J. Brit. Grassland Soc.*, 1955, **10,** 229–239. [Seale Hayne Agric. Coll., Newton Abbot, Devon.]

A pasture with herbage at 4 stages of maturity simultaneously was grazed by pairs of cows in a Latin square design. The stage of maturity was regulated by cutting the pasture from 3 to 9 weeks before grazing commenced. In 4 trials grazing periods were of 2 days, and between experimental periods the cows were allowed to graze herbage similar to the experimental herbage they were to be moved to for one day. A statistically significant increase was obtained by grazing the less mature pasture in only one of these experiments. Generally the chemical composition of the herbage on the several plots was similar, though there was a two- to four-fold difference in dry matter yield. In a fifth trial 2 herbages differing in maturity and chemical composition were grazed in a single-reversal design with 4-day periods. Cows grazing the less mature herbage yielded significantly more milk. In no trial was the butterfat or solids-not-fat content affected, nor could the technique used detect variations in herbage consumption. Observations showed that total grazing time decreased with increasing maturity of the herbage.

J. L. Corbett.

1219

SEATH, D. M., LASSITER, C. A., BASTIN, G. M. and ELLIOTT, R. F. **Effect of kind of pasture on the yield of TDN and on persistency of milk production of milk cows.** *Kentucky Agric. Exp. Stat. Bull.* No. 609, March 1954, pp. 11.

This trial was made during a 3-year period from 1951 to 1953. Four experimental pastures, each of 3·12 acres, were sown with the following mixtures: plot 1, 8 lb. orchard grass and 1½ lb. ladino clover; plot 2, 8 lb. Kentucky 31 fescue and 1½ lb. ladino clover; plot 3, 18 lb. Kentucky 31 fescue; plot 4, 16 lb. Kentucky bluegrass and 1½ lb. ladino clover. All plots were dressed with 200 lb. muriate of potash per acre at the time of sowing. In addition the fescue plot received 100 lb. nitrate of ammonia per acre in April and again in July in each year. During the last 2 winters all plots were dressed with barnyard manure. A variable number of Jersey and Holstein cows grazed the plots at intervals in each year. Milk production and bodyweight changes were recorded. From these data yields of total digestible nutrients were calculated.

The average persistency of milk production during the 3 grazing seasons was 98·3 for the orchard grass-ladino plot, 89·2 for the fescue-ladino, 87·2 for the bluegrass-ladino and 81·4 for the fescue alone. The estimated yields of total digestible nutrients per acre were 1726, 1789, 1760 and 2327 lb., respectively, for plots 1, 2, 4 and 3. It is concluded that the poor performance of the cows on the fescue plot was due to the effect of unpalatable herbage on appetite. The feeding value of the fescue could be improved by sowing it in a mixture with a ladino clover.—J. N. Aitken.

1220

GAALAAS, R. F. and ROGLER, G. A. **Grazing and grass-silage feeding studies at the Northern Great Plains Dairy Station.** *U.S. Dept. Agric. Tech. Bull.* No. 1115, June 1955, pp. 30.

Attempts were made to extend the length of the grazing season beyond that obtained from native pastures by the use of introduced grasses and legumes. During the 5-year period of study annual average rainfall was 12·55 in. and average monthly temperatures were below 32° F. during November-March inclusive, and reached a maximum of 64° to 69° F. during June-August. Combined results from the use of Sudan grass, crested wheat grass, and grass and lucerne pastures showed that length of the grazing season and milk production per acre were increased by 50 to 100 per cent. compared with native pastures, and the quality of the forage was improved. For the production of winter feed the yield from a mixture of oats and peas grown for silage was greater than from a mixture of wild rye and sweet clover and the crop was preferred to maize grown for silage both because of easier cultivation and because of the higher content of crude protein.—J. L. Corbett.

1221

LOOSLI, J. K., DAVIS, R. F. and WARNER, R. G. **Studies on the productive value of roughages and concentrates for lactation.** *J. Dairy Sci.*, 1955, **38,** 797–804. [Cornell Univ., Ithaca, N.Y.]

A series of trials was made with cows to determine the effect on milk production of replacing part of the roughage in an all-roughage ration with concentrates supplying equal amounts of total digestible nutrients (TDN) or estimated net energy. When the roughage was replaced by concentrates on an equal TDN basis but with slightly more

estimated net energy, milk production (fat-corrected) increased from 22·2 to 24·7 lb. per head daily. Replacement with concentrates on the estimated net energy system resulted in an increase of only 0·8 lb. milk daily. It is concluded that estimated net energy gives a better indication of the energy value of roughages than TDN. The suggestion by other workers that concentrates contain a specific unidentified substance which stimulates milk production is not supported (see Absts. 3036, Vol. 22; 1378, Vol. 25).—J. N. Aitken.

1222

RICHTER, K. and BECKER, M. Vergleichende Versuche über die ernährungsphysiologischen Wirkungen hoher Mengen an Rübenblattsilage und Maissilage im Futter von Milchkühen. [**Comparative experiments on the nutritional effects of large quantities of beet leaf silage and maize silage in the ration of milk cows.**] *Züchtungskunde*, 1955, **27**, 63–71. [Inst. Tierernähr., Forschungsanst. Landwirtsch., Brunswick, Völkenrode.]

The method was similar to that described in Abst. 3649, Vol. 23. The 2 cows were in their second lactation and still growing. For the first 3-week fore-period and 10-day experimental period their rations included 45 kg. beet leaf silage daily, and in the second fore-period and 10-day experiment, 32 kg. maize silage.

The beet leaf silage was more acceptable than the maize silage. Despite the higher water content of the beet silage the cows drank more with it, so that their total water intake was 95 to 100 litres daily in the first period and 68 to 70 in the second, and the mean urine volumes for the 2 cows were 32 and 29 litres in the first and 14 and 14 in the second. The beet silage contained 12·08 per cent. crude protein, the maize 6·77 per cent.

Both cows retained N in the first period, 6·47 and 22·54 g. daily, and lost N in the second, 4·56 and 9·26 g. The intakes of oxalic acid in the first period were 261 and 274 g. daily and those of Ca 216·4 and 225·1 g.; one cow lost 2·06 g. Ca daily and the other retained 4·10 g. In the second period the corresponding values were oxalic acid 32·5 and 32·5 g., Ca 91·9 and 92·1 g., and both cows retained Ca, 5·31 and 3·64 g. daily. P balances were positive in the first period, when Ca phosphate was given, and negative in the second, when there was no mineral supplement.

D. Duncan.

1223

LEROY, A. M. and ZELTER, S. Z. Recherches sur l'efficacité alimentaire des marcs de pomme fermiers. 4. Effet de l'ingestion de doses croissantes d'ensilage de marcs sur le niveau des sécrétions lactée et lipidique de la vache. [**The feeding value of cider apple residues. 4. Effect of ingestion of increasing amounts of apple silage on milk and fat secretion in the cow.**] *Ann. Zootech.*, 1955, **4**, 69–91. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

For previous parts see Abst. 5330, Vol. 24 and Abst. 1419, Vol. 25.

In 2 trials the effect on liveweight, milk yield and butterfat percentage of giving silage made from cider apple residue in place of part or all of the fodder beet in rations for dairy cows was investigated. The cows in each trial got the same concentrates. In the first trial there were 2 groups of 6 cows, and the trial was in 4 periods of 21 days. In the first period both groups got only beet, supplying 32 per cent. of the dry matter. In periods 2, 3 and 4, respectively, group 1 got 25 per cent. of the dry matter supplied by beet, and no silage; no beet and 31 per cent. silage; and no beet and 22 per cent. silage. During these periods group 2 got no beet and 32 per cent. silage; 23 per cent. beet and no silage; and 16 per cent. beet and no silage. In the second trial one group of 10 cows was given, in successive periods, 31 per cent. beet, 14 per cent. beet and 22 per cent. silage, and 18 per cent. beet and 15 per cent. silage.

The replacement of part or all of the fodder beet with silage of cider apple residue did not affect milk yield or percentage butterfat, or liveweight of the experimental cows. The silage was readily accepted up to 30 kg. per head daily. No ill effect was caused by the alcohol, about 2·1 per cent. of the fresh material.—T. D. Bell.

1224

VOLCANI, R. and RODERIG, C. **A preliminary report on the feeding of cattle and sheep with nitrogen-enriched orange peels.** *Ktavim, Rec. Agric. Res. Stat. Rehovoth*, 1953, **4**, 21–22.

Dairy cows readily ate up to 10 kg. daily of orange peel silage enriched with N by soaking in ammonia solution. The enriched silage was palatable as long as the added N did not exceed 3 per cent. of the dry matter. The processed silage had an N content of from 3·5 to 3·8 per cent. of dry matter.

For about a week sheep were reluctant to eat the dried enriched orange peel, with a total N content of 2·5 to 3 per cent., but when they became used to it they took 1 kg. daily. No ill effect occurred in either cows or sheep.—T. D. Bell.

1225

ROCHA, J. O. and RIVAROLA, V. R. Los cactus como alimento para el ganado. [**The cactus as feed for cattle.**] *Rev. Agric., Costa Rica*, 1955, **27**, 229–231.

The prickly pear (*Opuntia ficus indica*) is described. It is rich in vitamins A and C, and has some of the B complex vitamins. The juice is used medicinally, and from the fruit wine and vinegar are produced. It has 92 per cent. moisture, but for stock the fleshy leaves and fruit could be a useful source of carbohydrate; they contain only negligible quantities of protein. Particularly in dry areas it would be of great value.

T. D. Bell.

1226

MUELLER, W. S. and BLAZYS, K. **Effect of feeding antioxidant (cacao shell) on the stability of the milk fat.** *J. Dairy Sci.*, 1955, **38**, 695–696. [Univ. Massachusetts, Amherst.]

A Jersey cow whose milk was susceptible to oxidative deterioration was used in a feeding trial extending over 4 periods: pre-experimental, 1 week experimental feeding of cacao shell at the rate of 2·3 lb. daily, a 2-week post-experimental period and a 4-week post-experimental period. The basal ration was of chopped green maize, alfalfa hay and a grain mixture. The anti-oxidant effect of cacao shell was measured by the thiobarbituric acid test and taste tests on the milk, and by the same tests plus peroxide value and colour on the butter oil. The milk was sampled and to a portion of each sample 4 p.p.m. $CuSO_4$ was added to hasten oxidative deterioration.

The feeding of cacao shell increased the resistance of the milk to oxidative deterioration. This effect was most pronounced at the end of the 2-week post-experimental period. The maximum effect on butter oil was also obtained during this period.—J. N. Aitken.

1227

LARSEN, L. H. Beretning om et akklimatiseringsforsøg med dansk kvaeg i Italien 1954 og et tillaeg om ydelser af dansk kvaeg. [**Report of an experiment in acclimatisation of Danish cattle in Italy, 1954, and an appendix on the yields of Danish cattle.**] *Forsøgslab. København Beretn.*, 1955, No. 281, pp. 64. In Danish and Italian.

This report gives a condensed account of the size and production of the Red Danish (Røde Danske) and Black and White Danish (Sortbroget Dansk) breeds of cattle. The Black and White resembles, and is related to, the Friesian and has been accepted in Mediterranean countries for a long time. After some difficulty permission was got from the Italian government to set up a demonstration herd of cows of both breeds at Sutrium, a farm 45 km. north of Rome. In spite of a gruelling journey by rail during which 2 of the cows died and some calved prematurely, and in spite of conditions which, by Danish standards, were unsatisfactory, both breeds did extremely well. The cows were stall-fed for the whole lactation of 304 days in ill ventilated buildings, so that the temperature and humidity were more unfavourable than they need have been. There was no pasture for the Danish herd; the roughage was of variable quality because of poor harvesting practices and poor storage and there was not enough of it. Fodder crops were so small relative to the total stock carried that both roughage and concentrates were brought. Measures required to put the Italian farm on a sounder basis are suggested.

In spite of all these drawbacks, the Red cows in 304 days produced on the average 4640 kg. of 4 per cent. milk for 3248 feed units, which is a more economical performance than that of recorded cows in Denmark, 4226 kg. of 4 per cent. milk for 3495 feed units.—I. Leitch.

1228

SCHINDLER, H. **Seasonal variations in productivity of dairy cows under Israel conditions.** *Ktavim, Rec. Agric. Res. Stat. Rehovoth*, 1953, **4**, 41–46.

Records of 109 lactations from the Israel Herd Testing Association were studied with reference to the influence of season and month of calving on milk and butterfat yields and butterfat percentage. For each month of calving considered separately, yields of milk and butterfat showed a seasonal trend, being highest from February to April; milk yield was lowest in October and November, and butterfat yield from June to November. Butterfat percentage was lowest in June and July and highest from November to January. Highest yields of milk and butterfat were obtained from cows calving in autumn, and lowest from those calving in January and from March to July.

Since the cows are fed in the same way throughout the year, the possibility of the effect of season on the sex and thyroid glands is discussed.

T. D. Bell.

1229

SMOLIAK, S. and PETERS, H. F. **Climatic effects on foraging performance of beef cows on winter range.** *Canad. J. Agric. Sci.*, 1955, **35**, 213–216. [Range Exp. Stat., Manyberries, Alta.]

Hereford, Shorthorn, Angus, quarter-bison Cattalo and half-bison Cattalo breeding cows were wintered on short grass prairie. A record of the number of cattle grazing the upland range at midday was made throughout January to April when the mean monthly temperature did not exceed 17·6° F. There was a significant positive partial correlation between foraging frequency and temperature, but not between foraging frequency and daily wind velocity or the amount of supplemental feeding. More foraging was done by Cattalo than by domestic cattle.—J. L. Corbett.

See also Absts. 314–6.

REPRODUCTION

1230

MÄKELÄ, A. and OITTILA, R. Tiineysajan pituus Viikin opetus- ja koetilan Ayrshirekarjassa. **[Length of gestation in Ayrshire cows on the Viik experimental farm.]** *Maataloust. Aikakausk.*, 1955, **27**, 77–84. [Dept. Animal Husb., Univ. Helsinki.] English summary.

Records of 382 calvings of Ayrshire cows were studied. The length of gestation of cows carrying single calves was from 265 to 293, average 279·9 days. Twins were carried for 6·78 days less than single calves, and bull calves were carried 0·82 of a day longer than heifers. The gestation period for first calves was not significantly different from subsequent periods. When third and later calvings were considered, weight and degree of fatness of dam did not influence the length of the gestation period. Between duration of gestation and birthweight of the calf a positive correlation of $r = 0{\cdot}146$ was found when all data were considered. Within cows the correlation was $r = 0{\cdot}333$. Cows calving for the first time had calves 2·98 kg. lighter than those calving for the fourth time. The weight of the calf and the weight of the dam showed a positive correlation of $r = 0{\cdot}133$. Bull calves were 2·22 kg. heavier than heifer calves. (From summary.)

T. D. Bell.

1231

BAKER, F. N., VANDEMARK, N. L. and SALISBURY, G. W. **Growth of Holstein bulls and its relation to sperm production.** *J. Animal Sci.*, 1955, **14**, 746–752. [Dept. Dairy Sci., Univ. Illinois, Urbana.]

Bodyweights, heights at withers and heart girths of 9 bulls were recorded from 4 to 160 weeks of age. Semen was collected regularly from 39 years of age.

Statistical analysis of the data showed that weight and age were highly correlated, as were also the logarithm of the weight and heart girth. For heart girths up to 47 in. the regression of the logarithm of the weight in lb. (Y) on heart girth in inches (X) was $Y = 0{\cdot}7572 + 0{\cdot}03783\ X$. The regression for heart girths over 47 in. was $Y = 1{\cdot}7983 + 0{\cdot}01686\ X$. Sperm numbers per ejaculation were significantly correlated with age and weight.—J. N. Aitken.

SHEEP

1232

HUNDT, K. W. Bestehen Relationen zwischen der Dauer der Tragezeit, dem Geburtsgewicht der Karakullämmer und dem Gewicht der Rohfelle? **[Are the length of gestation, the birthweight of Karakul lambs and the weight of the raw pelts related?]** *Züchtungskunde*, 1955, **27**, 9–16. [Wolfenbüttel.]

The study was made on lambs killed in 2 successive seasons at the *Tierzuchtinstitut*, Halle; 208 ram and 21 ewe lambs were pure Karakul and 47 ram and 21 ewe lambs were crossbred. The ranges and mean birthweights for these 4 groups, taken after the lambs were licked dry by the ewes, were, in kg., 2·7 to 6·3, 4·53; 3·2 to 5·6, 4·36; 2·4 to 6·8, 4·5; and 2·5 to 5·7, 4·1. The length of gestation ranged from 143 to 157 days, mean 150·5. The lambs were killed within 24 hr. after birth and the air-dried skins weighed from 122 to 262 g., mean 219·4 g.

Birthweight increased with duration of pregnancy. Skin weight increased with birthweight, but there was little relation between duration of pregnancy and skin weight. No relation was found between the proportion of outcross and the skin weight in the crossbred lambs, nor was any effect of the breed used for crossing detected.

D. Duncan.

1233

MUNRO, J. **Studies on the milk yields of Scottish Blackface ewes.** *J. Agric. Sci.*, 1955, **46**, 131–136. [Dept. Agric., Univ. Aberdeen.]

In trials with 42 Blackface ewes with single lambs over a 6-week period, the estimated average milk yield per ewe on a hill providing a high plane of nutrition was 159 lb. (range 86 to 220 lb.) and on a hill providing a low and variable plane of nutrition 96 lb. (range 65 to 131 lb.). Average daily liveweight gains of lambs were 0·72 and 0·43 lb., respectively. A linear regression was found between milk yield and daily gain. A highly significant correlation existed between milk yield and liveweight of ewe. It was estimated that 5·5 oz. milk were required to give 1 oz. liveweight increase. Milk yields and liveweight gains of lambs are compared with published results from other breeds. Data on milk consumption are included.—J. C. Gill.

1234

VOLCANI, R. and EYAL, E. **Raising lambs on a restricted milk diet.** *Ktavim, Rec. Agric. Res. Stat. Rehovoth*, 1953, **4**, 35–40.

In Israel fat-tailed Awassi sheep are kept for milk. Experiments were made to investigate the possibilities of rearing the lambs on limited amounts

of milk. In each of two experiments one group was allowed to suckle and another was fed by hand, from pails in the first experiment and from bottles in the second. By weighing the lambs before and after suckling it was estimated that the daily milk intake was 1·058 kg. in the first and 1·305 kg. in the second experiment. In controls selected at random from the flock the average daily intake was 1·126 kg. In both experiments both groups had access to concentrates after the first week. Hand feeding was started after the lambs had been with their dams for 3 days. It was difficult to persuade the lambs to feed from pails in the first experiment, and their growth rate was poor for the first week, but after that they surpassed the suckled lambs. They took 50·3 kg. milk per head in 69 days, compared with the estimate of 81·6 kg. in 77 days in the suckling group. In the second experiment bottle feeding was found to be easy. By this method the lambs were given 39·4 kg. milk in 49 days, while the corresponding group suckling got 80·6 kg. in 62 days. In this experiment growth was better in the suckling group, but both groups did well, better than either group in the first experiment.

T. D. Bell.

1235

SLEN, S. B. and WHITING, F. **Wool and lamb production as affected by the source of protein in the ration of the mature ewe.** *J. Animal Sci.*, 1955, **14,** 844–859. [Div. Animal Husb., Exp. Farms Serv., Canada Dept. Agric., Ottawa.]

Eight sources of protein were compared in 2 experiments each with 96 mature ewes on rations containing 7 per cent. total protein until 6 weeks before lambing and 11 per cent. thereafter. Lambs from ewes given lactalbumin were heavier at birth and at 6 weeks of age than those from ewes getting linseed meal, peas, alfalfa meal or urea. Fleece weights of ewes on lactalbumin were higher than those of ewes getting peas, urea or urea plus sulphur, but not higher than those of ewes on linseed or alfalfa meal. There was no difference between the values of linseed, alfalfa or soya bean meals for lamb or wool production and all were superior to meatmeal for wool production but not for lamb production. The proteins were superior to urea for lamb and wool production. No benefit resulted from the addition of organic sulphur to the urea. The composition of blood and milk was unaffected by the different rations.—J. C. Gill.

1236

BLACKWELL, R. L. and HENDERSON, C. R. **Variation in fleece weight, weaning weight and birth weight of sheep under farm conditions.** *J. Animal Sci.*, 1955, **14,** 831–843. [Dept. Animal Husb., New Mexico Coll. Agric. Mech. Arts, State College.]

Data on 1965 records of fleece weight from 660 ewes, 1295 records of weaning weight of lambs from 463 ewes and 2158 records of birthweight of lambs from 560 ewes were examined for 4 breeds of sheep. Variation of fleece weight was associated mainly with age of ewe and year of recording. In the Corriedale, Hampshire and Shropshire, weaning weights were associated with year, age of dam, age of lamb, sex and type of birth and rearing. In all breeds birthweights were significantly correlated with year of birth, age of dam, sex and type of birth. In the Dorset, season of birth influenced birthweight, but age of dam and weaning weight were not associated. Estimates for repeatability and heritability of these characters are included.

J. C. Gill.

1237

HAYMAN, R. H., TURNER, H. N. and TURTON, E. **Observations on survival and growth to weaning of lambs from ewes with defective udders.** *Austral. J. Agric. Res.*, 1955, **6,** 446–455. [Div. Animal Health and Prod., C.S.I.R.O., F. D. McMaster Field Stat., Liverpool, N.S.W.]

Udder defects, including mechanical injury, mastitis and blind teats with no obvious sign of injury, were found in 6·3 per cent. of a flock of 342 Merino and 213 Merino × Border Leicester ewes aged from 1 to 7 years. The incidence increased significantly from 1·3 per cent. at 1 year old to 16·7 per cent. at 7 years old. There was no significant difference between breeds.

During 4 years 646 single lambs from Merino ewes were examined, and the effect of udder defects in the dams on birthweight, rate of gain from birth to weaning, mortality from birth to weaning and weaning weight of the lambs was studied. After adjustments for the effects of size and age of dam, length of gestation, coefficient of inbreeding and sire were made, it was found that lambs reared by ewes with defective udders had a lower rate of gain, weaning weight and survival rate. The effects were more serious in ewes with both sides defective than when only one side was defective. Birthweight was not affected.

T. D. Bell.

1238

WILKINSON, W. S., O'MARY, C. C., WILSON, G. D., BRAY, R. W., POPE, A. L. and CASIDA, L. E. **The effect of diethylstilbestrol upon growth, fattening, and certain carcass characteristics of full-fed and limited-fed western lambs.** *J. Animal Sci.*, 1955, **14,** 866–877. [Dept. Animal Husb., Univ. Wisconsin, Madison.]

Lambs implanted with diethylstilboestrol and fed on a lower level than controls, so that all reached the same carcase weight at the same age, had greater values than controls for rate of gain, pelt weight, carcase length and percentage of water

in fat, but smaller values for dressing percentage, carcase finish and grade, and external fat thickness. There was no significant difference between treated and untreated lambs in wool weight, shrinkage, skin thickness, shank length, percentage of water in the muscle, eye muscle area, liver weight or percentage of ash in the shank bone. The effect of the stilboestrol in retarding the deposition of external fat was increased by limited feeding. When the feeding period was extended from 49 to 84 days lambs finished without significant difference from controls in respect of live grade score, thickness of external fat and percentage of water in external fat. Two hundred wether lambs were used in all.—J. C. Gill.

1239

OLOFSSON, N. E. Utfodringsförsök med far vid Herrökna 1950–1951. [**Feeding experiments with sheep at Herrökna, 1950-1951.**] *Kungl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 106, 1954, pp. 8.

The effect was recorded of 4 different levels of winter feeding, 1·0, 1·2, 1·4 and 1·8 Scandinavian feed units (F.U.) per 100 kg. liveweight daily, on 32 Landrace ewes during and after pregnancy and on their lambs. The third group, receiving 1·4 F.U., had most lambs born, the smallest death rate for lambs and ewes, the highest lamb weight per ewe and only a slight decrease in the weight of the ewes during winter. These amply compensated for the extra cost. Only the last group had the same weight after pregnancy and both it and the first group had smaller weights of lamb per ewe than the other groups. With 32 non-pregnant Cheviot ewes about 2 F.U. per 100 kg. weight were found necessary to increase weight during winter. Three deaths occurred when the feed supplied only about half this.—A. Hepburn.

1240

DALY, R. A. and CARTER, H. B. **The fleece growth of young Lincoln, Corriedale, Polwarth, and fine Merino maiden ewes under housed conditions and unrestricted and progressively restricted feeding on a standard diet.** *Austral. J. Agric. Res.*, 1955, **6**, 476–513. [Div. Animal Health and Prod., C.S.I.R.O., Wool Biol. Lab., Sydney, N.S.W.]

Four sheep of each breed in single pens were used in 2 consecutive trials. In the first they were given a high-quality diet to appetite for 12 months and in the second the same diet reduced in amount every 4 weeks and finally maintained at 20 per cent. of the original amount for 12 weeks. The absolute or relative value of the characters measured increased or decreased from Merino through Polwarth and Corriedale to Lincoln. For example, feed and water intake, liveweight and chest dimensions, fibre thickness, length and volume, clean wool, suint and total skin products, and clean wool and suint output per unit feed intake increased; total and primary follicle density, ratio of secondaries to primaries, wax output, and wax output per unit feed intake decreased. Body length and height, feed intake per unit net liveweight and total skin products per unit feed intake were similar for all breeds. Weight of wool, fibre thickness, growth in length and volume, and production of wax and suint were positively correlated with food intake. Wool growth was not influenced by a rise in atmospheric temperature, except for fibre thickness in the Lincoln. Wax production in all breeds was negatively correlated with rise in temperature. Rate of wool growth was positively correlated with fleece weight through fibre length but not through fibre thickness. A negative correlation was found between production of wool, wax and suint per unit feed intake and feed intake; wax per unit feed intake was negatively correlated with temperature and suint per unit feed intake was positively correlated with fleece weight.—J. C. Gill.

1241

ZAKIROV, M. D. Vliyanie gornykh pastbishch na produktivnost' i zhivoi ves karakul'skikh ovets. [**The effect of mountain pastures on the productivity and liveweight of Karakul sheep.**] *Karakul. i Zver.*, 1955, **8**, No. 1, 9–17. [Inst. Animal Management Acad. Sci., Tadzhik SSR.]

Owing to the increase in arable land under cotton and other cash crops in Tadzhikstan it is necessary to use mountain pastures, since with the decrease of pasture in the plains and the increased number of livestock the plains pastures have become overstocked.

Experimentally one flock of sheep was taken to the mountain for the summer months while another flock was left on the plains. In the autumn the mountain sheep weighed 21·1 per cent. more than the flock that had been kept in the plains. They were also more productive, *i.e.*, had a higher percentage of twins, and the yearling lambs from the mountain ewes had a liveweight increase double that of their contemporaries from the plains.

The explanation of these differences was that after a period of growth of grass from the beginning of March to the middle of April, the plains pastures got burnt up with the heat. The mountain pastures, after the snow melted in May, continued to provide feed for a considerable time. Lambs born in the plains, after becoming accustomed to green fodder, had to fall back on their mother's milk when the pastures dried. On the mountain pasture both the ewes and their lambs were able to continue grazing for a considerable part of the

summer. By removing all the sheep to the mountains for the summer it was possible to maintain the grasslands in the plains in better condition, so that they could be used to better effect during the autumn, winter and early spring.

H. Scherbatoff.

1242

MOROZOV, N. L. and GAEVSKAYA, L. S. Pastbishchnoe soderzhanie karakul'skikh ovets v predokotnyi period. [**Pasture management of Karakul sheep in the pre-lambing period.**] *Karakul. i Zver.*, 1955, **8,** No. 1, 7–9. [All-Union Sci. Res. Inst. Karakul Management.]

At the end of the winter the pastures are dry. Winter pastures supply from 32 to 45 feed units (F.U.) and 1·3 kg. digestible protein per 100 kg. fodder, which means a daily intake of 0·81 to 0·93 F.U., where an in-lamb ewe weighing 45 kg. needs 1·1 F.U. and 92 g. protein daily. In order to avoid this deterioration winter pastures should be grazed in rotation so that the last 2 months of the pre-lambing period are spent on fresh pasture. Winter pasture is deficient also in minerals; the Ca : P ratio is 8 : 1, instead of 2 : 1. Apart from rotation of winter pastures, the ewes should receive a supplement of concentrates, 300 to 400 g. per head daily, according to liveweight. The weaker ewes should also be given bonemeal at the rate of 8 g. P per 100 kg. liveweight. Without rotation of pastures and supplementary feeding the ewes lose between 10 and 31 per cent. of their weight, depending on the severity of the winter, and also show signs of vitamin deficiency.

H. Scherbatoff.

1243

YURCHENKO, V. T. Opyt organizatsii tebenevki ovets. [**Practical experience of the organisation of free range pasturing of sheep.**] *Karakul. i Zver.*, 1954, **7,** No. 6, 16–18. [Karakul Sovkhoz "Volzhskii".]

As a result of correct use of pastures the sovkhoz "Volzhskii" saved 3400 tons of hay and 400 tons of concentrates during the year and only 1·3 per cent. of the sheep were lost. As the ground was covered with snow from the middle of November to 20 March these results were obtained only by letting the sheep out to the snowbound pastures; the plants under the snow were not frozen and kept their natural nutritive qualities even at very low temperatures. The sheep, however, were not able to maintain themselves exclusively on the pastures. Hay was given in the morning, and a second and larger feed of hay on their return in the evening. The amount depended on the weather and on the day's pasturing. The morning feed of hay was given on the pastures to accustom the sheep to follow the sledges out into the fields even at low temperatures such as — 30° C. During sharp frosts, when each sheep is given up to 1 kg. hay, they should be watered every 2 to 3 days; with increased rations of hay and when small amounts of concentrates are introduced into the ration, the sheep should be watered every day or every other day. With temperatures of — 10° C. and below and additional small amounts of hay up to 800 g., each sheep needs 2 to 2·5 litres of water every other day. Shortage of water was found to lead to abortion.—H. Scherbatoff.

1244

MOULE, G. R. **The supplementary feeding of sheep in Queensland. 1. Introductory.** *Queensland Agric. J.*, 1955, **80,** 279–286.

The variations in climate and feed naturally available for sheep in the sheep-rearing areas of Australia, the chemical composition of the most common perennial and annual grasses, and the botanical composition of the most common type of grassland are described.—T. D. Bell.

See also Absts. 460, 461, 1224.

PIGS

1245

SCHÄFER, H. and GRANZ, E. Boebachtungen über die Gewichtsverluste der Sauen während der Säugezeit. [**Loss of weight by sows during lactation.**] *Züchtungskunde*, 1955, **27,** 37–46.

A statistical study was made of weight changes in sows between the day after farrowing and the end of the fourth and eighth weeks of lactation. There were 57 Improved Landschwein sows which produced 240 litters and 2896 young, and 32 Berkshire sows which had 90 litters and 794 young. The Landschwein sows had at 8 weeks a mean of 9·1 pigs per litter and lost 16·3 ± 10·10 per cent. of their initial bodyweight, the Berkshires had 7·4 pigs and lost 14·1 ± 9·84 per cent. More weight was lost in the first month than in the second, when the young pigs had begun to eat solid feed. The sows received 2 kg. concentrates plus ¼ kg. for each piglet daily, with chopped green feed to appetite in summer and roots, but never potatoes, in winter. The Landschwein sows with the largest litters did not lose more weight than those with small litters, so the ration was probably sufficient for their requirements. There was a positive correlation between the total weight of the litter and the weight loss of the sow at 4 weeks, but not at 8 weeks. Very heavy sows had high litter weights and big weight losses at 4 weeks, very light sows

had light litters and smaller losses, but middle-sized sows showed less correlation between litter weight and bodyweight loss. Old sows with 9 or more litters, despite their large size, did not have heavy litters at 4 weeks and themselves lost less weight than young sows. The variation in weight loss at 4 and 8 weeks was less between 25 full sisters than between all the sows, showing a genetic influence.

Sows with a medium weight loss in their first lactation lived on the average longest and had the largest and heaviest litters ; those which lost little or no weight in the first lactation were poor performers later.—D. Duncan.

1246

COEY, W. E. **The relationship between the weaning weight of pigs and the number of pigs in the litter.** *Res. and Exp. Rec. Minist. Agric. N. Ireland*, 1952–53 (1955), **3,** 106–115.

Since selection of pigs for breeding is often done on the basis of prolificacy records, and litter weight at 8 weeks has been suggested as the most important measure of the efficiency of a breeding sow, it is desirable to know how the number of pigs in a litter will influence the weaning weight per pig. Earlier evidence on this point has been conflicting.

Analyses were made on the records of the Hillsborough herd of Large White pigs for the period 1933–1950, including results for all sows which produced 4 or more litters but excluding any litters not managed on the ordinary farm routine. . For each order of litter, the average weight per pig at 8 weeks decreased with increasing litter size, the effect being more marked for the first 2 litters than for the later ones. There was no evidence that there was a critical size of litter below which this effect did not operate. Consideration of the weights at 3 weeks and at 8 weeks showed that the greater part of the litter size effect was operative before the age of 3 weeks, the relation of 8-week weight per pig to 3-week weight per pig varying only slightly with litter size.

Over the period of these records, the level of supplementary feeding used in the Hillsborough herd was very low, and average weaning weights were often under 30 lb. Other published data, from herds with good supplementary feeding, have shown no litter size effect, and it is suggested that the different levels of supplementary feeding, rather than the different breeds of pigs involved, have been the cause of the contradictory results.

It is concluded that with successful supplementary feeding techniques there is no reason why large litter size should lead to low weaning weight, and that such techniques are even more important for first and second litters than for later litters.

I. McDonald.

1247

TEAGUE, H. S. **The influence of alfalfa on ovulation rate and other reproductive phenomena in gilts.** *J. Animal Sci.*, 1955, **14,** 621–627. [Ohio Agric. Exp. Stat., Wooster.]

In each of 4 trials 2 groups of gilts were used, one getting a ration containing alfalfa, and the other a similar ration with no alfalfa, but mineral and vitamin supplements to compensate. The experimental rations were given to the gilts, which were kept in dry lot, at least 19 days before they were served. They were served only once, and those that did not conceive, and some of those that did, were slaughtered, the latter early in gestation, for post-mortem examination. Birth-weights, litter numbers, vigour of newborn pigs and numbers surviving to 8 weeks of age were recorded.

The presence of alfalfa in the ration did not affect the breeding performance of the gilts that farrowed, as regards liveweight or vigour of the piglets, but the number of pigs born alive was significantly greater, as was the number which survived to weaning.

Of the animals killed and examined in early gestation those which had received alfalfa had a larger number of corpora lutea. The results suggest the presence in alfalfa of a substance which favourably influences ovulation rate and survival to weaning.—T. D. Bell.

1248

LENKEIT, W. and GÜTTE, J. O. Langfristige Untersuchungen zum äusseren und inneren Stoffwechsel des graviden und laktierenden Schweines. 1. Allgemeine Angaben zur Versuchsmethodik. [**Prolonged studies of external and internal metabolism of pregnant and lactating sows. 1. General account of methods.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 94–102. [Inst. Tierphysiol., Univ. Göttingen.]

Pigs kept in ordinary stalls and driven out every 2 to 3 hr. during the day and every 3 to 5 hr. at night were trained in a few days to urinate and defecate in a place where the excreta could be collected quantitatively. Metabolism studies could thus be made under more normal conditions than are possible with metabolism cages or harness. Some loss of urine in the stalls occurred when sows were in oestrus and in the last few days of pregnancy, but still the method was considered more accurate than the use of cages.

In studies of milk yield the piglets were allowed to suck at least 15, and up to 28, times daily. The number of young in the litter in such experiments should not be less than normal, since small numbers elicit only a small milk yield. When young pigs are to be weighed before and after suckling it is advisable to keep them in a light cage standing

permanently on the balance, since if they are picked up and weighed just before suckling they become so excited that accuracy is impaired. Correction was made for loss of weight by salivation by allowing piglets to suck the empty teats shortly after a feed. The losses found in this way ranged from a mean of 2 g. per feed in the first 5 days of life to 4·8 and 5·8 g. for pigs of 2 litters a month old.

For analysis of milk the litter was moved about in the first few days to ensure that at least 2 more teats were used than there were piglets. Then after a teat had been sucked for 8 to 10 sec. the piglet could be given another and the first one could be milked by hand. Different teats were used in succession.

The sows were fed twice daily and were given 2 to 3 litres of drinking water per kg. dry matter of the ration plus 0·8 litre per kg. milk yield. Foreperiods of at least 7 days were allowed on any ration before collections were made. For faecal collections 10-day periods were preferred, for milk and urine 5 or 10 days.—D. Duncan.

1249

HEIDA, J. De opfok van moederloze biggen. [**The rearing of motherless piglets.**] *Tijdschr. Diergeneesk.*, 1955, **80,** 616–623. [Beetsterzwaag.] English, French and German summaries.

The pigs were fed, 6 times a day at first, with synthetic milk on Nelson's formula (*Iowa Farm Science*, 1952, **10,** 147) in amounts increasing from 500 to 1750 g. daily. At 3 weeks they were given baby-pig meal mixed with water or buttermilk.

Of 1036 pigs fed in this way that did not have enough colostrum, 29·4 per cent. died; of 1457 that had enough colostrum, only 9·7 per cent. died. I. Leitch.

1250

GROOT, E. H. and MUYTJENS, E. E. Een vergelijkende proef met antibioticumhoudende en antibioticumvrije kunstmatige zeugenmelk voor de opfok van zeer jonge biggen. [**Comparative test of artificial milk with and without antibiotics in the rearing of very young pigs.**] *Landbouwk. Tijdschr.*, 1955, **67,** 497–504. [Lab. N.V. Chem. Fab. Noord-Holland, Beverwijk.]

Literature is briefly reviewed. In a test with 4 and 5 pigs of one litter, taken from the sow after 4 days and given an artificial milk, 2 in the first group without antibiotic died; the other 2 had diarrhoea and poor appetite. Appetite was good in the group which got 100 mg. terramycin per kg. air-dry "milk", and growth and condition were satisfactory.—I. Leitch.

1251

CUNNINGHAM, H. M. and BRISSON, G. J. **The utilization of lard by baby pigs.** *Canad. J. Agric. Sci.*, 1955, **35,** 371–376. [Chem. Div., Sci. Serv., Canada Dept. Agric., Ottawa.]

In 2 digestibility trials 12 baby pigs were fed on liquid purified diets with 13 per cent. solids. The diets contained 1·5, 3·0 and 4·5 per cent. fat, as lard. During each test period the diets were given to appetite for 5 days, and then held constant. The apparent digestibility of fat, protein, carbohydrate and dry matter was estimated at 1 to 2, 3 to 4, 6 to 7 and 8 to 9 weeks of age. The apparent digestibility of the lard was not affected by the percentage of lard in the diet, but increased significantly from 83·8 to 90·3 per cent. in the first trial and from 91·3 to 97·6 per cent. in the second trial from the second to the fourth week of age, and then remained constant. The apparent digestibility of protein and carbohydrate was similarly affected by age but not by the composition of the diet. The apparent digestibility of the dry matter increased with age, but decreased with increasing percentage of fat in the diet, because at the higher levels more fat was excreted in the faeces. Data on metabolic fat excretion were obtained from 4 pigs fed on a fat-free diet from 2 to 56 days of age, and from these data the true digestibility of the lard was calculated to be 1·23, 0·70 and 0·59 per cent. higher than its apparent digestibility in the low-, medium- and high-fat diets, respectively.—T. D. Bell.

1252

BECKER, D. E., NESHEIM, M. C., TERRILL, S. W. and JENSEN, A. H. **Problems in the formulation of a semi-synthetic diet for amino acid studies with the pig.** *J. Animal Sci.*, 1955, **14,** 642–651. [Illinois Agric. Exp. Stat., Urbana.]

A synthetic diet designed to be low in L-lysine and L-tryptophan was made up of dried skimmed milk, zein, maize starch, dextrose, wood flock, maize oil, minerals, vitamins and amino-acids. This was used in feeding and N balance trials with pigs of about 20 lb. liveweight.

The synthetic diet with 18 per cent. skimmed milk and 5 per cent. zein, with the tryptophan deficiency rectified and only 0·54 per cent. L-lysine, produced satisfactory rate and efficiency of gain, which were not improved by adding more L- or DL-lysine. When the percentage of milk was reduced to 12 per cent., zein increased to 7·5 per cent., and the L-lysine content was only 0·37 per cent., growth was poor, and added L- or DL-lysine did not improve it. A similar diet, not corrected for tryptophan deficiency, with 1 per cent. added L-lysine, was used and again growth and efficiency were poor. Supplements of 0·04 to 0·16 per cent.

L-tryptophan all improved rate and efficiency of gain, though they were still not satisfactory. The best level was 0·02 per cent., which was significantly better than 0·04 and 0·16 per cent. DL-Tryptophan, 0·08 per cent., depressed growth and efficiency.

A diet with no skimmed milk was used to estimate the apparent digestibility of zein, 11 per cent., as a source of protein, without amino-acid supplements. The apparent digestibility was 44·8 per cent. The pigs did not gain weight, but were in positive N balance.

In all the amino-acid trials some pigs showed signs of locomotor incoordination and coma. The syndrome was produced experimentally with a diet containing skimmed milk and zein but with 50 per cent. dextrose. Bloat was seen consistently in the evenings and was the cause of some deaths. Sometimes vomiting relieved the stress and pigs recovered. Post-mortem examination revealed no pathogenic organism, but yeast organisms were present and active in the stomach and caecum.

T. D. Bell.

1253

BECKER, D. E., NOTZOLD, R. A., JENSEN, A. H., TERRILL, S. W. and NORTON, H. W. **The tryptophan requirement of the young pig.** *J. Animal Sci.*, 1955, **14,** 664–673. [Illinois Agric. Exp. Stat., Chicago.]

In 3 experiments pigs weighing 30 lb. were used to estimate tryptophan requirement, and the effect of antibiotics and different levels of protein in the diet on this requirement.

The protein levels compared were 15 per cent., supplied largely by yellow maize and fishmeal, and 20 per cent., made up by the addition of 5 per cent. of zein. Such diets did not supply sufficient tryptophan for growth. Supplements of L-tryptophan were added. At the lower protein level it was found that 0·115 per cent. total L-tryptophan in the ration gave the best growth and efficiency, and this was considered the minimum requirement. The protein level did not affect the requirement. There was evidence that the pig could utilise some of the D-isomer from a racemic mixture. The addition of a mixture of terramycin, streptomycin and penicillin did not influence the response to different supplements of tryptophan. Pigs on a diet deficient in tryptophan had thyroids larger than normal, but dressing percentage and sp. gr. of the carcase were not affected.—T. D. Bell.

1254

LARSON, N. L., HILL, E. G. (with WARMANEN, E.) **The intestinal microflora of young swine obtained by hysterectomy. Observations on chlortetracycline supplementation.** *J. Animal Sci.*, 1955, **14,** 674–687. [Hormel Inst., Univ. Minnesota, Austin.]

In a series of 3 experiments foetal pigs were obtained by hysterectomy. They were not allowed colostrum, and had no contact with other pigs. In each experiment one group got the basal ration and the other had the same plus a supplement of chlortetracycline. Faeces were sampled at intervals and at the end of the experiments, 69, 99 and 88 days for experiments 1 to 3, respectively, the pigs were killed and contents of duodenum, ileum, caecum and large intestine were also sampled. In all samples bacterial counts of total aerobes, anaerobes, *Bacterium coli*, enterococci, lactobacilli, clostridia, yeasts and proteus were made.

There were slight differences between the diets and the housing conditions in the 3 experiments, but the differences in bacterial counts were as great within experiments as between them. Similarly, no effect of the antibiotic on faecal bacterial counts was found. In pigs getting chlortetracycline clostridia in the ileum were suppressed.

In a fourth experiment the respiratory activity of faeces and intestinal contents of pigs which had been treated in the same manner as in the previous experiments was estimated. Chlortetracycline greatly reduced the oxygen uptake of the contents of the ileum and that of the faeces to a less extent.

T. D. Bell.

1255

HARRINGTON, G. and TAYLOR, J. H. **The effect of antibiotic dietary supplements on the carcass measurements and dressing percentage of bacon pigs.** *J. Agric. Sci.*, 1955, **46,** 173–179. [Agric. Res. Counc., Sch. Agric., Univ. Cambridge.]

An analysis was made of data on carcase quality from 4 experiments with 402 bacon pigs in all.

There was no significant difference between carcase lengths of pigs on control diets and those of pigs on the same diets supplemented with aureomycin or penicillin. There was more variation between groups receiving different levels of penicillin than between control groups or groups receiving aureomycin. This variation in length was apparently associated with variation in growth rate, faster growing pigs having the shorter carcases.

There was no overall difference in backfat or belly thickness between control groups and those receiving either antibiotic.

Penicillin gave dressing percentages below those of the controls, but the difference was not statistically significant. Aureomycin gave dressing percentages significantly above those of groups receiving penicillin.

Diets containing animal protein gave higher dressing percentages than all-vegetable diets.

I. A. M. Lucas.

1256

BOEGER, O., WESTERHOFF, W. and WINTER, A. G. Untersuchungen über Antibiotika aus höheren

Pflanzen. Schweinemastversuche mit den antimikrobischen Wirkstoffen der Kapuzinerkresse. [**Studies of antibiotics from higher plants. Pig feeding experiments with antimicrobial substances from nasturtium.**] *Naturwissenschaften*, 1955, **42**, 464. [Versuchsanst. Futterungsfragen, Wahn, Rheinland.]

In a 5-month experiment with 10 pigs of the Improved White Landschwein breed fed from 36 to 100 kg. on a ration of ensiled potatoes and beet slices, improved fodder beet, dried sugar beet leaves and 3/4 kg. coarsely ground cereals, one group had also 300 g. protein concentrate and the other group half as much plus 8·3 g. per 100 kg. bodyweight of Tromalyt, a preparation containing about 1 per cent. of the antibiotic substance of mustard oil type discovered in the nasturtium by Winter and Willike (*Naturwissenschaften*, 1952, **39**, 236).

The mean daily weight gains were 591 and 567 g., respectively, but the amounts of true protein per kg. weight gain were 405 and 347 g.; that is, Tromalyt gave a saving in protein of 14·3 per cent., compared with 22 per cent. in an experiment with procaine penicillin at the same place. Although the Tromalyt group did not look well, with rough coats and rather grey skin, there was no difference in carcase quality. Nasturtiums are easily grown and pigs eat them readily without ill effect. It is suggested that other plants containing mustard oils may have similar properties, and more extensive studies have been begun. (See Abst. 1299).

W. M. Deans.

1257

Taylor, J. H. and Gordon, W. S. **Growth-promoting activity for pigs of inactivated penicillin.** *Nature*, 1955, **176**, 312–313. [Agric. Res. Counc., Field Stat., Compton, Berks.]

In one experiment 4 groups each of 8 pigs were fed from weaning to 200 lb. liveweight on a diet supplemented with 15 g. procaine penicillin G per ton. For 3 groups the supplementary penicillin was inactivated by heat, by penicillinase or by contact with the salts of heavy metals. Active penicillin was given to the fourth group and a fifth control group received the unsupplemented basal diet. Pigs receiving active penicillin grew 9·7 per cent. faster than the controls and had a 6·6 per cent. better feed conversion efficiency; pigs receiving inactivated penicillin grew 5·9 per cent. faster than the controls and had a 3·0 per cent. better feed conversion efficiency.

In a second experiment 120 pigs were kept from weaning to 120 lb. liveweight and different groups received the basal diet alone or supplemented with 15 g. of either active or inactivated procaine penicillin per ton. Other groups were given the basal diet and received intramuscular injections of 0·5 mg. per kg. bodyweight daily of either active or inactivated procaine penicillin. In this experiment the inactive material produced an increase in rate and efficiency of growth, irrespective of the route of administration. In a comparable experiment inactivated aureomycin hydrochloride was found to produce no growth response. Over both experiments inactive penicillin produced 66 per cent. of the growth response achieved with active penicillin. It is suggested that this response may have been due to the thiol amino-acid penicillamine, which is a relatively stable end-product common to each of the 3 methods of inactivation employed.—I. A. M. Lucas.

1258

Lucas, I. A. M. and Calder, A. F. C. **Thyroxine, stilboestrol and antibiotics in rations for castrated male pigs.** *Brit. J. Nutrition*, 1955, **9**, 267–279. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Castrated male pigs were reared and fattened from 40 to 200 lb. liveweight, the control group on a basal ration containing white-fish meal, with 17 per cent. protein, up to 100 lb. liveweight, and then with 13·5 per cent. protein. The feed was given as a meal wet with twice its weight of water, 2·2 lb. per head being given at the start, rising to 7·7 lb. by the last week. Experimental groups were given the same, with supplements of: group 2, sodium L-thyroxine pentahydrate with stilboestrol; group 3, Aurofac 2A; group 4, procaine penicillin; group 5, Aurofac 2A and the hormones; group 6, procaine penicillin and the hormones.

During the growing period, 40 to 100 lb. liveweight, groups 3 and 4 grew 23 and 21 per cent. faster and efficiency of feed conversion was 14 and 15 per cent. better, respectively, than in controls. In group 2 rate of gain was only 4 per cent. and efficiency 3 per cent. better than in controls during this period. The efficiency and rate of gain of groups 5 and 6 were both 8 per cent. less than those of groups 3 and 4.

From 100 to 200 lb. liveweight the improvements in groups 3 and 4 were 6 and 4 per cent. for efficiency, respectively, and 7 per cent. for growth rate for both groups. The hormones given to group 2 improved both growth rate and efficiency by 8 per cent. There was no difference between groups 3 and 5, but group 6 was 8 per cent. more efficient and grew 6 per cent. faster than group 4.

From weaning to slaughter the antibiotics given to groups 3 and 4 improved rate of gain by 15 per cent. and efficiency by 8 per cent., while the hormones alone, in group 2, improved growth by 6 and efficiency by 4 per cent. In group 5 growth rate was no better than in group 3, but efficiency was 5 per cent. less; group 6 was 5 per cent. more efficient than group 4 though rate of gain was not

affected. There was no difference between the groups in dressing percentage or carcase measurements, except that in group 6 depth of fat over the eye muscle was reduced. The reasons for the different effects of the hormones in the growing and fattening periods are discussed.—T. D. Bell.

1259

BRAUDE, R., CAMPBELL, R. C., LUCAS, I. A. M., LUSCOMBE, J. R., ROBINSON, K. L. and TAYLOR, J. H. **Antibiotics and endocrine stimulants as promoters of growth in fattening pigs.** *Brit. J. Nutrition*, 1955, **9**, 191–196. [Nat. Inst. Res. Dairying, Univ. Reading.]

At 5 centres 154 pigs were used in a coordinated experiment designed to test the value of additions of L-thyroxine or L-thyroxine and stilboestrol to rations already containing either aureomycin or penicillin. In addition control groups of pigs were given diets containing neither antibiotic nor hormone.

At 3 centres pigs on the diet supplemented only with antibiotic grew faster than the controls, but at 2 centres there was no difference with antibiotic.

The addition of both thyroxine and stilboestrol to a ration not containing antibiotic gave a slight improvement in rate and efficiency of growth at one of 2 centres.

When thyroxine and stilboestrol were added to a diet already containing antibiotic at 2 centres there was no growth stimulation but at 2 other centres there was a significant improvement. At one centre, toxic signs were seen which were apparently associated with the feeding of stilboestrol, and it was therefore considered inadvisable to use this substance as a growth stimulant.

At 2 centres the addition of thyroxine alone to a diet containing antibiotic gave a slight improvement in rate and efficiency of growth, but at a third it did not.—I. A. M. Lucas.

1260

OLOFSSON, N. E. Kompletta kraftfoderblandningar för svin. [**Complete concentrate mixtures for pigs.**] *Kungl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 105, 1954, pp. 6.

The recommended standard concentrate ration for pigs (see Abst. 3955, Vol. 17) contained mixed grain, bran, meatmeal, fishmeal, hay meal, salts and vitamin D. A mixture now produced commercially differs from the above in that the grain is wholly or partly replaced by the remaining ingredients and sometimes contains antibiotic. Directions are given with this product for the amount of grain to be added according to the age of the pig to make up a suitable ration. Pigs fed on rations containing 90 or 95 per cent. mixed grain and the remainder concentrate, and on rations containing only grain and skimmed milk, 0·5 or 1·0 kg. milk per kg. grain, had similar gains in weight. The higher cost of the rations containing concentrate was considered to be compensated for by the decrease in work required.—A. Hepburn.

1261

BECKER, D. E., TERRILL, S. W., JENSEN, A. H. and NOTZOLD, R. A. **Levels of protein for pigs fed a controlled concentrate intake on alfalfa pasture.** *J. Animal Sci.*, 1955, **14**, 652–658. [Illinois Agric. Exp. Stat., Urbana.]

Trials were made in 2 seasons with pigs on alfalfa pasture from weaning to slaughter. The pasture was kept lush by frequent clipping. Groups of pigs were given concentrate mixtures containing 8·9, 9·0, 10·0, 12·0, 14·0 or 16·0 per cent. protein. The source of protein was solvent-extracted soya bean oilmeal, and the percentage was regulated by varying the proportions of this and ground yellow maize. The mixture contained antibiotics and vitamin B_{12}. Results were considered from weaning to 100 lb. and from 100 to 200 lb. liveweight.

In both trials the best growth rate and efficiency of feed conversion from weaning to 100 lb. liveweight were in the group getting 12 per cent. protein. There was a significant difference between the trials: on all protein levels growth rate was not as good in the second, but efficiency was greater.

From 100 lb. to slaughter there was no advantage of the higher levels of protein when pigs had had 12 per cent. protein during the first period. The performance of the pigs during the fattening period was influenced by the diet during the growing period. Thickness of back fat was not significantly affected.—T. D. Bell.

1262

RICHTER, K. and OSLAGE, H. J. Zur Frage der Fleischqualitat und ihrer Beeinflussung durch die Fütterung. [**Quality of meat and the effect of diet on it.**] *Züchtungskunde*, 1955, **27**, 99–113. [Inst. Tierernähr. Forschungsanst. Landwirtsch., Brunswick-Völkenrode.]

In the first study there were 4 groups, each of 8 pigs. In all groups the concentrate ration consisted of 1 kg. per head of a mixture of barleymeal, soya meal, fishmeal and minerals. The rest of the ration, given to appetite, consisted of steamed ensiled potatoes alone, or with ensiled "Diffusionschnitzeln" in the ratio 2 : 1 or 1 : 2, or of artichokes. At the end of the fattening period the pigs were fasted for 15 hr. and then slaughtered. Carcase quality was judged by a points system on colour, quality of meat, back fat, fat : flesh ratio, hams, abdominal fat and general impression. The water-binding capacity of the meat was estimated. The carcase was measured and different parts were weighed.

There was no important difference in carcase quality between the 4 groups. The highest total of points was given to the group which received 2 parts of potatoes to 1 of " Diffusionschnitzeln ". This group had meat of rather dark colour.

In the second study, by the same methods, there were 3 groups of 8 pigs. All received fresh steamed potatoes to appetite. The 1 kg. concentrates contained for different groups either 150 g. fishmeal and 150 g. soya meal, or 75 g. of each, or only 50 g. fishmeal to provide protein.

The low-protein group had a low points count for carcase quality, but there was little difference between the other groups. The low-protein pigs had pale-coloured meat of poor quality, and the meat gave up its water more readily than that of the other groups. The hams and abdominal fat were poorly developed.—D. Duncan.

1263

CALDER, A. **Fodder beet for pigs.** *Rhodesia Agric. J.*, 1955, **52,** 238–245. [Pig. Indust. Board, S. Rhodesia.]

Trials of the possibilities of growing fodder beet in Rhodesia are in progress. It is hoped that the crop will replace some of the maize at present used for fattening pigs.

With this object in view an experiment was made with 4 groups of pigs fattened from weaning to 200 lb. liveweight. Group 1 got a meal supplement gradually increasing in amount till each pig was receiving 3 lb. daily, at a liveweight of about 69 lb., and then got fresh chopped fodder beet to appetite in addition to the meal. The second group did not get fodder beet until, at about 115 lb. liveweight, meal consumption was 4·5 lb. daily. The meal was then reduced to 3 lb. and fodder beet was given to appetite. The meal supplement had 18·5 per cent. protein. Groups 3 and 4 were given an allowance of the same supplement and maize. The supplement was 22·2 per cent. of the ration under 100 lb. liveweight, 20·1 per cent. from 100 to 150 lb. and 16·7 per cent. over 150 lb. liveweight. Group 3 was allowed this ration to appetite, and group 4 got a maximum of 5 lb. daily. The saving in meal was 198 and 128·6 lb. by groups 1 and 2, respectively, compared with group 3, and 178 and 107 lb. compared with group 4. Judged by standards for thickness of back fat and firmness of fat the pigs fattened with fodder beet were superior to those getting maize.—T. D. Bell.

1264

FIRTH, J. A. and JOHNSON, B. C. **Sewage sludge as a feed ingredient for swine and poultry.** *J. Agric. Food Chem.*, 1955, **3,** 795–796. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Baby pigs, 2 to 3 days old, were given a diet of synthetic milk. One group of 3 received daily 0·8 μg. vitamin B_{12} per kg. bodyweight intramuscularly and a second group of 4 received dry activated sewage sludge, containing from 4·0 to 7·5 μg. vitamin B_{12} per g., at a level of 10 per cent. of the dry matter of the diet. At this level the sludge had a detrimental effect on growth. With 5 per cent. of sludge growth was comparable with that of pigs on the basal ration with vitamin B_{12}.

In similar experiments with chickens levels of 2 and 10 per cent. sludge produced in 4 weeks growth responses 8 per cent. higher than that from the basal ration supplemented with 50 μg. vitamin B_{12} per kg. diet. Feed efficiency also was considerably improved.—J. S. Thomson.

1265

NOLAND, P. R., STEPHENSON, E. L. and DIGGS, B. **The value of several supplements as sources of unidentified growth factors for swine.** *J. Animal Sci.*, 1955, **14,** 628–635. [Dept. Animal Indust., Univ. Arkansas, Fayetteville.]

In 2 trials with weanling pigs the addition of 2 per cent. of the residue of cod liver after enzymic digestion increased growth rate when oxytetracycline (terramycin) was also present. In one trial 3 per cent. fish solubles increased growth, but in another no response was obtained with 2 per cent. of the same solubles. The basal ration contained soya bean meal, but when part of this was replaced by cottonseed meal the response to fish solubles was greater. Oxytetracycline also improved growth rate when added to the basal ration. Other supplements tried, replacing soya bean meal on an equivalent protein basis, were fishmeal, a fermentation product, and the water- and fat-soluble fractions of the cod liver residue. None of these alone or in combination produced any growth response, but when part of the soya bean meal was replaced by cottonseed meal the fermentation product did improve growth rate slightly.—T. D. Bell.

1266

TSCHIDERER, K. Schweinefütterungsversuch mit " Wal-Sol " und Magermilch als tierische Eiweissquellen. [**Pig feeding experiments with " Wal-Sol " and skimmed milk as sources of animal protein.**] *Bodenkultur*, 1954, **8,** 39–42. [Schweine-Versuchsanst., Schwechat, Vienna.]

In a trial with 2 groups of 7 pigs of the German Edelschwein breed fed for 133 days, from about 19 to about 100 kg. liveweight, on a ration of cereals and skimmed milk (details given), a supplement of 1·5 per cent. " Wal-Sol " (dried whale solubles, crude protein content 78·4 per cent.) gave smaller final weight, mean daily weight gain and feed efficiency than 3 per cent. " N-yeast ". There was no difference between the carcases at slaughter except that 3 of the pigs given whale solubles had firmer back fat than those given yeast.—W. M. Deans.

1267

LEVIN, N. Otkorm svinei na maslodel'nykh zavodakh. [**Fattening pigs at butter factories.**] *Mol. Prom.*, 1955, **16,** No. 3, 39–40. [Belglavmasloprom.]

1268

KLINE, E. A. and HAZEL, L. N. **Loin area at tenth and last rib as related to leanness of pork carcasses.** *J. Animal Sci.*, 1955, **14,** 659–663. [Iowa State Coll., Ames.]

The area of muscle of the loin (eye muscle) at the tenth and the last ribs on each side, the percentage lean cuts and the percentage loin of 23 carcases of 8 breeds and crosses were studied. No difference between sides was found. The area of the eye muscle at the last rib was 0·43 sq. in. greater than at the tenth rib. There was no difference between the correlation of percentage lean cuts or percentage loin and area of eye muscle at the tenth and the last rib. The additional accuracy obtained by measuring eye muscle at different locations in calculating percentage lean cuts or area of loin was too small to be worth while.

T. D. Bell.

See also Absts. 153, 366, 457, 462.

GOATS, RABBITS AND OTHER MAMMALS

1269

NORDFELDT, S., MELIN, G. and THELANDER, B. Försök med antibiotika i fodret till pälsdjur. [**Experiments with antibiotics in the ration of fur animals.**] *Kungl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 107, 1954, pp. 24. English summary.

The effects of aureomycin, terramycin, bacitracin, penicillin and vitamin B_{12} on pregnant and nursing mothers of silver fox, blue fox and mink and on their kits up to pelting time were observed. Results varied considerably. Weaned silver fox and blue fox kits fed on an all-vegetable diet did not grow normally and the addition of antibiotics or vitamin B_{12} had no effect. Fresh meat or fish was needed for good growth and antibiotics gave little improvement but were beneficial to suckling young. Procaine penicillin prevented diarrhoea and weight loss in mink kits fed for several days on tainted fish.—A. Hepburn.

1270

ABRAMOV, M. D. and POVETSKII, I. G. Normy i ratsiony dlya vzroslykh golubykh pestsov. [**Standard diets and rations for adult blue Arctic foxes.**] *Karakul. i Zver.*, 1955, **8,** No. 1, 26–33. [All-Union Sci. Res. Lab. Fur-bearing Animals and Pantiferous-Deer Management.]

The generally accepted standard rations for Arctic foxes were found in practice to be above requirements and they do not take into consideration biological and seasonal variations. For instance, the standard recommended for the entire period October to March is 700 Cal. daily, but at the Saltykov Animal State Farm foxes receive not more than 610 Cal. from October to December, 550 Cal. in January and 510 Cal. in February and March, with perfectly satisfactory results.

From practical experience on a number of state farms revised standards were evolved, the allowance varying from 525 to 650 Cal. daily according to the season. During the first half of pregnancy 650 Cal. was allowed and during the second 700 Cal. Meat and fish supply 50 to 70 per cent. of the energy, dairy products 5, grain 18 to 35 (a higher proportion of grain being given in summer than in winter and autumn, least of all in spring), vegetables 3 to 5, and fish oil 2 all the year round. During pregnancy the percentages are 65, 10, 18, 5 and 2. All these figures are averages which may be altered according to the health of the animals, seasonal or climatic variations, or liveweight.

H. Scherbatoff.

1271

BELYAEVA, V. A. Rol' ovoshchei v pitanii norok. [**The role of vegetables in mink nutrition.**] *Karakul. i Zver.*, 1955, **8,** No. 1, 40–44. [Sci. Res. Inst. Rabbit and Animal Management.]

The inclusion of green vegetables in the ration of minks had no bad effect on fur growth, but did have a detrimental effect on the digestibility of the ration and on the utilisation of protein. It is concluded that the amount supplied should not exceed 20 g. daily.—H. Scherbatoff.

1272

TSIREL'SON, N. B. Vliyanie polnotsennogo kormleniya krolikov na razvitie nasledstvennykh kachestv potomstva. [**The effect of improved feeding of rabbits on the development of hereditary qualities in the progeny.**] *Agrobiologiya*, 1954, No. 6, 138–139. [Moscow Technol. Inst. Meat and Milk Indust., Dept. Raising Agric. Animals and Special Zootech.]

The result of improved feeding of rabbits was apparent in the third generation, which showed a considerable advance on the second and first generations. This improvement showed itself in increased live- and deadweight, faster growth, larger size, better developed internal organs and increase in the amount of down by 6 to 7 per cent.

H. Scherbatoff.

See also Absts. 312, 368.

POULTRY

GROWTH AND FATTENING

1273

HOHLS, H. W. Der maximal mögliche tägliche Eiweissansatz von Leghornküken verschiedenen Alters. [**Maximum possible daily deposition of protein by Leghorn chicks at different ages.**] *Arch. Geflügelk.*, 1955, **19**, 327–353. [Bundesforschungsanst. Kleintierzucht, Celle.] English summary.

Some of the results discussed appeared in an earlier paper (Abst. 5854, Vol. 25). From these experiments and others it was concluded that the protein intake of chickens given practical rations to appetite often exceeded their capacity to deposit body protein. No way is known of increasing this capacity, which was not improved by antibiotics. It is suggested that poultry feeding costs may be reduced by selection of good converters of protein and by giving supplements to improve general efficiency of use of feed.—D. Duncan.

1274

HOHLS, H. W. **The rate of daily feed consumption, the daily maximum protein anabolism and their importance concerning the evaluation of feeding experiments with antibiotic supplements.** *Poultry Sci.*, 1955, **34**, 717–724. [Bundesforschungsanst. Kleintierzucht, Celle, Germany.]

When feed eaten provides more protein than can be retained the effects of penicillin may be negligible. This is often the case in experiments with antibiotics. Before the effects of an antibiotic can be evaluated it should be ascertained that feed intake is not excessive.—T. D. Bell.

1275

FANGAUF, R., KLEIN, F. W. and BARLÖWEN, G. v. Die Höhe des Proteinanteiles im Aufzuchtfutter für Hühnerküken. [**Level of the protein component in rearing rations for chicks.**] *Arch. Geflügelk.*, 1955, **19**, 358–368. [Versuchsanst. Kleintierzucht, Kiel-Steenbek.] English summary.

Twenty groups of 30 day-old New Hampshire chicks were used in this 8-week trial. There were 4 main divisions : animal protein only, and animal protein and vegetable protein in the ratio 2 : 1, 1 : 1 and 1 : 2, supplied by cod fishmeal, crude protein 66 per cent., and extracted soya grits, crude protein 44 per cent. Within each division there were 5 groups, for which the rations were adjusted to supply 14, 16, 18, 20 and 22 per cent. crude protein. All groups had 3 per cent. of a mineral mixture, calcium carbonate 40, calcium phosphate 40, salt 20 and manganese sulphate 0·025 per cent., and vitamins, vitamin A 4000 I.U., vitamin D_3 400 I.U., vitamin B_2 2·5 mg. and pantothenic acid 8 mg. per kg. diet. The rest of the ration, from 69 to 92·5 per cent., was a mixture of equal parts of ground wheat, ground maize, ground barley and wheat bran. The food was given dry and was available all the time. The results are presented in tables. Only 1 chick died of the 600.

Total feed consumption was not significantly affected by the nature of the protein but did increase with the crude protein content of the diet up to 20 per cent. and then fell. Weight at 8 weeks and weight gain behaved similarly. The best gain was with 20 per cent. protein of which 2/3 was animal. Feed efficiency, measured both by total nutrients and by feed consumed per unit gain, likewise varied little with the nature of the protein, and was best with 16 per cent. protein, all animal, and next best with half animal, half vegetable. Particulars of protein consumption also are tabulated and show that 22 per cent. crude protein is definitely wasteful. Least cost per kg. gain was found with 16 per cent. protein, all animal or half animal, half vegetable ; next came 18 per cent. protein, with animal and vegetable in the ratio 1 : 2.

Practical recommendations are that laying and breeding pullets should be reared on a 16 per cent. protein ration containing fishmeal 4·6 and soya grits 6·9 per cent., and that for fattening the ration should contain 20 per cent. protein (fishmeal 10·8 and soya grits 8·2 per cent.).—W. M. Deans.

1276

BENTON, D. A., SPIVEY, H. E., HARPER, A. E. and ELVEHJEM, C. A. **Factors affecting the growth of chicks on amino acid diets.** *Arch. Biochem. Biophys.*, 1955, **57**, 262–263. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Day-old chicks were given a synthetic basal ration containing adequate amounts of amino-acids instead of protein. To this was added one of the following supplements : casein 5 or 10 per cent. ; gelatine 5 per cent. ; casein 18 and gelatine 10 per cent. ; zein 5 per cent. ; fibrin 5 per cent. ; acid or alkaline hydrolysates of gelatine.

The growth stimulation in 13 days given by 5 per cent. casein was only slightly inferior to that given by 10 per cent. Gelatine 5 per cent. was twice as good as casein 5 per cent., and fibrin was as good as casein ; zein was intermediate. Between them zein and gelatine have deficiencies of all the essential amino-acids, and the difference in growth stimulation seemed to be related to their proline contents, but the addition of 1 per cent. proline to the basal ration, already containing 0·5 per cent.,

stimulated growth only slightly. The acid hydrolysate of gelatine was as effective as the intact gelatine, but the alkaline hydrolysate was not so effective, though growth was better when it was added to the basal ration than in control birds. The high level of casein and gelatine combined was scarcely better than 5 per cent. gelatine alone. The growth substance in acid hydrolysates of gelatine is being investigated.—T. D. Bell.

1277

SHAW, R. B. and NIGHTALL, E. W. **The influence of protein levels on poultry production.** *J. Sci. Food Agric.*, 1955, **6**, 390–401. [Univ. Nottingham Sch. Agric., Sutton Bonington, Loughborough, Leics.]

During 3 years, trials were made with growing chickens and laying pullets to compare rations with no protein supplement, rations with a supplement of bean meal, and normal rations with fishmeal. The crude protein contents of the laying rations were 10, 12 and 12 per cent. The birds had access to pasture when they reached 10 days of age. At 24 weeks old they were transferred to houses with slatted floors on a grass run for the laying period. Growth rates to 24 weeks and egg production during a laying season of 48 weeks were recorded.

On the fish meal ration growth rate was best, and the birds began to lay 2 to 3 weeks earlier. Egg production was also best on this ration, but it was satisfactory on all the rations. The extra production of the birds getting animal protein offset the extra cost of the ingredients. In all respects the group getting bean meal was least satisfactory.

In trials comparing laying hens folded on fresh pasture every day and receiving similar rations except that fishmeal was excluded from one group, the birds on the ration without fishmeal gave egg productions, in seasons of 47, 48 and 39 weeks, of 181·0, 191·6 and 130·9 on a hen-day basis. For the other group the egg production was 175·5, 183·7 and 150·2. The protein contents of the rations were 1 per cent. higher in the birds getting the animal protein. It was clear from the foregoing trials that on pasture satisfactory egg production could be maintained without fishmeal.

Finally, trials were made with laying pullets in batteries, receiving rations with or without 7 per cent. fishmeal. In all 3 trials egg production was much better when the fishmeal was given, and profits were greater. In 2 of the trials, the groups without fishmeal produced satisfactory numbers of eggs ; in the other trial it became obvious after 14 weeks that the birds were doing badly, and 3·5 per cent. fishmeal was added to the ration. Thereafter they produced almost as many eggs as the birds in the fishmeal group.—T. D. Bell.

1278

CARVER, D. S., RICE, E. E., GRAY, R. E. and MONE, P. E. **The utilization of fats of different melting points added to broiler feed.** *Poultry Sci.*, 1955, **34**, 544–546. [Swift and Co. Res. Labs., Chicago, Ill.]

Three experiments are reported on the effect on growth to 4 weeks and feed conversion of adding tallow, hydrogenated tallow, hydrogenated tallow fatty acids or oleic acid at a 3 per cent. level to the basal ration of day-old chicks. For 4 days during the experiment the amount of food eaten was accurately measured and the faeces were collected and analysed to estimate the absorption of the added fats.

Growth to 4 weeks was not affected by any of the fats. In one experiment feed conversion was improved by 6 per cent. with all fats except hydrogenated tallow. Hydrogenated tallow and hydrogenated tallow fatty acids were not well absorbed but unmodified tallow was, to the extent of 81 to 100 per cent. Inability to hydrolyse the hydrogenated product cannot explain the poor absorption.

J. S. Thomson.

1279

SCHNEIDER, A. J., BOHREN, B. B. and ANDERSON, V. L. **The effect of restricted feeding on several genetically controlled characters in the fowl.** *Poultry Sci.*, 1955, **34**, 691–702. [Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Two groups of New Hampshire and Single Comb White Leghorn chicks were given a starter ration containing 25·15 per cent. protein. To one group, the fast-growing group, this was given to appetite to 8 weeks of age ; then a growth ration containing 18·8 per cent. protein was given to 22 weeks of age. The other group, the slow-growing group, got the starter mash plus crimped oats, restricted to 2 hours' feeding daily after 6 weeks. After 8 weeks the same restriction was imposed, but the starter mash was replaced by the same growth mash as was given to the fast group. For the slow group the scale of feeding was further reduced at 12, 16 and 24 weeks of age, and they continued on the same ration to 28 weeks of age. From hatching to 28 weeks of age the feed intake of the slow group was 79 per cent. of that of the fast group to 22 weeks of age, and the total protein was 15·86 per cent. of the ration.

At the end of the growing period each group was divided into 2, half of each group getting a normal laying ration with 16·96 per cent. protein, and the other a high-protein laying ration with 21·34 per cent. protein, to appetite. A group of New Hampshires only got the starter mash to appetite to 8 weeks of age, the grower mash to 22 weeks of age, and then were divided and treated as the first 2 groups. The whole experiment lasted 60 weeks.

During the growing period growth was retarded in the restricted group, but after 4 weeks on either laying ration the difference disappeared ; maturity was retarded by 2 to 4 weeks ; there was no effect on mortality. In the laying period, from 28 to 60 weeks of age, mortality was lower in those groups in which feed had been restricted during the growing period. During the first 4 laying weeks egg size in the slow groups was less, but after that there was no difference. Fast-growing birds laid more eggs during the first part of the laying period and slow-growing more during the last part, so that over the whole laying period there was no difference between fast- and slow-growing birds in the total number of eggs produced. Significantly more eggs of hatchable size were produced by the slow growers. They were also slightly better in fertility and hatchability.

The protein level of the laying ration did not affect bodyweight, mortality, size or number of eggs, or number of eggs of hatchable size, but the high protein reduced fertility, hatchability and hatch of total eggs set. The response of both breeds was the same.—T. D. Bell.

1280

KRATZER, F. H., VOHRA, P., ATKINSON, R. L. and DAVIS, P. N. **Treatment of dried whey with various solvents ; effects upon the growth of chicks.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 273–274. [Dept. Poultry Husb., Univ. California, Davis.]

The addition of untreated dried whey to a synthetic ration for chickens gave only a small growth response or none. When the whey was extracted with 70 per cent. methanol, ethanol or *iso*propanol the extract and the extract plus residue were more active than the original whey ; the residue alone was only slightly better than the original dried whey. Dried whey treated with water in an amount equivalent to that of the solvent-water mixture increased the rate of growth above that with the original untreated dried whey. The addition of water to the basal ration had no effect.

J. S. Thomson.

1281

CARPENTER, K. J., ELLINGER, G. M. and SHRIMPTON, D. H. **The evaluation of whaling by-products as feeding-stuffs.** *J. Sci. Food Agric.*, 1955, **6**, 296–304. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Studies were made on 6 samples of whalemeat meal and 2 samples of condensed whale solubles. Estimation of the proximate components and selected minerals of these 8 by-products showed that the meatmeals were low in ash, in particular Ca and P, and that condensed whale solubles contained negligible amounts of Ca ; the level of chlorides was not unduly high in any of the meals but was higher in both samples of solubles. Selected vitamins and amino-acids were estimated microbiologically ; the condensed whale solubles were inferior to the meatmeals as sources of lysine, cystine, methionine, tryptophan, riboflavin, pantothenic acid and vitamin B_{12}. The by-products were tested as protein supplements for starting chicks ; of 936 chicks used in the study, 33 died. The calculated gross protein values, relative to standard casein = 100, from each trial gave values of 95 to 105 per cent. for the meatmeals and 55 to 60 per cent. for the condensed whale solubles. Toxicity tests also were made with the condensed whale solubles, with chicks from 1 to 4 weeks of age ; there was no evidence of toxicity when the solubles formed up to 15 per cent. of the ration.

G. F. Garton.

1282

WILDER, O. H. M., OSTBY, P. C. and GREGORY, B. R. **The use of chicken feather meal in feeds.** *Poultry Sci.*, 1955, **34**, 518–524. [Div. Animal Feeds, Amer. Meat Inst. Found., Univ. Chicago, Ill.]

The feather meals used had the following average percentage composition : crude protein 87, pepsin-digestible protein 75, tryptophan 0·56, lysine 1·34, methionine 0·51, ash 3·16 ; cholesterol 667 mg., choline 612 mg. and vitamin B_{12} 38·6 μg. per lb.

Three experiments are reported in which feather meal was added at levels varying from 2·4 to 6·2 per cent. of the total protein of a low-protein ration, chiefly of maize and soya bean oilmeal, for chickens fed from 2 days old up to 6 or 8 weeks. Comparisons were made with bloodmeal and meat-and-bone scrap as supplements. In some experiments the feather meal was supplemented with L-lysine or vitamin B_{12}.

The data from the 3 experiments showed that feather meal alone did not completely replace an equal amount of soya bean oilmeal in the basal ration, probably owing to its deficiency in lysine. The addition of lysine improved its value. Satisfactory growth and feed utilisation were obtained when the feather meal was combined with either bloodmeal or meat-and-bone scrap which remedied the lysine deficiency. The further addition of vitamin B_{12} to some of the rations produced a slight increase in growth rate.—J. S. Thomson.

1283

PALAFOX, A. L. and ROSENBERG, M. M. **A comparison of Hawaiian meat and bone meal, soybean oil meal, and herring meal in chick starter rations.** *Hawaii Agric. Exp. Stat. Tech. Bull.* No. 28, June 1955, pp. 15.

Meat-and-bone meal is a by-product of the local meat industry and contains 46 to 50 per cent. protein. Four experiments are reported on its

value for growing chickens in conjunction with soya bean oilmeal and herring meal.

The results showed that meat-and-bone meal, which is cheaper than soya bean oilmeal, could be incorporated in the ration up to 6 weeks of age at a level of 16 to 18 per cent. without loss of feed efficiency.—J. S. Thomson.

2384

McDonald, M. W. and McClymont, G. L. **High energy chicken rations based on crushed wheat and meatmeal.** *Agric. Gaz. N.S.W.*, 1955, **66,** 265–269. [Poultry Exp. Stat., Seven Hills.]

Results are reported of 6 experiments with chickens to demonstrate that high-energy rations based on wheatmeal and high-protein meatmeal, though dearer, are more economical than standard-type rations containing bran and pollards, in that less feed was consumed per lb. weight gain. A source of B vitamins, such as buttermilk powder, and of manganese, to replace those in milling offals is required.—J. S. Thomson.

1285

Fangauf, R., Klein, F. W. and Barlöwen, G. v. Binsenmehl als Geflügelfutter. [**Bulrush meal as a feed for poultry.**] *Arch. Geflügelk.*, 1955, **19,** 374–379. [Versuchsanst. Kleintierzucht, Kiel-Steenbek.] English summary.

This trial was suggested by the facts that bulrushes (*Scirpus lacustris*, L.) are eaten by cattle and that fishermen in Finland give cut-up dried remnants from weaving to their hens along with reindeer moss and thereby get more eggs in winter.

The dry matter of fresh bulrushes was found to contain 17 or 18 per cent. crude protein. The dry matter of the bulrush meal amounted to 94·2 per cent., consisting of ash 37·7, crude protein 12·7, fat 1·7, fibre 15·2, N-free extract 26·9 ; it was thus much poorer in nutrients than green alfalfa meal, except in carotene, 144 mg. per kg. dry matter. This suggested a trial with bulrush meal replacing alfalfa meal.

Three groups of 30 day-old New Hampshire chicks were fed for 8 weeks on the usual Steenbek ration of ground maize 30, ground wheat 30, wheat bran 15, alfalfa hay meal 3, dried yeast 3, cod fish-meal 8, soya grits 8, calcium carbonate 1·2, calcium phosphate 1·2, salt 0·6, manganese sulphate 0·025 per cent. and a mixture supplying vitamins A and D, or the same with bulrush meal replacing the alfalfa meal, or the same with 6 per cent. bulrush meal and less maize, wheat and bran. The feeds were given as a mash available all day.

With 3 per cent. bulrush meal feed consumption was increased, but not with 6 per cent. The final mean weights on the assumption of a 50 : 50 ratio of the sexes were 600·4, 690·8 and 579·4 g., respectively. Feed efficiency, measured by total nutrients consumed per 100 g. gain, was 10 per cent. greater with 3 per cent. bulrush meal than with the other rations.

It was concluded that bulrush meal can replace alfalfa meal in the rearing of chickens, but should not exceed 4 per cent. of the ration.—W. M. Deans.

1286

Burton, H. W. **Sorghum doesn't harm chickens.** *Queensland Agric. J.*, 1955, **80,** 221–224.

Experiments with day-old cockerels showed that large amounts of sorghum, up to 60 per cent. of the ration, could be given without affecting growth rate. Feed efficiency was reduced, but this was offset by the lower cost of the sorghum compared with wheatmeal. A ration of 40 per cent. sorghum and 20 per cent. wheat was the most economical. Mortality rate was not affected.—J. S. Thomson.

1287

Arscott, G. H., Johnson, L. E. and Parker, J. E. **The use of barley in high-efficiency broiler rations. 1. The influence of methionine, grit and stabilized animal fat on efficiency of utilization.** *Poultry Sci.*, 1955, **34,** 655–662. [Dept. Poultry Husb., Oregon State Coll., Corvallis.]

In 2 experiments barley replaced 25, 50 or 100 per cent. of the yellow maize in rations for fattening broilers from hatching to 9 weeks old. In the first experiment supplements of 0·05 per cent. DL-methionine with or without grit were given, and in the second 4 or 8 per cent. fat as stabilised prime tallow.

In both experiments substituting 25 per cent. barley gave growth and efficiency of feed conversion comparable to the results on the all-maize ration. No benefit was gained from the supplement of DL-methionine at any level of barley, and the addition of granite grit was of no value. In the second experiment 4 or 8 per cent. fat improved growth rate and efficiency on 25 and 50 per cent. barley to the levels obtained with the all-maize ration, but the results on 100 per cent. barley did not compare favourably with those of the other groups. On the all-maize ration with 8 per cent. added fat feathering was poor, but this was not so when at least 25 per cent. of the maize was replaced by barley. Efficiency, but not growth rate, was slightly improved by the addition of fat to the maize ration.—T. D. Bell.

1288

West, J. W. **Cottonseed meal as a substitute for soybean oil meal in poultry rations.** *Poultry Sci.*, 1955, **34,** 547–553. [Dept. Poultry Husb., Mississippi Agric. Exp. Stat., State Coll.]

Two trials were made with New Hampshire chickens fattened for the broiler market, and one

with Broad Breasted Bronze turkeys getting a starter ration. Replacement of soya bean oilmeal by cottonseed meal was investigated. Both the meals were solvent extracted, and the cottonseed meal was free from gossypol. The broiler ration contained 20 per cent. protein, and the turkey starter ration 24 per cent. The basal rations were complex mixtures, with vitamin, mineral, antibiotic and arsonic acid supplements. The oilseed represented up to 20 per cent. of the starter and up to 25 per cent. of the broiler ration, and within this range the cottonseed meal and soya bean oilmeal were varied so that all combinations of the two were tested.

It was found that cottonseed meal could replace up to 80 per cent. of the soya bean meal satisfactorily, but when only cottonseed meal was given growth rate and efficiency of feed conversion were depressed, though in one of the tests with broilers this effect was not so clear as in the other. The meals together in any proportion gave better growth rate than either meal alone, which suggested that there was a complementary relationship.

Limited observations on carcase quality and uniformity did not show any specific effect due to cottonseed meal.—T. D. Bell.

1289

ROSENBERG, M. M. **B-grade molasses in starter, grower, and layer rations for chickens.** *Hawaii Agric. Exp. Stat. Bull.* No. 109, July 1954, pp. 26.

The results are reported of 7 feeding trials with chickens, cockerels and laying pullets to determine to what extent B-grade molasses and bagasse pith could replace yellow maizemeal in the diet. In most of the diets the levels of herring meal and soya bean meal were adjusted to replace the protein lost when molasses was substituted for maize.

Molasses was tolerated even when all the maize was replaced, so that B-grade molasses would be useful as an emergency carbohydrate feed. Efficiency of feed conversion fell as the level of molasses rose. In starter rations the most economical level was between 22 and 33 per cent. of the ration. In the trials with cockerels from 6 to 13 weeks the best results were obtained with levels of 17 to 18 per cent. With laying pullets levels up to 24 per cent. did not affect egg production, but feed consumption rose steeply at higher levels. Bagasse pith adversely affected growth of chickens and cockerels at levels of 4 to 9 per cent. of the ration.

J. S. Thomson.

1290

MORRISON, A. B., SCOTT, M. L. and NORRIS, L. C. **Evidence for an unidentified mineral required by the chick.** *Poultry Sci.*, 1955, **34**, 738–740. [Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

A mixture of maize distiller's solubles, fish solubles, grass juice, a dried whey product and penicillin mycelium meal, substances believed to contain an unknown growth substance for chickens, was added to a purified complete diet and given to chicks from hatching to 4 weeks of age. Another group of chicks got the purified ration plus the neutralised ash of the mixture of supplements given to the first group. A control group got the purified ration only. Weights at 4 weeks in 2 experiments on the diets in the above order were 445, 442; 402, 411; and 342, 330 g. These results indicate that at least some of the unidentified substance was contained in the ash.

Addition of minerals other than those contained in the basal ration, increase in the amounts of minerals already present, change in the Ca : P ratio and the addition of chlortetracycline (aureomycin) did not stimulate growth beyond that of controls.—T. D. Bell.

1291

PETERSEN, C. F., WIESE, A. C. and PAPPENHAGEN, A. R. **Unidentified chick growth factors. 1. Purified assay diet and crude supplement response.** *Poultry Sci.*, 1955, **34**, 673–678. [Dept. Poultry Husb., Univ. Idaho, Moscow.]

A purified diet made up of alpha-(soya bean) protein, DL-methionine, glycine, soya oil, minerals, vitamins, cerelose and penicillin, in which the cerelose and alpha-protein were varied to give rations of 20, 24, 28 and 32 per cent. protein, was tested with chickens from hatching to 4 weeks old. It was found to support satisfactory growth and maintain good health at all levels of protein. To the purified rations were then added substances thought to contain unidentified growth factors. Growth was stimulated by herring meal, sardine fish solubles, a 50 per cent. lactose dried whey product, Biopar C [not further described], and a defatted liver residue. Combinations of these supplements did not give any greater stimulus than the substances separately, and it is suggested that the New Hampshire chickens used in these trials, from hens reared on a standard breeder mash containing 25 per cent. fishmeal and kept on deep litter, may have had sufficient reserves of some growth factors which, when combined with others, have been shown to cause greater growth response.—T. D. Bell.

1292

CAMP, A. A., CARTRITE, H. T., QUISENBERRY, J. H. and COUCH, J. R. **Further information concerning unidentified chick growth factors.** *Poultry Sci.*, 1955, **34**, 559–566. [Texas Agric. Exp. Stat., Gonzales.]

Experiments are described in which day-old White Rock chicks were given a complete ration

with the addition of supplements which were thought to contain unidentified growth factors. Weights of birds at 10 weeks of age, efficiency of feed utilisation, and mortality were recorded.

Supplements of fish solubles, dried whey, fermented whey, hydrolysed whey and an antibiotic fermentation product all stimulated growth. The factor in dried and fermented whey appeared to be different from that in fish solubles and the antibiotic fermentation product. Combinations of the supplements thought to contain the different factors stimulated growth more than any single supplement. Hydrolysed whey may have contained a third factor, but the extra stimulation of growth when it was added to the other supplements may have been due to the increase of energy in the ration.—T. D. Bell.

1293

NORDIO, C. B. Le attuali conoscenze sui nuovi fattori esogeni che stimolano l'accrescimento ponderale dei polli. [**The new exogenous factors which stimulate growth in weight of poultry.**] *Riv. Zootec.*, 1955, **28,** 228–236.

A review.

1294

WEST, J. W. and HILL, J. E. **Protein requirement of broilers as influenced by antibiotics.** *Poultry Sci.*, 1955, **34,** 628–634. [Mississippi Agric. Exp. Stat., State College.]

Eight trials were made in which basal rations containing 16, 18, 20, 22 or 24 per cent. protein were given to chickens of broiler type from hatching to 9 weeks of age. The basal rations were supplemented with aureomycin, terramycin or bacitracin, 10 g. per ton feed, or procaine penicillin, 2 g. per ton feed. The best growth rate and efficiency of feed conversion were obtained on the ration containing 18 per cent. protein and any of the antibiotic supplements: without antibiotics at least 20 per cent. protein was necessary to produce comparable results. Mortality was reduced when antibiotics were given.—T. D. Bell.

1295

MORENG, R. E., BOLIN, D. W., BRYANT, R. L. and GOSSLEE, D. G. **The influence of environment, diet and mode of administration on the response of chicks to antibiotics.** *N. Dakota Agric. Exp. Stat. Bull.* No. 398, June 1955, pp. 11.

Achromycin, bacitracin or aureomycin given by mouth to chicks, 1 week old, improved growth and efficiency of feed conversion in trials lasting 4 and 6 weeks. Subcutaneous implantation of bacitracin at the base of the head depressed growth, and the depression was less when penicillin was given by mouth. Change of environment from batteries to pens did not affect the response of the birds to the antibiotics. The responses obtained in old and new environments in 4 trials were not consistent, and no conclusion could be drawn.—T. D. Bell.

1296

RICHTER, K. and GERLACH, G. Kükenaufzuchtversuche mit gestaffelten Fischmehlgaben und dem antibiotischen Beifuttermittel "Entan". [**Chick rearing tests with graded amounts of fishmeal and the antibiotic supplement "Entan".** *Arch. Geflügelk.*, 1955, **19,** 354–] 357. [Inst. Tierernährung Forschungsanst. Landwirtsch., Brunswick-Völkenrode.] English summary.

Two trials with 14-day-old Brown Leghorn chicks are reported. In the first, 3 groups of 50 were fed for 7 weeks on a basal ration of ground barley 25, ground oats 25, ground maize 20, wheat bran 10, cod fishmeal 6, extracted soya grits 9, dried yeast 2, charcoal 1 and a 7 : 3 mixture of calcium carbonate and phosphate 2 per cent., or the same with 0·5 per cent. Entan, a preparation containing terramycin and vitamin B_{12}, or a ration with fishmeal only 2, ground oats 24, soya grits 14 and the other ingredients as before, with 0·5 per cent. Entan. Mean final weights were 649·4, 708·9 and 696·7 g., respectively; efficiency of use of feed was about 20 per cent. higher in the groups given Entan, and mortality was about 2 per cent., as against 11·8 per cent. in the control group.

In the next year there were 4 groups of 65 chicks and the trial lasted 8 weeks. The basal ration (group 1) contained barley 39, oats 30, no maize, dried yeast 3 and the other ingredients as before. Group 2 had the same with 0·5 per cent. Entan. Group 3 had fishmeal 4·5, barley 38·5, soya grits 11 and the rest as before, with 0·5 per cent. Entan. Group 4 had fishmeal 3, barley 38, soya grits 13, and the rest as before, with 0·5 per cent. Entan. Mean final weights were 730·1, 815·6, 770·8, 762·7, respectively. Efficiency was greater and mortality less when Entan was given, but the differences were less striking than in the first trial.

W. M. Deans.

1297

AMSCHLER, J. W., NOWAK, H. and PAMMER, H. Gänsespätmast mit Aurofac-2A und Fortafeed mit verschiedenen Mineralstoffgaben unter besonderer Berücksichtigung der Lebergewichte. [**Late fattening of geese with Aurofac-2A and Fortafeed with different amounts of minerals, with special reference to liver weight.**] *Bodenkultur*, 1954, **8,** 43–49. [Inst. Tierzucht, Hochsch. Bodenkultur, Vienna.]

Results are tabulated of a 4-week trial, in October-November 1953, with 8 groups each of 60 geese in their first year, imported birds of the Jugoslav

breed, of a mineral mixture, Aurofac-2A or Fortafeed, singly, in pairs or all 3 together, as supplement to a basal ration of ground barley, ground maize, flaked oats and dried skimmed milk. The mineral mixture, of 3 parts calcium carbonate, 1 part salt and 1 part antimony trisulphide, was given at the rate of 30 kg. per 1000 kg. feed; Aurofac-2A, 1·360 kg., supplying 10·8 g. aureomycin, per 1000 kg.; and Fortafeed, a low-protein substitute for yeast containing residues from riboflavin and aureomycin manufacture, citrus meal, extracted soya bean meal, liver meal and diatomaceous earth and guaranteed to supply riboflavin 2, pantothenic acid 4, nicotinic acid 9, choline chloride 10 and folic acid 0·06 mg. per lb. at least, 1·330 kg. per 1000 kg.

Mean initial weight was about 3·4 kg. Mean weight gains in g. were: control without supplement 1483, minerals 1416, Aurofac-2A 1701, Fortafeed 1600, Aurofac-2A plus Fortafeed 1734, minerals plus Aurofac-2A 1667, minerals plus Fortafeed 1600, minerals plus Aurofac-2A plus Fortafeed 1667. Thus minerals reduced weight gain, but Fortafeed and still more Aurofac-2A increased it, and the best results were got when both Fortafeed and Aurofac-2A were given. The effects on feed efficiency were similar. All groups remained healthy. Neither Aurofac-2A nor Fortafeed affected the quality of the meat. Geese given minerals had livers on the average 49 g., nearly 40 per cent., heavier and the extra cost of the minerals, 1·67 schilling per bird, might be economically worth while if the livers were to be sold separately (here they went with the bird).—W. M. Deans.

1298

COATES, M. E., DAVIES, M. K., HARRISON, G. F., KON, S. K. and PORTER, J. W. G. **The mode of action of antibiotics in chick nutrition. 2. The effect of penicillin in clean and stale premises.**

COATES, M. E. and PORTER, J. W. G. **3. The nature of the "infection" counteracted by penicillin.** *J. Sci. Food Agric.*, 1955, **6**, 419–421; 422–425. [Nat. Inst. Res. Dairying, Univ. Reading.]

For previous work by the authors in support of the theory that antibiotics exert their beneficial effect on growth by counteracting a transmissible "infection" see Abst. 1422, Vol. 22.

2. Chickens from an "infected" room used for intensive rearing where growth was sub-optimum were transferred to new premises and the "infected" house was thoroughly cleaned and fumigated. When day-old chickens were re-introduced, growth rate was better and the addition of penicillin to the diet gave only a slight response, 2·5 per cent. at 2 weeks. When further batches of chickens were introduced growth rate deteriorated and the effect of penicillin increased to 22 per cent. at 40 weeks, in spite of the use of disinfectants. In the new premises with "infected" chickens, growth was significantly depressed and penicillin was clearly beneficial.

Three experiments were made with chickens reared in field units. In the first, penicillin significantly stimulated growth in units deliberately "infected", but had no significant effect on "uninfected" chickens. In the 2 subsequent experiments in which the "uninfected" chickens were moved to fresh ground but the "infected" were not, the trend of effect was similar to that in the disinfected chick room, in that a small but significant response to penicillin occurred in the "uninfected" groups.

3. Preliminary results with chickens in isolation units, which are described, indicate that the "infection" could be transmitted by feeding the gut contents of "infected" chickens to newly hatched "uninfected" chickens. The infective agent was destroyed by autoclaving the gut contents. It was not present in the gut contents of uninfected chickens. It is suggested that the infective agent is a living organism or group of organisms.

J. S. Thomson.

1299

SCHARPENSEEL, H. W. Über einige neue Probiotika und Antibiotika in der Geflügelernährung. **[New probiotics and antibiotics in poultry feeding.]** *Arch. Geflügelk.*, 1955, **19**, 380–384. [Dept. Agric. Chem., Araneta Inst. Agric., Manila.]

In view of the possible risks of using powerful antibiotics to rear animals for food production, it is suggested that more attention should be given to the substances with mild antibiotic activity which occur naturally in flowering plants, and which Winter (*Medizinische*, 1955, No. 2, 73) calls "probiotics". Some preliminary results are given of experiments with day-old chicks and pullets given young nasturtium leaves or an oily extract of these; from the third week until laying began they made better weight gains than a similar group given Aurofac. Results at least equal to those with Aurofac were also obtained with press juice from the leaves of *Cassia sophora*, and with small amounts of papain, a tenth or less of that theoretically required to digest the protein of the ration, and costing only 9 Pf. per bird for the 5-month growing period. All 3 supplements, particularly nasturtium, gave some protection against fowl-pox virus. Further experiments to test this, and on the use of the supplements for hens in lay, will be reported later. (See also Abst. 1256).

W. M. Deans.

1300

EBBELL, H. Der Einfluss von 3-Nitro 4-Hydroxy Phenylarsinsäure allein und in Kombination

mit einem Terramycin-Produkt auf das Kükenwachstum. [**Effect of 3-nitro-4-hydroxyphenylarsonic acid alone and in combination with a terramycin product on growth of chicks.**] *Arch. Geflügelk.*, 1955, **19**, 255–267. [Ovomaltine Farm, Oberwangen bei Berne.] English summary.

In experiments lasting 6 or 10 weeks with practical chick and broiler all-mash rations, neither 3-nitro-4-hydroxyphenylarsonic acid alone, at 50 g. per 1000 kg., nor terramycin at 0·04 per cent., nor both improved feed efficiency. Each gave better final weights than the basal rations alone, and both together improved final weights by from 17 to 27 per cent.—D. Duncan.

1301

ALMQUIST, H. J. and MERRITT, J. B. **The effects of a detergent in the diet of range turkeys.** *Poultry Sci.*, 1955, **34**, 740–741. [Grange Co., Modesto, Calif.]

The addition of 0·10 per cent. sodium alkylamyl sulphonate to the mash of range turkeys had little effect on rate of growth but improved feed conversion efficiency, particularly in hens. The hens consumed much more grain than the toms.

J. S. Thomson.

1302

FOX, T. W. **Effects of progesterone on growth and sexual development in S.C. White Leghorns.** *Poultry Sci.*, 1955, **34**, 598–602. [Massachusetts Agric. Exp. Stat., Amherst.]

Intramuscular injection of 2, 4, 8 or 16 mg. progesterone weekly for 12 weeks had no effect on average bodyweight gain or shank length of Single Comb White Leghorn chickens although there was greater variation in the treated groups. Comb index (height × length) and testis size were reduced by the treatment. Females removed from treatment after 16 weeks took longer to reach sexual maturity than controls.—J. S. Thomson.

See also Absts. 337, 433, 701.

EGG PRODUCTION

1303

GERRIETS, E., WERNER, C. and STAHL, H. Vergleichende bioklimatische Untersuchungen am Huhn unter verschiedenen Haltungsbedingungen. [**Comparative bioclimatic studies on hens under different housing conditions.**] *Arch. Geflügelk.*, 1955, **19**, 276–300. [Abt. Geflügelkrank., Humboldt Univ., Berlin.] English summary.

A long discussion, with references, on the effects of climate and housing on the health and performance of livestock, with special reference to poultry, occupies the first third of this paper. Thereafter the results of a one-year trial from October 1953 to September 1954 with 4 specially built henhouses at Damsdorf, Brandenburg are reported. The houses were (1) solidly built of 12-cm. brick, (2) lightly built of Heraklith slabs, (3) lightly built of double pine planking with Piatherm insulating material between, (4) lightly built of single pine planking with the front open. In other details they were similar. Full descriptions and photographs are given. All measured 2 × 2 × 2 metres and had 2 alternative sandy runs. Each housed 10 pullets and 1 cock of the Leghorn breed. In the morning and evening each group had 500 g. sprouted oats, at midday 1000 g. of a soft mash of steamed potatoes 1, green feed (in winter carrots) 1 and laying meal 3 parts. The percentage composition of the laying meal was : ground barley 66, protein concentrate (45 per cent. of animal origin) 10, ground oats 10, wheat bran 10, minerals and trace elements 3, charcoal 1. Laying meal was available in self-feeders at all times. Each group also had daily 2 ml. liver oil with additional vitamins A, D_2 and E. Records of temperature, humidity, feed consumption, weight gains and egg production are tabulated.

The total feed consumption in kg. was, for group 1, oats 198, mash 362, laying meal 60 ; the corresponding figures for the other groups were 196, 360, 59 ; 199, 358, 61 ; 196, 370, 62. In February, the coldest month, all the groups ate less oats and more mash, presumably because the mash was given hot. Consumption of both rose when laying began in March but fell to the usual amounts in April. The fowls in the open-fronted house did not eat more than the others even in very cold weather. When winter cold first set in in December the first 3 groups lost weight but not the group in the open-fronted house. Weight gains during the year were 404·5, 223, 337 and 332 g., respectively. Egg production in all groups fell in December. The monthly averages from October to February were 13·0, 15·1, 14·5, 13·6. Over the whole period the monthly averages were 16·8, 18·8, 18·3, 17·6 and the total egg weights 117, 123, 125, 118 kg. All groups remained healthy in spite of respiratory diseases in the neighbourhood. Slight frost damage to head appendages occurred in January and February, most severe in the open-fronted house, but combs were not permanently damaged. Freezing of eggs was avoided by collecting them at 2-hr. intervals. Further trials are being made.—W. M. Deans.

1304

ATKINSON, R. L., FERGUSON, T. M., QUISENBERRY, J. H. and COUCH, J. R. **Dehydrated alfalfa meal, condensed fish solubles, distillers dried solubles and dried whey as supplements to an**

all-vegetable protein turkey laying diet. *Poultry Sci.*, 1955, **34**, 730–735. [Dept. Poultry Husb., Texas Agric. and Mech. Coll. System, College Station.]

Turkey hens were given a basal ration of soya bean meal, yellow maize, milo, minerals, vitamins and antibiotics. To this was added, at the expense of soya bean meal and milo, dehydrated alfalfa meal, alone or in combination with condensed fish solubles, dried whey, dried whey and condensed fish solubles, dried distiller's solubles, dried distiller's solubles and condensed fish solubles, or condensed fish solubles, dried distiller's solubles and dried whey. For 17 weeks hatchability and fertility were recorded in 2 periods, 1 to 11 and 12 to 17 weeks. The tocopherol content of the yolk in the 17th week was estimated.

The supplements did not improve fertility or hatchability in the first period; during the second period hatchability on the basal ration fell from 83·7 to 31·0 per cent., but in the groups getting supplements it was maintained at 54·3 to 81·0 per cent., the highest level being in the group getting dried alfalfa meal and condensed fish solubles. The tocopherol content of the yolks was higher than values reported in the literature, and was increased by the supplements. In the second period embryonic mortality during the first 7 days was reduced by dried alfalfa meal and during the last 4 days by the other supplements.—T. D. Bell.

1305

MAYFIELD, H. L., ODLAND, L. M., PAGE, L. and HALBROOK, E. R. **Egg quality as influenced by certain feed combinations.** *Montana Agric. Exp. Stat. Tech. Bull.* No. 493, November 1953, pp. 22.

Experiments were made over 5 years to compare mash mixtures containing 2 of the common grains, wheat, oats and barley, with a more complex mixture containing maize and milling by-products in their effects on egg size and quality. Some of the rations were supplemented with riboflavin, fish solubles or animal-protein factor.

Yolk colour of eggs from hens receiving maize was generally darker than from those not receiving maize, and palatability was better. Eggs from hens receiving 2 of the common grains were higher in vitamin B_1 than those from hens getting maize. A supplement of 2 mg. riboflavin per lb. feed increased the riboflavin content of the eggs from 2·41 to 3·97 μg. per g. The addition of condensed fish solubles to the ration containing wheat and oats affected egg quality measurements, but it had no effect when added to the ration containing maize, wheat and oats.

Except for egg weight and yolk colour all measurements of egg quality were similar for rations with and without animal-protein factor.

J. S. Thomson.

See also Absts. 456, 1277.

FOOD ECONOMICS AND STATISTICS

1306

HARRAR, J. G. **Food for the future.** *Science*, 1955, **122**, 313–316. [Rockefeller Found., New York.]

A paper read at the symposium of the American Association for Advancement of Science in Berkeley, Calif., in December 1954.

1307

DICKINS, D. **The home-produced food supply of non-owner farm families. Some factors associated with it.** *Mississippi Agric. Exp. Stat. Bull.* No. 512, March 1954, pp. 24.

A survey was made in May and June 1952 of the value of home-produced food for the previous year in 443 white and negro non-owner farm families in the cotton areas of Mississippi and causes associated with differences in these values. Only families of 2 or more members were included. The average net income was $1389. There were 249 families using less than $75 per person per family of home-produced food and 194 families using over $75. The greatest differences were in the amount of animal products, especially milk, produced and used and in the amount of processed home-produced foods. Average total expenditure on food was $496 for the group producing less (44 per cent. of the net income) and $518 in the group producing more (30 per cent. of the net income).

J. S. Thomson.

1308

BREIREM, K. Matforsyningen og jordbruksproduksjonen. [**Food supply and agricultural production.**] *Tidsskr. norske Landbruk*, 1955, **62**, 183–234.

This article reviews the major problems of world food production as set out chiefly in publications of The Economic Commission for Europe, FAO and FAO staff; of the growth of world population as discussed by Bennett (Abst. 4015, Vol. 24) and others, and finally discusses Norwegian diet. Supplies per head of the Norwegian population are about 3100 Cal. daily with 53 g. animal protein, chiefly from milk and fish. The shortages are of fruit and vegetables. A high proportion of the nation's food, reckoned in calories, is imported, but, in spite of the growth of population, the gross import of cereals and oilcakes has not risen since

the war because the use of concentrates for animal feeding has fallen. Agricultural technique has greatly improved. Yet Norway produces only 12 per cent. of the wheat it uses for bread and although milk production has risen slightly since 1950, it has not kept pace with demand. More wheat could be supplied by Sweden with advantage to both countries, and Norway requires a new and consistent policy in respect of subsidies on concentrates to encourage the improvement and greater use of homegrown feedingstuffs.—I. Leitch.

1309

NÖU, J. and NILSSON, O. Produktivitet och produktivitetsberäkningar inom jordbruket. [**Productivity and the estimation of productivity in agriculture.**] *Kungl. Lantbruksakad. Tidskr.*, 1955, **94**, 159–209. English summary.

As measures of production sales and turnover are rejected and the concepts of gross, " rensad " (gross less bought-in seed and feedingstuffs), and net production are discussed. The expression of production by number, weight or volume in terms of calories, crop units, or cereal units is reviewed and assessment in terms of money units, income or standard prices is considered, and later related to input in terms of labour units and land units. Efficiency and capacity to produce are then considered as criteria of successful production, the several concepts are linked and examples are given of their practical application to farming in Sweden.

I. Leitch.

1310

JONES, W. D. and HALLETT, G. **An economic survey of beef production in Wales 1949-54.** *Univ. Coll. Wales, Aberystwyth, Dept. Agric. Econ.*, 1955, pp. 26.

The world meat situation is reviewed. Although world production of meat has increased since 1939, the amount exported and available to the United Kingdom is less than it was then. This underlines the necessity for an increase in home-produced beef.

To investigate the economics of fattening beef cattle in Wales a study was made from 1949 to 1954 of 31 farms in each of the first 3 years, 30 in the fourth and 23 in the last. The farms were from 72 to 600, average 300 acres, of which 2/3 was permanent grass. The number of cattle handled ranged from under 20 to over 250, with an average from 82 to 189 per farm. Most animals were of beef breeds, but there were some dual purpose, and some dairy, and most were steers. Fattening was the main enterprise on some farms, and on others it was combined with or subsidiary to dairying. There was no winter fattening in yards, but only summer fattening off grass. Just under half the stores were purchased in the autumn and kept in store condition until spring. The rest were bought in the spring. Costs of purchasing, keeping and fattening the animals and the income from their sale were recorded, showing the return per animal. This ranged from £12 16s. 10d. to a loss of 12s. 11d., average profit £6 7s. 2d. Comparison of the 5 worst and the 5 best showed that the difference in profit was not related to the size of the farm, the number of cattle handled or the cost of production. When spring and autumn purchases were compared, the higher price paid in the spring was offset by the cost of keeping through the winter. It was difference in weight between purchase and sale, and thus in rate of gain, that was related to the profit per animal. Thus skill in selecting stores and in management were of great importance.

Profits from beef production in Wales, though above those in 1949, are still not high, but the demand for beef is great, and its production is encouraged by deficiency payments and subsidies on hill cattle and calves. With improved grassland to increase output of beef per acre, improved dairy stock to reduce the acreage required for milk production, the use of dual purpose breeds which can be fattened when not required for dairy replacements, and a good supply of stores from upland farms not suited to fattening, but needing cattle in combination with sheep for pasture management, the beef industry can be maintained and improved with advantages to both producer and consumer.—T. D. Bell.

1311

PHILLIPS, J. R. E. **Economic studies in Welsh dairy farming. 5. General report on the costs of milk production for 60 herds during 1951-52. With summary tables for a reduced sample for 1952-53 and 1953-54.** *Univ. Coll. Wales, Aberystwyth, Dept. Agric. Econ.*, 1955, p. 42.

The conditions influencing costs and returns on Welsh dairy farms are discussed. It is shown that feedingstuffs and labour accounted for 57 and 17 per cent., respectively, of the gross costs. Food costs rose from £49 7s. in 1948–49 to £63 8s. in 1951–52. The average yield per cow rose from 666 to 703 gal. over the same interval. There was a wide variation in costs and returns between farms due to differences in size and geographical location of the farms, to differences in average yield per cow in the herd and to different methods of feeding and management. Tables summarising the costs and returns of a reduced sample of herds for 1952–53 and 1953–54 are given in an appendix.

J. N. Aitken.

1312

ROWBOTTOM, J. D. and HORSBURGH, A. S. **Report on costs of milk production for the year ended 30th September 1954.** *Edinburgh and East of*

Scotland Coll. Agric. Dept. Econ., Bull. No. 48, March 1955, pp. 32.

This report is based on the production records of 45 herds. All counties in the East of Scotland College area were represented. Compared with the previous year the average milk yield per cow increased by 10 gal. to 788 gal. The increase was largely due to increased summer milk production. The total net cost of keeping a cow for the full year was £90 5s. 2d. Cost of feedingstuffs formed 61 per cent. and cost of labour 19 per cent. of the total cost. A study of the feedingstuffs used on the different farms showed that grass silage was becoming increasingly popular.

The feeding of up to 1½ tons of concentrates per head per annum was shown to be profitable in herds giving an average yield of 1000 gal. per cow ; it would be uneconomic in herds where the average yield was only 750 gal. per cow.—J. N. Aitken.

1313

GREGORY, W. F. **Economics of pastures in feeding systems for dairy cows.** *Alabama Agric. Exp. Stat. Bull.* No. 296, June 1955, pp. 29.

1314

IMPERIAL CHEMICAL INDUSTRIES, LTD. **Milk from leys in the weald of Sussex. A case study of a small dairy farm.** *Agric. Development Dept. Bull.* No. 6, May 1955, pp. 42.

This bulletin describes the alterations in cropping and livestock production which have taken place on a small 95-acre, poor-land dairy farm during the years 1948 to 1953. The growing of cash crops was gradually abandoned, and the total acreage under tillage crops reduced. The most significant change in the cropping programme was the replacement of permanent grassland by leys. This, with a well planned programme of manuring, silage-making, haymaking and strip grazing, has enabled the farmer to increase the number of stock, reduce the amounts of purchased concentrates and obtain a bigger margin of profit per cow and per gal. milk.—J. N. Aitken.

1315

BEYNON, V. H. and DAVIES, T. H. **Production and profit on a small Devon farm.** *Agriculture, J. Minist. Agric. Engl.*, 1955, **62,** 258–262. [Dept. Econ., Univ. Bristol.]

An account is given of the management of a farm of 53 acres. By selecting replacements to the dairy herd from high-yielding heifers milk production has been increased. High production per acre has been achieved by concentrating on growing kale and well fertilised 3- and 4-year leys which are strip-grazed. The good utilisation of the land has allowed the dairy herd to be increased, and an attempt is made to keep the number of followers down to a minimum. The poultry section of the farm has also been increased. The improved management has increased the farm income threefold.—T. D. Bell.

1316

MCKERGOW, P. R. W. **Grassland dairy farming in the Industrial Pennines.** *Agriculture, J. Minist. Agric. Engl.*, 1955, **62,** 262–266. [Nat. Agric. Advisory Serv., E. Province.]

A description of 2 farms of 60 and 23½ acres at altitudes of 900 and 800 ft. and one of 42 acres in a valley are described. They are dairy farms, relying for all feeding on grazing or conserved grass with some purchased concentrates. How milk production is maintained and regulated for the market is explained and discussed.

T. D. Bell.

1317

KOORNNEEF, H. De mogelijkheden van besparingen bij de voedering in de Nederlandse veehouderij. [**The possibility of economies in feeding in Dutch animal husbandry.**] *Landbouwk. Tijdschr.*, 1955, **67,** 403–419.

When the feed eaten by farm stock in the Netherlands is valued at market price a year's consumption totals 2·5 to 3 milliard gulden. A survey of the distribution of feed over the several classes of stock, with special reference to cattle (76), pigs (12) and poultry (6), which between them take 94 per cent. of the total feed in terms of protein and 92 per cent. in terms of starch equivalent, has been made with the help of agricultural organisations and a random survey of feeding practice, to cover 15 years' records, and the gross consumption is compared with feeding standards. The main assumption is that the stock population is unaltered in number and production over the period of survey ; losses in getting and preserving pasture products are ignored. There are known to be differences in the application of standards. In some districts cows, in milk and dry, are given 15 to 25 per cent. more than the standard allowance of starch equivalent (S.E.) ; heifers and calves get less than the standard. Further complications are that, in spite of similar chemical analyses, hay from clay soil is considered better than hay from sandy soil and that better than hay from peat soil.

In terms of S.E. pigs get 45 per cent. of their feed from mixed rations, 30 per cent. from home-grown grain, 20 per cent. from potatoes and some sugar beet, and 5 per cent. from whey and skimmed milk. In general allowances exceed the standards by about 11 per cent. in protein and 38 per cent. in S.E. Comparing different breeding centres feed per kg. weight increase ranges from 3 to 3·75 feed units and in general practice it is assessed at about 4.

Records of feed consumption by poultry are difficult of analysis, but in general consumption appeared to be about 6 per cent. above theoretical requirements.

Altogether it appears that the possible saving, in terms of imported concentrates, would be of the order of 175 million kg., valued at 40 to 50 million gulden annually. And that means a saving on total feed cost of about 2 per cent. Greater economies could possibly be made by improving the composition of rations and by replacing existing stock by more productive animals.—I. Leitch.

1318

BONADONNA, T. Riflessioni sulla produzione e sui consumi nazionali di prodotti di origine animale. [**Production and national consumption of products of animal origin.**] *Zootec. Vet.*, 1955, **10,** 216–218. [Ist. Sper. Ital. "L. Spallanzani" Fecond. Artific., Milan.]

Animal production is subsidiary, though complementary, to crop production in Italy, and animal products should not be exported at the expense of other products such as fruit, wine and rice. There is a great potential demand for the animal products at home. The majority, particularly in the south and the islands, are poorly fed, and too much is spent on luxuries. By educating the public and increasing their purchasing power, the potential demand should be made a reality, and the increased supply of animal products available from improved technique and from economically necessary imports would be absorbed.

T. D. Bell.

1319

CONSOLINI, A. Della carne nelle zone tradizionalmente a produzione lattiera. [**Beef production in districts traditionally devoted to milk production.**] *Zootec. Vet.*, 1955, **10,** 196–204.

In Italy periodic crises arise in the milk market because of overproduction, and on the other hand production of meat is below requirements. It is suggested that dairy farms could even out the discrepancy by devoting more milk to rearing calves and then fattening them for slaughter. This would withdraw some milk from the market and at the same time increase the supplies of meat. For this dual purpose breeds are preferable. It is shown that at current prices such a programme would not reduce the farmer's profits.

T. D. Bell.

1320

HALNAN, E. T., MOSKOVITS, I. and THRELKELD, T. (Eds.) **Problems of animal feeding in Europe. Efforts towards self-sufficiency.** *FAO Agricultural Development Paper* No. 51 and *European Association for Animal Production Publ.* No. 3. Rome, Italy, June 1955, pp. viii+147.

Livestock feeding in Europe was the subject of a technical meeting convened jointly by FAO and the European Association for Animal Production in Paris from 23 to 28 March 1953. Fifty-seven delegates attended from 16 countries in Europe and North Africa and observers were sent by 3 other international organisations.

This publication has 5 chapters which deal comprehensively with the problems; they are based on papers prepared by 5 authorities and incorporate the discussions to which the papers gave rise. Professor A. M. Frens, Hoorn, discussed recent trends in the production and utilisation of feedingstuffs in Europe, dealing with the changes which have occurred in 10 of the countries of Europe in particular and proceeding to review recent developments in the production of feedingstuffs as grassland and green fodders or as arable crops and in the use of compound mixtures. Professor Crasemann, Zürich, dealt with technical problems arising from the more extensive use of homegrown feeds, the conditions influencing the amount of fodder consumed, the extent to which their protein contents limit the use of homegrown feedingstuffs, the adequacy of supplies of fat and the limitations of self-sufficiency on the farm either natural, from soil or climatic conditions, or artificial, from man's misuse of the soil and its products.

The 3 following chapters are on special problems of feeding livestock. Those of cattle feeding by Professor Breirem, Oslo, concern the principles of the evaluation of feeds, those of pig feeding by Professor Richter, Brunswick-Völkenrode, the use of homegrown feeds, minerals, vitamins and antibiotics, and those of poultry keeping by Dr. Halnan, Cambridge, the problems of bulk and fibre and of animal protein and antibiotics in the diet of poultry.

At the end of the meeting recommendations were approved on the drawing up of a general programme to assist individual governments in their long-term projects and on the need for standardising methods of calculating feed requirements and the value of available feedingstuffs. It was agreed also that EAAP should examine methods of calculating protein requirements, that work on the value of feeds should be attempted, and that FAO should continue its study of legislation governing the manufacture of and trade in compound feedingstuffs in European countries.

D. Harvey.

1321

LETARD, E., LABOUCHE, C. and MAINGUY, P. Les sous-produits industriels dans l'alimentation animale. [**Industrial by-products in animal feeding.**] *Rev. Élevage Méd. vét. Pays trop.*, 1955, **8,** 285–296. [École Nat. Vét. d'Alfort.]

Industrial by-products for animal feeding are in small supply or non-existent in French West

Africa because the corresponding industries have not yet been developed. Such as there are, are used to a small extent for pig feeding in the ports. In 1953, 125,000 tons of groundnut cake were exported. Most of the article consists of descriptions and data on the composition of by-products from groundnut, oil palm, coconut, sesame, cotton, karité (a native tree), beref (*Citrullus vulgaris*), coffee and fish. Most of these are quoted from the literature, but local values are given for groundnut straw, sesame cake, beref cake and fishmeals.—W. M. Deans.

1322

JONES, W. D. **Economic factors in egg production.** *Univ. Coll. Wales, Aberystwyth, Dept. Agric. Econ.*, 1955, pp. 21.

To compete with Danish eggs on the free market it is necessary that the United Kingdom reduce the cost of production. This can best be done by using as much homegrown feed as possible, and high egg yields per bird are necessary. A survey was made of 6 flocks kept in batteries, 10 on deep litter and 4 on free range. The cost of feed was highest in batteries and lowest on free range, but under the intensive systems the birds could be kept under closer observation, with lower mortality rates, and with regular culling, only the high-yielding birds were maintained. This meant that profits per bird were higher. The production of eggs for the market when prices were highest was an added advantage. Capital outlay was highest for batteries, and for this reason deep litter would possibly be preferred for new enterprises, though accurate culling would not be so easy.

When deciding the time for hatching, or buying day-old chicks, the seasonal fluctuations of egg prices should be kept in mind. The price of culls and the value of the reduced number of eggs in the second year should be considered when the question of keeping hens for the second laying year arises. It might be better to keep culls until Christmas, when they would sell for more, but this would depend on the cost of their keep and the small returns from their eggs. Hatching or purchase of day-old chicks in autumn instead of spring is discussed.—T. D. Bell.

1323

GÓMEZ, J. A. Algunos problemas de tenencia y uso de la tierra en Colombia. [**Some problems of tenure and use of land in Colombia.**] *Acta agronom., Colombia*, 1955, **5**, 67–115. English summary.

A description of conditions in Colombia shows the very low standard of living of the population, particularly in rural areas. Ignorance, a bad educational system, undernutrition resulting in illness, inability to work and a very short expectation of life which means that agricultural skill is not developed, all aggravate the state of affairs, and the distribution of the land plays a large part in creating and perpetuating the present conditions. A brief historical review shows how this system of land tenure has developed, in which a large proportion of the land is in the hands of a few owners, and is producing as little as one-sixth of what it could produce and supporting only a few of the people that it could support. Legislation introduced to improve things has been ineffective. In contrast to these vast enterprises there are some small holdings, but on them there are too many working, so that none can work to capacity. Here ignorance and poverty contribute to poor use of the land.

The solution does not lie in simple redistribution of the land. Industry should first be developed, so that it will be able to absorb the excess labour which will result from mechanisation and improved farming methods.—T. D. Bell.

1324

Numeros indices agricolas. [**Index numbers in agriculture.**] *Inst. nac. Invest. agronom., Madrid*, 1952, Nos. 1, 2, pp. 18; 1954, No. 4, pp. 9.

DIET IN ETIOLOGY OF DISEASE

GENERAL

1325

ZORNIG, H. H. Untersuchungen zum Problem der Nutzungsdauer von Rindern des Verbandes "Rotbunte Schleswig-Holsteiner". [**The useful life of cows of the Red Pied Schleswig-Holstein Association.**] *Züchtungskunde*, 1955, **27**, 71–87. [Tierzucht Inst., Univ. Kiel.]

From the herdbook of the Red Pied Schleswig-Holstein Association were selected only those cows for which records were complete, in number 5376, about 7 per cent. of all entries between 1920 and 1952.

The cows which calved first at 2 years 7 months of age had the longest useful life of 6 years 7 months and 6·1 calvings. The useful life fell after a first calving at 3 years 5 months to 5 years 3 months, and there was one calf fewer. The cows which calved first at 2 years 7 months gave in all 84 kg. less milk annually than those which calved at 2 years 9 months. The best age for first calving was considered to be about 2 years 7 months to 2 years 10

months. Of all the cows 26·05 per cent. calved at this age, 15·87 per cent. earlier and 58·12 per cent. later.

The mean time between calvings was less than 1 year for 38·5 per cent. of the cows, more than 430 days in only 5·8 per cent. The commonest interval was 370 days. The reason given most often for loss of cows was sterility, 31·5 per cent., and the next was " sent for fattening ", 11 per cent., which also included sterile cows. With the third group, udder disorders, 8·28 per cent., these accounted for nearly half the losses. " Old age " accounted for 6·32 per cent., but included some cows only 8 years old. The percentage of cows discarded for sterility or sent for fattening was highest in the group with milk yields of 2500 kg. or less and fell with increasing yield. Half of those discarded for sterility or sent for fattening were within 2 years of their highest annual yield. The percentage discarded for udder disorders was lowest with low milk yields and rose with yield, but again nearly 60 per cent. were within 2 years of their peak output. The mean highest annual yield was given by cows 8 years old, with range from 5·5 to 10·5. The mean age reached by cows was 9 years 4 months, their useful life 6½ years and number of calves 5·8. As a result of selection, useful life increased with annual yield up to 5000 or 5500 kg.

The findings are discussed and compared with others in the literature.—D. Duncan.

1326

WITHERS, F. W. **Wastage and disease incidence in dairy herds.** *Vet. Rec.*, 1955, **67**, 605–612. [Minist. Agric. Vet. Lab., Weybridge.]

Records of 58 dairy herds in Surrey and 64 in Berkshire in 1950 to 1951 and of 55 in Surrey, 58 in Berkshire and 50 in Wiltshire in 1951 to 1952 were studied. Of these, 75 in the first year and 110 in the second were tuberculin-tested herds, the remainder being accredited or unregistered. It was understood that the farmers who co-operated in the investigation had the better managed farms, and the results would be slightly biased. The average herd sizes were 25, 31 and 33 for Surrey, Berkshire and Wiltshire, respectively.

Deaths and disposals were divided into 6 classes, the first 5 representing cows disposed of outside the dairy industry, because of natural death, age, infertility, poor yield or disease and accident, and the sixth representing disposals in the normal course of business, *e.g.*, sales within the industry. The average wastage for the 2 years represented by cattle in classes 1 to 5 was 19·1 per cent. of the total cows in the study, and by cattle in class 6 was 5·2 per cent. Of the deaths, 1·4 per cent. of all cows, 37 per cent. were associated with calving, 13 per cent. were due to bloat and 10 per cent. to accident and injury; the remaining 40 per cent. were due to miscellaneous causes such as yew poisoning, anthrax and blackleg. The animals culled for infertility, poor yield and age were grouped together since the distinction between these reasons for culling was not always clear-cut, the main reason given depending to some extent on the judgement of the farmer or recorder. These animals represented 11 per cent. of the total cows. It was found that of all pregnancies 1 in 14 ended in stillbirth or abortion, and it was thought that since the introduction of S19 vaccine abortions had been reduced: of the abortions recorded few were due to brucella. The incidence of retained placenta, milk fever and mastitis increased with age. Mastitis was generally found at the beginning of lactation, usually during the first few weeks, after which it decreased but occurred again towards the end. As a rule only one quarter was affected. The incidence was greater in the larger herds.

T. D. Bell.

1327

WHITEHAIR, C. K. and GALLUP, W. D. **A study of winter disorders in cows and ewes fed low-quality roughage.** *Oklahoma Agric. Exp. Stat. Tech. Bull.* No. T. 53, March 1955, pp. 31.

A high incidence of loss by death in range cows in Oklahoma was caused by a disorder typified by inability of the cow to get to her feet, lack of appetite and rough hair coat. It occurred almost exclusively in cows in late pregnancy, 4 to 7 years old, in late winter and early spring. The affected cows had been fed on poor hay or pasture, and the cause was thought to be underfeeding, particularly in respect of protein, though a few responded to Co treatment, and sometimes calcium gluconate and dextrose were effective. Improving the ration could bring cows back to health and prevent the occurrence of the disorders.

An experiment with pregnant ewes was made in which they were fed on poor hay typical of that used on farms where the disorder had occurred. Giving this hay alone resulted in signs similar to those in cows. Supplements supplying energy, in the form of maize starch, maize or molasses, protein as soya bean meal, maize gluten meal, solvent- or hydraulic-extracted cottonseed meal, and added Ca, P and trace minerals were tested for their ability to prevent the disorder. Urea nitrogen was also used to replace part of the protein supplement.

When no supplement was given many of the ewes died during pregnancy, and a small supplement of protein, though it prevented death, did not enable the ewes to produce vigorous lambs, and few of the offspring survived to weaning. Supplements supplying energy were not effective. Larger supplements of protein raised reproduction and lactation performance to normal, and there

was no advantage from adding minerals. In the deficient ewes anaemia developed to a greater degree during pregnancy and early lactation than in the ewes which performed normally. Levels of Ca, P and vitamin A in the blood did not suggest that deficiency of any of them was responsible in any way for the disorder. Urea was used satisfactorily to replace some of the protein, and the quality of the protein seemed to be immaterial.

T. D. Bell.

1328

RYDELL, R. O. **A new approach to bovine bloat therapy.** *J. Amer. Vet. Med. Assoc.*, 1955, **127,** 74. [Wheaton, Minn.]

Administration of calcium intravenously to cows suffering from parturient paresis was found to cause belching. It is suggested that in such cases the nervous mechanism associated with belching is less sensitive. Four bloated cows were treated by injection of calcium and success is claimed.—A. T. Phillipson.

1329

FERGUSON, W. S. and TERRY, R. A. **Bloat investigations.** *J. Agric. Sci.*, 1955, **46,** 257–266. [Imperial Chemical Industries, Ltd., Jealott's Hill Res. Stat., Bracknell, Berks.]

This is an account of many attempts to produce bloat. The administration of 2·5 litres of lucerne juice produced bloat fairly regularly; this is equivalent to about 5 kg. fresh lucerne. No method of preventing the bloat so produced was found except by using foam-breaking agents; these appeared to have some preventive action.

A. T. Phillipson.

1330

BETTS, A. O., WHITTLESTONE, P., BEVERIDGE, W. I. B., TAYLOR, J. H. and CAMPBELL, R. C. **Virus pneumonia in pigs. Further investigations on the effect of the disease upon the growth-rate and efficiency of food utilisation.** *Vet. Rec.*, 1955, **67,** 661–665. [Dept. Animal Pathol., Univ. Cambridge.]

Five experiments at the Department of Animal Pathology, Cambridge University, and 3 at the Agricultural Research Council Field Station at Compton are reported. In each experiment littermate pairs of pigs free from virus pneumonia were used, one pig being retained as a control and one having injected into the lumen of the trachea suspensions of lung infected with virus pneumonia. In all, 120 pigs of several different breeds and breed crosses were used and environmental conditions varied considerably between experiments. The results from all experiments were similar. The control pigs showed no sign of infection with virus pneumonia either during life or at post mortem, but the infected pigs all coughed during life and at post-mortem examination most showed lesions of virus pneumonia. Occasionally, and usually between 19 and 26 weeks of age, infected pigs lost weight, their appetites became poor and rectal temperatures rose to above 104·5° F. The term "secondary breakdown" was used to describe this condition. At Cambridge, over all 5 experiments, infection with virus pneumonia caused an average depression in rate of growth of 16·7 per cent. and an average increase in meal eaten per lb. liveweight gain of 20·6 per cent. At Compton, over 3 experiments, the average depressions in growth rate and efficiency of food conversion caused by the infection were 17·1 per cent. and 24·6 per cent., respectively. The applicability of these results to field conditions is discussed.—I. A. M. Lucas.

1331

VESSELINOVITCH, S. D. **Electrophoretic studies of oedema disease in swine.** *Brit. Vet. J.*, 1955, **111,** 398–403. [Ontario Vet. Coll., Guelph.]

The pattern of the serum protein fractions of pigs in good health and pigs suffering from oedema disease was studied by electrophoresis on filter paper. The pigs were 2 and 3 months old. The pattern of the "normal" pigs was characterised by low γ-globulin, and the albumin : globulin ratio was 0·86. In infected pigs with clinical oedema there was a decrease of albumin and an increase of α- and γ-globulins, with an albumin : globulin ratio of 0·35. Infected pigs without clinical signs had low albumin but an increase in γ-globulin only, and the albumin : globulin ratio was 0·59. The changes in protein fractions were not specific enough to indicate the site of the disturbance which gave rise to them. It was thought that they might be a manifestation of reaction to stress.

T. D. Bell.

1332

WRIGHT, M. M. and TEMPERTON, H. **Curled tongue in turkey poults.** *Vet. Rec.*, 1955, **67,** 510–513. [Nat. Inst. Poultry Husb., Newport, Shropshire.]

Curled tongue in young turkeys was first noted at the above Institute in 1954 when the incidence was 16·4 per cent. in the first 6 hatches. The turkeys had been reared on a home-compounded dry mash. Subsequent hatches were used to investigate the cause. No genetic or nutritional cause was found, but the physical state of the ration was incriminated. Dry rations containing over 70 per cent. by weight of particles less than 1 mm. were liable to produce curled tongue. There was a high rate of recovery when the diet was changed from dry to wet mash.—J. S. Thomson.

1333

SADEK, S. E., HANSON, L. E. and ALBERTS, J. O. **Suspected drug-induced anemias in the chicken.** *J. Amer. Vet. Med. Assoc.*, 1955, **127,** 201–203.

[Dept. Vet. Pathol., Coll. Vet. Med., Univ. Illinois, Urbana.]

An increased incidence of anaemia in poultry is reported, affecting from 5 to 40 per cent. of flocks; it is attributed to the indiscriminate use of potentially dangerous drugs such as oxytetracycline, 4-nitrophenylarsonic acid and sulphaquinoxaline.

J. S. Thomson.

See also Absts. 387, 534.

DEFICIENCY DISEASES

1334

BRION, A. and PAGOT, J. Les carences alimentaires du bétail dans leurs rapports avec la pathologie animale. [**Feed deficiencies in livestock in relation to animal pathology.**] *Rev. Élevage Méd. vét. Pays trop.*, 1955, **8**, 223–276. [École. Nat. Vét., Lyons.]

The physiological role of minerals and vitamins and the signs of deficiencies in animals are described. Even when signs are not apparent, some deficiency is frequently there, and animals are in a precarious state of health, prone to infectious disease and parasitic infestation. This is true of most of French West Africa. As things are the nomadic life of most stock keepers is probably advantageous in that it avoids worse deficiencies by not overstocking the poor forage and soil.—T. D. Bell.

1335

ANDREWS, E. D. and ANDERSON, J. P. **The effect of cobalt topdressing in preventing cobalt deficiency disease of lambs in Southland.** *N.Z. Vet. J.*, 1955, **3**, 78–79. [Wallaceville Animal Res. Stat., Dept. Agric., Wellington.]

Lambs kept for 3 months on pastures topdressed with cobalt sulphate at 6 oz. per acre and then transferred to Co-deficient pasture were protected against deficiency for at least 17 weeks. It is concluded from this and other experiments that, in Southland, topdressing pastures with 5 oz. cobalt sulphate per acre in November should protect lambs against deficiency for at least 7 months.—D. Duncan.

1336

THAIN, R. I. **Cobalt deficiency in sheep and cattle. (With special reference to the Wynyard Veterinary district.)** *Tasmanian J. Agric.*, 1955, **26**, 154–164.

In 1952 unthriftiness in lambs in a flock at Seabrook in Tasmania was put down to Co deficiency and was successfully treated with Co. In the same year a tentative diagnosis of Co deficiency was made in another flock at Rulla. On this property a paddock on basaltic soil with an admixture of grey sand was bisected and half was dressed with cobalt sulphate at about 1 lb. per acre. Newly weaned lambs were run on both parts for 3 months, during which time those on the part dressed with Co gained on the average 48 lb. and the others 15 lb. One lamb in the untreated group died and one had to be treated with Co, and the rest had harsh wool, lacked energy and had dull and "rheumy" eyes. The part treated with Co was eaten bare while the untreated part contained plenty of grass, showing the effect of Co on appetite.

On another farm on red-brown basaltic soil, fortnightly drenching of lambs with cobalt sulphate caused them to gain in 5 months 33·4 lb. more than untreated controls. Six control lambs out of 19 died, but no treated lamb.

The incidence of Co deficiency and of possible Cu deficiencies in cattle in the Wynyard district is discussed.—D. Duncan.

1337

KEENER, H. A., PERCIVAL, G. P. and MORROW, K. S. **Cobalt deficiency in New Hampshire cattle, sheep, and goats.** *New Hampshire Agric. Exp. Stat. Bull.* No. 411, June 1954, pp. 14.

Cobalt deficiency in sheep, goats and cattle was widespread in New Hampshire until 1944, but since then it has been almost eliminated by including 2 g. Co sulphate in each ton of concentrates. Abundant growth of forage caused by heavy manuring with artificial fertilisers or poultry manure appeared to give hay with a low Co content. In experiments with yearling lambs, although those given a diet deficient in Co did not show extreme signs of Co deficiency, their weight gains were less than half those of animals given a supplement of Co. Experiments with young Holstein calves showed that they could tolerate 100 times the amount of Co usually supplied as a supplement. Co was more effective in preventing or curing a deficiency when given by mouth than by vein. Co was thought to play an important part in rumen function.—T. D. Bell.

1338

SUTHERLAND, A. K., MOULE, G. R. and HARVEY, J. M. **On the toxicity of copper aminoacetate injection and copper sulphate drench for sheep.** *Austral. Vet. J.*, 1955, **31**, 141–145. [Dept. Agric. Stock, Brisbane.]

Further trials were made to test the toxicity of copper glycinate (aminoacetate) injected and of copper sulphate as a drench to correct copper deficiency in sheep (see Abst. 2668, Vol. 24).

In the first experiment 2 ewes injected with 40 mg. Cu as copper glycinate and 4 with 60 mg. showed no toxic sign except for local lesions. One ewe injected with 80 mg. Cu died within 48 hr. and one showed anorexia, abdominal pain and progressive weakness; 2 others showed no sign except for local lesions.

In a second experiment copper glycinate was injected at the rate of from 5 to 60 mg. Cu into 7 groups of wethers and copper sulphate (3·5 per cent. solution) was given as a drench, from 1 to 2 fluid oz., to other 3 groups. Three of the wethers injected with 60 mg. Cu died; 2 died after drenching with 2 oz. copper sulphate solution and 2 were missing, presumed dead. A drench of 1½ oz. produced persistent diarrhoea.

J. S. Thomson.

1339

SLATTER, E. E. **Mild iodine deficiency and losses of newborn pigs.** *J. Amer. Vet. Med. Assoc.*, 1955, **127**, 149–152. [Indiana Livestock Sanitary Board, Indianapolis.]

1340

PANTIĆ, V. and JOVANOVIĆ, M. Enzootska struma domaćih žibotinja. 2. Histološka ispitivanja. [**Enzoötic goitre of domestic animals. 2. Histological study.**] *Acta vet., Belgrade*, 1955, **5**, No. 1, 13–32. [Inst. Histol. Embryol., Vet. Fac., Belgrade.] English summary.

For part 1 see Abst. 3998, Vol. 24. [The original is in Serbian, not Russian.]

When thyroids of domestic animals from the goitre area were examined histologically, the commonest type of enlargement was diffuse colloid goitre, especially in sheep and cattle but also in horses and goats. Diffuse parenchymatous goitre was found also in goats and horses, and the larger size of the colloid goitre in these species was ascribed to its having developed from the parenchymatous form. Early pathological changes were found in glands of normal size. Adenoma was occasionally found in horses, sheep and goats. Toxic goitre (*Struma basedowificata*) was found in several horses and a cow.—D. Duncan.

1341

BARBER, R. S., BRAUDE, R. and MITCHELL, K. G. **Studies on anaemia in pigs. 2. Comparison of haemoglobin levels in blood of pigs reared indoors and outdoors on pasture.** *Vet. Rec.*, 1955, **67**, 543–545; 546. [Nat. Inst. Res. Dairying, Univ. Reading.]

For part 1 see Abst. 5970, Vol. 25.

Hb values of pigs reared indoors and outdoors from birth to weaning were studied. The pigs reared indoors were given daily doses of 2 ml. Fe pyrophosphate from the 4th to the 11th day, supplying 30 mg. Fe. The outdoor pigs were moved outside at 4 days of age to fold units, with grass runs which were renewed daily; they received no Fe supplement. From 14 days old both sets of pigs had access to creep feed, and the amount eaten was recorded. Liveweights were also recorded weekly. The trial took place during the summer.

Hb values in the indoor pigs rose from 9·27 g. per 100 ml. blood on the 4th to 11·26 g. on the 14th day, and then fell rapidly to 8·5 g., at which level they remained fairly constant, showing only a slight rise by the 8th week. The average liveweight at weaning was 32·3 lb. Consumption of creep feed increased from 0·2 to 5·9 lb. weekly.

In the outdoor pigs Hb values fell from 10 to 8·5 g. from the 4th to 7th days, then rose steadily for 3 weeks to a level of 12 g., where they remained. Liveweight at weaning was 39·6 lb., and consumption of creep feed rose to 9·5 lb. weekly during the last week. The growth rate of the 2 groups was the same up to the 3rd week, and it was only then that the outdoor group began to outstrip the indoor. The period of more rapid growth coincided with the higher Hb values of the outdoor pigs. It was thought that intake of Fe by the indoor pigs was too low, since very little was supplied by the creep feed or the milk consumed; in the outdoor pigs sufficient was probably obtained from the grass and earth. Further investigations with pigs raised indoors are in progress to find the effect of more frequent doses and of higher Fe intake from increased consumption of creep feed.—T. D. Bell.

1342

MCDONALD, F. F., DUNLOP, D. and BATES, C. M. **An effective treatment for anaemia of piglets.** *Brit. Vet. J.*, 1955, **111**, 403–407. [Benger Res. Labs., Holmes Chapel, Cheshire.]

A report is given of successful experiments in the treatment of piglet anaemia with an iron-dextran preparation given intramuscularly.

In 8 young anaemic pigs Hb was raised from 5·1 to 9·8 g. per 100 ml. within a fortnight after the first injection. The Fe in this preparation was almost completely absorbed. A comparison was made with injected Fe phosphate, which was poorly absorbed. A first injection of iron-dextran should be given after the first week of life, with a second 2 weeks later, or it is suggested that a single injection of 20 mg. Fe per lb. could be given at about 10 days to tide the young pig over the critical stage.—J. S. Thomson.

See also Absts. 343, 344, 348, 349, 396, 408.

DISEASES OF METABOLISM

1343

SJOLLEMA, B., GRASHUIS, J., VAN KOETSVELD, E. E. and LEHR, J. J. Onderzoekingen over kopziekte. [**Grass tetany.**] *Tijdschr. Diergeneesk.*, 1955, **80**, 579–604. [Inst. Moderne Veevoeding "De Schothorst", Hoogland.] English, French and German summaries.

An experiment is described with 8 milk cows, procured on the basis that they had already had one or more attacks of grass tetany. They were

in full lactation. Their daily ration was of 8 kg. bought-in hay, 25 kg. fodder beet and concentrates, according to milk yield, 6 to 7 kg. Four of the cows were given, while still stall-fed, a mixture of potassium acetate and dipotassium phosphate, equivalent with that in the ration to a total of about 550 g. K daily. Two of these and 2 without extra K were pastured on a lush, heavily manured grazing, the other 4 on a less rich pasture. One of those given K had an attack while still in stall. The other 3 and one of those not given extra K and on the less rich pasture had attacks soon after grazing began. One of the cows receiving extra K had a serum Mg value of 1·6 to 1·7 per cent. on pasture and 1·3 per cent. during the attack. It was therefore atypical. The others at the time of the attack had serum Mg values from 0·1 to 0·3 per cent.—I. Leitch.

1344

HEAD, M. J. and ROOK, J. A. F. **Hypomagnesaemia in dairy cattle and its possible relationship to ruminal ammonia production.** *Nature*, 1955, **176,** 262–263. [Chem. Dept., Nat. Inst. Res. Dairying, Univ. Reading.]

When cattle are turned out to spring grass the ammonia content of the rumen fluids rises. Cattle feeding on hay and concentrates were given 1250 g. ammonium carbonate or ammonium acetate into the rumen, and ruminal ammonia contents comparable with those found on spring grass were produced after 4 days. Urinary excretion and blood levels of magnesium were reduced. Though the level of blood Mg was not reduced as much as has been found in hypomagnesaemia on spring grass, it was thought that the results of the test indicated that increase of ammonia in the rumen was responsible for impaired absorption of Mg.

T. D. Bell.

POISONS OCCURRING IN FOOD

1345

WALKER, G. W. and MILNE, A. H. **Fluorosis in cattle in the Northern Province of Tanganyika.** *E. African Agric. J.*, 1955, **21,** 2–5. [Vet. Res. Lab., Mpwapwa.]

Preliminary results are reported of a survey of the incidence of fluorosis in cattle, first noted in 1952, in 3 areas near Mount Meru strewn with volcanic ash. Water from many of the streams rising in the mountain showed high F contents, up to 45·5 p.p.m. Cattle from farms in the 3 areas were examined and lesions of the teeth were apparent in nearly all, the severity depending on the F content of the drinking water. Exostoses were apparent on the ribs in 10 per cent. of the animals in the highly affected area and bone ash showed an F content of about 0·6 per cent. The survey is being continued.—J. S. Thomson.

1346

HALE, W. H. and KING, R. P. **Possible mechanism of urea toxicity in ruminants.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 112–114. [Iowa Agric. Exp. Stat., Iowa State Coll., Ames.]

In an experiment with 13 lambs, 7 to 12 months old, ammonium carbamate was given by intravenous or subcutaneous injection, or introduced into the rumen by drench or into the abomasum by injection. Urea and ammonium chloride were also given intravenously.

Ammonium carbamate given intravenously in doses of 2, 3, 4, 5 or 6 g. caused increasing signs of toxicity, the largest resulting in death. The signs of toxicity were similar to those reported in poisoning by urea. Twenty g. injected into the abomasum, and 25 g. by drench into the rumen, also caused death. When injected into the abomasum just after feeding, 25 g. caused severe signs and 15 g. mild signs, but the lambs recovered. Subcutaneous injection of 7 g. had no ill effect.

Intravenous injection of 2 g. ammonium chloride caused dizziness and lethargy, which were not the same as the signs of toxicity usually seen, and from which the lamb recovered. Intravenous injection of 5 g. urea had no toxic effect.

In no case was any appreciable rise in the level of ammonia in the blood observed. It is suggested, in the light of these results, that urea toxicity in the ruminant may be due to ammonium carbamate, not to ammonia.—T. D. Bell.

1347

HVIDSTEN, H. **Studies on the effect of nitrite in pig feed.** *Acta Agric. scand.*, 1955, **5,** 245–256. [Div. Animal Nutrit., Agric. Coll. Norway, Vollebekk.]

A method of preserving herring meal with sodium nitrite has been developed and the proposed standard has been set at an upper limit of 0·2 part nitrite per thousand. The effect of this meal and of meals containing higher amounts of nitrite was tested with pigs.

The feeding of about 200 g. daily of a meal containing 10 times the above amount of nitrite had no effect on growth, feed efficiency, pork quality or health of the pigs, and no methaemoglobin was found in the blood. When up to 260 g. of a meal containing 4 parts nitrite per thousand were given methaemoglobin appeared in the blood, but there was no apparent effect on growth. At this level of nitrite, blood methaemoglobin was higher when an equivalent amount of nitrite was given as an aqueous solution of $NaNO_2$. At the highest level of nitrite intake, and with cod liver oil in the diet, the deposition of vitamin A in the liver was inhibited.—J. S. Thomson.

1348

PAYNE, W. J. A. and NAIDU, R. K. **The toxicity of creeping indigo ("Indigofera endacaphylla".)** *Fiji Agric. J.*, 1955, **26,** 1–3. [Dept. Agric. Serv., Dept. Agric., Fiji.]

Indigofera endacaphylla [*? endecaphylla*] (creeping indigo) is a useful pasture legume palatable to cattle and goats. In view of its alleged poisonous properties an experiment was made with 5-week-old chickens in which creeping indigo was incorporated in rations at levels of 5 and 10 per cent. The results were inconclusive in that no death was reported at the 10 per cent. level, but 3 out of 16 died at the 5 per cent. level. Rate of growth was adversely affected at the high level.

J. S. Thomson.

1349

KNOTT, S. G. **Lantana poisoning of stock.** *Queensland Agric. J.*, 1955, **80,** 200–204.

1350

DANON, J. Jedno nalazište *Saponaria officinalis* L. i ispitivanje njene toksičnosti. [**Discovery of *Saponaria officinalis*, L. and a study of its toxicity.**] *Acta vet., Belgrade*, 1955, **5,** No. 1, 43–47. [Inst. Botany, Belgrade.] German summary.

1351

SPREHN, C. and LÖLIGER, H. C. Über die toxische Wirkung des mit Aldrin gebeizten Getreides auf Hühner. [**Toxic effect on poultry of grain treated with Aldrin.**] *Berl. Münch. tierärztl. Wochenschr.*, 1955, **68,** 298–300. [Vet.-Med. Abt., Bundesforsch. Anst. Kleintierzucht, Celle.]

Poultry given to appetite seed wheat treated with 125 g. of the contact insecticide Aldrin (hexachlorohexahydrodimethylnaphthalene) to 50 kg. took 4 or more days to develop signs of poisoning, namely, lack of appetite, apathy, paralysis and convulsions; all of 15 died within a week or two. Winnowing and thorough washing of the grain were useless and such grain should be stored where poultry cannot get at it.—W. M. Deans.

1352

ACKERSON, C. W. and MUSSEHL, F. E. **Toxicity of treated seed corn in rations for chicks.** *Poultry Sci.*, 1955, **34,** 728–729. [Dept. Biochem. Nutrit., Univ. Nebraska, Lincoln.]

See also Absts. 534, 796.

IMMUNITY

1353

MICHEL, J. F. **Parasitological significance of bovine grazing behaviour.** *Nature*, 1955, **175,** 1088–1089. [Vet. Lab., Weybridge.]

Observations suggest that cattle select their grass in such a way that they pick up fewer lungworm larvae (*Dictyocaulus viviparus*) than they would if they grazed the pasture at random.

G. C. Hunter.

1354

SOUTHCOTT, W. H. **Observations on the removal of *Oesophagostomum columbianum* Curtice from sheep grazing on green oats and on pastures.** *Austral. J. Agric. Res.*, 1955, **6,** 456–465. [Div. Animal Health and Prod., C.S.I.R.O., Reg. Pastoral Lab., Armidale, N.S.W.]

When 6-month-old wethers were infested with larvae of *Oesophagostomum columbianum*, Curtice, grazing on green oats reduced the number of eggs in the faeces. There was no reduction when similar animals grazed on native pasture. After 3 months' grazing, 24 adult worms per sheep remained in those on green oats and 108 in those on native pasture. On green oats, the faeces were softer and had an acid reaction, but on native pasture they were alkaline. Liveweight gains were not significantly different, since the animals on native pasture were given an adequate supplement of lucerne hay. In wethers free from adult worms before grazing, green oats delayed the development of the larvae 8 weeks, and after 3 months' grazing those on native pasture had 91 adult worms, those on green oats only 20.

A similar comparison was made with grazing on green oats, phalaris-subterranean clover pasture, red clover and native pasture. Again there was a reduction in faecal egg counts on green oats but not on native pasture. There was also a reduction on the other pastures, but not as rapid as on green oats. After 3 months' grazing the number of adult worms remaining was 23 on green oats, 57 on phalaris-subterranean clover, 51 on red clover and 77 on native pasture. Faeces became softer on all crops except native pasture, but only green oats reduced the *p*H.—T. D. Bell.

1355

RIEDEL, B. B. **Leucine and fowl ascarids.** *Poultry Sci.*, 1955, **34,** 587–589. [Dept. Animal Dis., Mississippi Exp. Stat., State College.]

Day-old New Hampshire chickens were given a ration low in leucine, or the same with a supplement of DL-leucine. After receiving the ration for 2 weeks some of the chickens on each level of leucine were infected with *Ascaridia galli*, and the others were kept as controls. The birds were examined *post mortem* 3 weeks after being infected. According to the number of worms found in the chickens, and the length of the worms, the level of leucine did not appear to have any effect on resistance to ascarid infection. The higher level of leucine gave better growth than the low, and the birds appeared healthier. Growth in the infected groups

compared favourably with growth in the control groups at the corresponding level of leucine.

T. D. Bell.

1356

MARKHAM, F. S., PRICE, R. J., SEEGER, K. and WHITE-STEVENS, R. **Dietary aureomycin chlortetracycline and immune response to Newcastle disease and infectious bronchitis.** *Poultry Sci.*, 1955, **34**, 554–559. [Lederle Labs. Div., American Cyanamid Co., Pearl River, N.Y.]

In 3 field trials involving 35,000 chickens, the effect on resistance to disease of giving up to 300 g. chlortetracycline per ton feed from hatching was investigated. Some birds were vaccinated against Newcastle disease and infectious bronchitis viruses. Serological data and exposure of the birds to virulent Newcastle disease virus showed that administration of the antibiotic at any level up to 300 g. per ton of feed did not affect response to the vaccines and subsequent resistance to the infections. The results are discussed in relation to contrary findings by other workers.—T. D. Bell.

See also Abst. 1299.

7. BOOK REVIEWS

1357

KOLMER, J. A., SPAULDING, E. H. and ROBINSON, H. W. **Approved laboratory technic.** Appleton-Century-Crofts, Inc., New York, 1951, 5th ed., pp. xii + 1180. Price 90s. net.

This is a textbook of medical laboratory techniques and will be of interest mainly to clinical laboratory workers. The practical details of the techniques which are considered are so full, however, that biochemists who only occasionally require to employ them should be able to do so with a minimum of difficulty. The book is also instructional in that the principles underlying the experimental procedures are discussed at some length. There are 7 sections, which deal with (1) general laboratory methods, including microscopy and the care, inoculation and bleeding of laboratory animals, (2) clinical pathological methods, including the examination of tissue fluids, blood, excretions and secretions, (3) bacteriological, mycological and virological methods, (4) parasitological methods, (5) serological methods, (6) chemical methods and (7) pathological methods. The arrangement of material does not seem ideal in that the techniques which might be required for application to a single specimen, *e.g.*, blood or urine, may be distributed over several sections, widely separated in the book. The chapters dealing with chemical methods occupy less than 200 of the 1150 pages of the book and only about 100 pages are given to blood and urine, the remainder being concerned with fundamental techniques such as weighing, preparation of volumetric solutions and the use of colorimeters and with methods for toxicological examination of specimens. In general only one method is described for each estimation and no assessment is made of the relative merits of other methods in use.

H. G. Bray.

1358

GLICK, D. (Ed.), **Methods of biochemical analysis. Volume 1.** Interscience Publishers, Inc., New York and London, 1954, pp. x+521. Price 75s.

Each of the articles in this volume consists of an account of the background to the topic under consideration and a critical discussion of previous work, followed by experimental details of procedure recommended by the authors. The subjects considered are: estimation of sulphydryl groups in certain biological substances, analysis of phenolic compounds of interest in metabolism, microbiological assay of antibiotics, microbiological estimation of vitamin B_{12}, chemical estimation of ascorbic, dehydroascorbic and diketogulonic acids, zone electrophoresis, chromatographic separation of steroids of the adrenal gland, analysis of radioactive iodine compounds from the thyroid gland and body fluids, chemical estimation of choline, estimation of nucleic acids, estimation of raffinose and kestose in plant products, estimation of adenosine triphosphate (firefly luminescence and other methods), assay of catalases and peroxidases, estimation of hyaluronidase *in vitro*, ultracentrifugal analysis of serum lipoproteins, assay of urinary neutral 17-ketosteroids. The standard of this first volume of the series is high and the production excellent. It will undoubtedly be of interest and practical value to biochemists in many fields of investigation.—H. G. Bray.

1359

ALBRITTON, E. C. (Ed.) **Standard values in blood. Being the first fascicle of a handbook of biological data.** W. B. Saunders Co., Philadelphia and London, 1953, pp. x + 199. Price 31s. 6d.

In this compilation from the literature, the first instalment of the Handbook of Biological Data, the systems of preparation and presentation of the data are those which were later used for the second instalment, *Standard Values in Nutrition and Metabolism*, to which reference has already been made (Abst. 3153, Vol. 25). Over 600 investigators took part in the assembly of the information and in reviewing it. The result is 101 tables on

the composition and reactions of blood which cover 143 demy quarto pages and for which the bibliography runs to 46 more pages. Where possible code letters are added to show by which of 4 methods the upper and lower limits of the 95 per cent. ranges have been inferred. The whole is a serviceable manual for those interested in the wide subject of the composition of blood.—D. Harvey.

1360

WEINMANN, J. P. and SICHER, H. **Bone and bones. Fundamentals of bone biology.** Henry Kimpton, London, 1955, 2nd ed., pp. 508. Price 100s.

The first edition of this book was published in 1947, and the reviewer regrets not having seen it. The introduction begins thus : " Although created and constantly molded by man, language and linguistic terms influence man's thinking to an astonishing degree. All too often, linguistic ambiguities are the cause of unnecessary confusion." The authors have avoided such confusion. Nearly every section of the book begins with clear definitions of the terms used, and this practice, combined with clarity and conciseness of the literary style and the good format, produces a book which is a joy to read, apart from turns of phrase which are perhaps better American than English. Here is proof that even a difficult subject—and there is no doubt of the complexity of bone biology—can be presented in a way which makes the reader feel at home with it. How often, after struggling to decipher in other works pages which the authors have sought to cover with the longest imaginable words twisted into the longest possible sentences, does the same reader feel that here is a subject beyond his comprehension?

The authors are a pathologist and an anatomist, and the book is intended as " a challenge to the research worker ; a guide to those who work on bone and on bones in their medical speciality : orthopedists, radiologist, metabolists, dentists, orthodontists ; and an aid to the teacher who wants to integrate his particular field into the greater unit of biology ". It should serve all these purposes. The section on normal structure and growth of bone and bones occupies only 120 pages, but within this small space there is no lack of interest, and material also to stimulate controversy. For example, the authors intend " to bury once and for all the specters of ' halisteresis or decalcification ', ' interstitial growth of bone ', ' physical plasticity ' and ' creeping replacement ', which are resurrected again and again by the magic of the imagination ".

Most of the remainder of the book is devoted to pathology, but there are chapters on the influence of vitamins and on the effect of minerals on bone and bones. In the chapter on minerals there is an unfortunate lapse into that ambiguity so happily absent elsewhere. On page 297 we read : " Since calcium is so readily available, a deficiency should be expected only as a consequence of general malnutrition ; for example, in famine districts or among the underprivileged. It has been established that about one-half of the American dietaries are below the safety level in calcium intake. In most instances, the calcium deficiency is caused by a decrease in, or lack of, absorption." It must be supposed that the " availability " of calcium referred to in the first sentence is commercial and not physiological. America, after all, is a land flowing with milk and ice-cream. What evidence supports the second sentence, which appears directly contradicted by the third? The criterion of safety is surely the absence of deficiency.

The book is profusely illustrated, mostly with photomicrographs of unusual excellence and, thanks to the good quality of the paper, well reproduced ; there is a bibliography at the end. It is worth every penny of the high price, and one hopes that libraries can be persuaded of its value. The reader will need no persuasion.—D. Duncan.

1361

RURAL RECONSTRUCTION ASSOCIATION. **Feeding the fifty million. A report of the Rural Reconstruction Association Research Committee on the increase of agricultural production.** Hollis and Carter, London, 1955, pp. 138. Price 12s. 6d.

The fifty million to whose feeding the Research Committee of the Rural Reconstruction Association has, since its appointment in 1947, given its attention and towards whose welfare the recommendations in this book are directed are the inhabitants of the United Kingdom. At present they grow only about half of what they eat. Early in the report, in a short section dealing with home production, the Committee emphasises the long-term and risky nature of farming as an occupation. For the farmer the risks are personal ones and to him stability and fairness of prices are unconditional prerequisites.

Britain's agricultural resources and their present mode of utilisation are next considered under the three main headings of land, the human factor and capital. On this there follows under the same three headings and in what is the report's most important chapter, an examination of possible methods whereby the use of these resources might be improved. It is here, as the Committee well recognises, that highly controversial subjects are being dealt with such as land use, on which agricultural and industrial interests may clash, land value taxation, on which agriculturists and economists may be opposed, and soil fertility, on the maintenance of which disagreement exists among

agriculturists themselves. Many of the proposals will call for change not only at the agricultural but also at the national level. The further study which they will require may take a long time as, for example, will amendment of the law dealing with common land by the Royal Commission, the forth-coming appointment of which was announced at about the same time as this report was published.

In the last chapter possible changes in the pattern of consumption are suggested with special reference to wheat, oils and fats, meat, eggs and milk products. The increase in the consumption of liquid milk and the preference for lean meat and bacon have reduced home supplies of fat. The raw materials for margarine and cooking fat are now the weakest link in the chain of supplies.

But only slightly less in degree of importance is another supply problem, that of rural depopulation. Of every 10,000 workers in Britain there were, in 1952, only 353 in agriculture. For many of the 97·5 per cent. outside the industry and lost in our conurbations this report, were it to reach them, would provide interesting and salutary reading.

For a Progress Report published in 1951 see Abst. 2561, Vol. 21.—D. Harvey.

1362

SHERLOCK, S. **Diseases of the liver and biliary system.** Blackwell Scientific Publications, Oxford, 1955, pp. xv + 720. Price 50s.

The great increase in information on liver disease since the beginning of the second world war made clinicians aware of the need for an authoritative review of the present position and of modern literature. Dr. Sheila Sherlock has accomplished this task with outstanding success. With her colleagues at the Postgraduate Medical School, Dr. Sherlock has contributed greatly to the recent advances in knowledge of hepatic disease.

In this book diseases are classified according to the functional and morphological changes to which they give rise. Clinical and laboratory methods are described which are of value in identifying and in assessing the degree of damage to each of the four hepatic components: the liver cell, the vascular system, the reticulo-endothelial system and the bile ducts. In this way the pattern and trend of individual diseases can be more clearly presented. The author has the gift of lucidity and this book will be valued by both clinical and laboratory workers. It is beautifully produced.

M. MacLeod.

1363

LUCK, J. M., LORING, H. S. and MACKINNEY, G. (Eds.) **Annual review of biochemistry. Volume 24.** Annual Reviews, Inc., Stanford, California, 1955, pp. xvi + 805.

1364

MCELROY, W. D. and GLASS, B. (Eds.) **A symposium on the mechanism of enzyme action.** Johns Hopkins Press, Baltimore, 1954, pp. xvi + 819. Price 88s.

1365

NORD, F. F. (Ed.) **Advances in enzymology and related subjects of biochemistry. Volume 16.** Interscience Publishers, Inc., New York and London, 1955, pp. 584. Price 88s.

1366

SPECTOR, H., PETERSON, M. S. and FRIEDEMANN, T. E. (Eds.) **Methods for evaluation of nutritional adequacy and status. A symposium.** Quartermaster Food and Container Institute for the Armed Forces, Chicago 9, December 1954, pp. vii + 313.

In this report of a symposium held under the auspices of the U.S. Army the methods of evaluation of diets and the status of populations are dealt with authoritatively by two types of investigator, those in nutritional laboratories to whom the Army has referred the problems arising in connection with the feeding of the armed forces and those whose experience has been of nutrition either under field conditions in the campaign in Korea or under experimental conditions in physiological laboratories.

Rather more than half of the book is in four chapters, three dealing with the evaluation of protein, vitamin and mineral supplies. Much of the information in them is from animal experiments and the fourth chapter in this section deals specifically with the use of animals for this purpose. The remaining two chapters are on the significance for man of this knowledge, one giving an assessment of the methods of study of populations and the other reporting a round-table discussion on body composition.

Contributions on different aspects of the measurement of protein adequacy were given by H. H. Mitchell, P. R. Cannon, J. N. Williams and J. B. Allison. Discussions were initiated by O. A. Bessey on levels of vitamins in blood and by W. G. Unglaub and Grace A. Goldsmith on urinary excretion tests. Balance studies with macro-elements were discussed by D. M. Hegsted and the function of trace elements in blood formation by G. E. Cartwright, C. J. Gubler and M. M. Wintrobe. The principal contributors to the final discussion were M. I. Grossman, J. Brožek, D. E. Bass, W. R. Best and A. R. Behnke.

The background of the symposium may have been defence against war or its actual prosecution, but the peaceful applications of this summary of scientific knowledge on nutrition are obvious.

D. Harvey.

1367

SMITH, R. W. (Jr.), GAEBLER, O. H. and LONG, C. N. H. (Eds.) **International symposium, October, 1954. The hypophyseal growth hormone, nature and actions.** Blakiston Division, McGraw-Hill Book Company, Inc., New York, Toronto, London, 1955, pp. xv + 576. Price 90s.

The symposium recorded in this volume, held at the Henry Ford Hospital in Detroit in 1954, was attended by 300 people. According to the editors of the report "the enigmatic pituitary growth hormone had been under study by one full generation of investigators and . . . present at the symposium were all the scientists, with few exceptions, who had been intimately concerned at one time or other with this most elusive of the pituitary hormones . . . it was a memorable experience to have witnessed the joint participation of such eminent investigators ".

In 5 parts there are 29 papers and the discussions which followed them. Beginning with a paper entitled " What is growth? " by Paul Weiss, the list includes such names as Alfred Wilhelmi, Hans Selye, Honor B. Fell, H. L. White, E. B. Astwood, S. J. Folley and Laurance W. Kinsell. The material included the preparation and properties of the hormone, its effects on specific tissues, its relation to nutrition and nitrogen metabolism, the production of diabetes and ketosis in experimental animals, a session on growth hormone and cellular systems, two papers on lactation and finally two on the disappointing results so far obtained in human subjects.

Clearly this symposium is one not to be disregarded by the research worker interested in the pituitary hormones. No wider usefulness can yet be claimed for it. To quote the editors again, the symposium " was held to sift over the rapidly accumulating data, to compare techniques of study, to attempt a resolution of disturbing differences, and to stimulate new approaches which some day may bring usefulness to this most intriguing pituitary substance ".

The book is clearly printed on good paper, and illustrated.—D. Duncan.

1368

INTERNATIONAL ASSOCIATION OF GERONTOLOGY, LONDON. **Old age in the modern world. Report of the third congress 1954.** E. & S. Livingstone, Ltd., Edinburgh, 1955, pp. vii + 647.

After the public oration by Miss Margery Fry and the presidential address by Dr. J. H. Sheldon on the Social Philosophy of Old Age, this report is divided into 17 chapters, not always identical with the sessions of the congress.

Chapter 4 deals with nutritional aspects of ageing and includes 5 papers: C. M. McCay, on bridging the gap between research and gerontological nutrition; H. M. Sinclair, on the dangers of overfeeding; E. M. Widdowson and R. A. McCance, on the response of well-nourished old men to starvation and of undernourished old men to unlimited food; W. Schulze, on protein metabolism and requirement in old age; N. W. Shock, D. M. Watkin and M. J. Yiengst, on metabolic aspects of ageing. Chapters 5, on tissue changes, 6, on cancer, and 12, on cardiovascular diseases, contain papers of nutritional interest, including one by W. S. Hartroft, on ageing of the cardiovascular system produced in young rats by choline deficiency, and a series of 4 papers on atherosclerosis by F. M. Antonini.—D. Duncan.

8. SYMPOSIA, PROCEEDINGS AND CONGRESS REPORTS

Proceedings of the Nutrition Society. *Brit. J. Nutrition*, 1955, **14**, 93–129.

A symposium on " Alcohol and its nutritional significance " with contributions by Jellinek, E. M., Le Breton, E. and Tremolières, J.; Sinclair, H. M.; Platt, B. S.; Wilkinson, A. W.

Proceedings of the Nutrition Society. *Brit. J. Nutrition*, 1955, **14**, 130–160.

A symposium on " Assessment of the energy value of human and animal foods " with contributions by Blaxter, K. L. and Graham, N. M.; Hutchinson, J. C. D.; Widdowson, E. M.; Hollingsworth, D. F.

Proceedings of the Nutrition Society. *Brit. J. Nutrition*, 1955, **14**, i-vii.

Bolton, W., poultry feeding standards; Shrimpton, D. H., vitamin B_{12} retention by cockerels; Cowlishaw, B. and Blaxter, K. L., triorthocresyl phosphate and vitamin E metabolism in calves; Sang, J. H., *Drosphila melanogaster*, test organism for aseptic nutritional research; Blaxter, K. L., Graham, N. M. and Wainman, F. W., passage of food through the intestine and its digestibility; Thomson, A. M. and Billewicz, W. Z., toxaemia and weight gain in pregnancy and energy intake; Marr, J. W., Hope, E. B., Stevenson, J. D. and Thomson, A. M., consumption of milk and vitamins by pregnant women.

Proceedings of the Nutrition Society. *Brit. J. Nutrition*, 1955, **14**, viii-xvii.

Cruickshank, E. M., Kodicek, E. and Armitage, P., vitamin D in tissues of irradiated rats; Harris, L. J.,

Constable, B. J., Hughes, R. E. and Loewi, G., cortisone and vitamin C requirements; Constable, B. J., Harris, L. J. and Hughes, R. E., effect of cortisone and ACTH on vitamin C in adrenal gland; Hill, C. R. and Bourne, G. H., uptake of ^{35}S in scurvy (guineapig); Bourne, G. H., histochemical dephosphorylation of vitamin phosphates; Heard, C. R. C., palm wine in nutrition; Byron, F. E., the plaintain in relation to protein malnutrition; Bender, A. E., protein efficiency in relation to net-protein utilisation; Coates, M. E., Gregory, M. E., Harrison, G. F., Henry, K. M., Holdsworth, E. S. and Kon, S. K., availability to animals of bound forms of vitamin B_{12}; Blaxter, K. L. and Graham, N. M., nutritive value of dried grass for sheep; Masterton, J. P., Lewis, H. E. and Widdowson, E. M., food intake and faecal excretion by men sledging in Greenland; Knopfelmacher, F., Khairy, M., Russell, R. W. and Yudkin, J., effect of vitamin B_1 deprivation on learning and behaviour (rat).

Proceedings of the Physiological Society. *J. Physiol.*, 1955, **128**, 61P–84P.

Acland, J. D., estimation of serum protein-bound iodine; Whittam, R., estimation of tissue chloride, micro-method; Sheff, M. F. and Smyth, D. H., intestinal absorption in the rat *in vivo*, apparatus; Dowse, C. M., Saunders, J. A. and Schofield, B., composition of lipid material from jejunum of fasting dog.

Proceedings of the Biochemical Society. *Biochem. J.*, 1955, **60**, xxiii-xlii.

Dalgliesh, C. E., biotin and tryptophan metabolism (rat); Taylor, T. G. and Moore, J. H., effect of calcium depletion on composition of bone; Whitmarsh, J. M., Albans, J. W. and Wright, R. D., vitamin B_{12} in sewage; Harris, H. and Warren, F. L., electrophoretically distinct haemoglobins in ruminants; Peel, J. L., Fox, M. and Elsden, S. R., inorganic phosphate estimation (Lowry and Lopez), interference by sulphide, elimination; Abdel-Wahab, E. M. and Laurence, D. J. R., evaluation of plasma proteins after electrophoresis, quantitative aspects; Robinson, D. S., Harris, P. M., Poole, J. C. F. and Jeffries, G. H., effect of fat on free amino-acids in plasma; Pennington, R. J. and Sutherland, T. M., succinate production from propionate by CO_2 fixation in rumen epithelial tissue (sheep); Johnson, B. C., Holdsworth, E. S., Ford, J. E., Porter, J. W. G. and Kon, S. K., vitamin B_{12} and methyl synthesis in *Ochromonas malhamensis*.

Proceedings of the Biochemical Society. *Biochem. J.*, 1955, **61**, i-viii.

Taylor, W. H. and O'Brien, J. R. P., proteolytic activity of gastric juice and mucosal extracts; Hodgkiss, W. and Jones, N. R., free amino-acids of fish, post-mortem changes; Fisher, L. R., Henry, K. M., Kon, S. K., Plack, P.A. and Thompson, S. Y., vitamin A isomer in eye of *Meganyctiphanes norvegica;* Thomas, A. J., Watkin, J. E., Evans, I. A. and Evans, W. C., bracken poisoning in ruminants.

Third International Congress of Nutrition, Amsterdam, September 1954. Pp. 486.

Kennedy, G. C., Obesity, disease and life expectancy; Clements, E. M. B., standard bodyweight; Edwards, D. A. W., body fat, estimation from skin-fold measurements; Mayer, J., food intake, regulation and etiology of obesity; McCance, R. A., appetite, growth and obesity; Widdowson, E. M., reproduction and obesity; Passmore, R., Meiklejohn, A. P., Dewar, A. D., Mutch, E. and Thow, R. K., metabolism in overfeeding; Vague, J., physicopathological mechanism of obesity; Leitner, Z. A., obesity and blood pressure; Clement, G. and Chimenes, H., local action of insulin on the composition of adipose tissue; Van Putten, L. M., Van Bekkum, D. W. and Querido, A., influence of food intake on obesity in hyperphagic rats; Brock, J. F., kwashiorkor; Patwardhan, V. N., human malnutrition and liver disease in the tropics; Bigwood, E. J. and Robazza, F., amino-acid and sulphur in hair in normal African natives and in kwashiorkor; de Maeyer, E. M., weight and blood changes in kwashiorkor; Schoental, R., pathological effects of Senecio alkaloids, a kwashiorkor-like syndrome; Autret, M. and Van Veen, A. G., sources of proteins for children in underdeveloped countries; Visco, S., plant proteins in the feeding of infants; György, P., human milk versus cow's milk; Mellander, O., nutritional significance of some peptides; Waterlow, J., liver composition in malnourished infants; Went, L. N., blood composition in children with malignant malnutrition; Le Breton, E., diet in relation to hepatoma production in the rat by a carcinogen; Guggenheim, K., nutritional deficiency and pitressin inactivation by liver; Gounelle, H., Teulon, H. and Blondin, M., vitamin A and E contents of blood in liver disease; Kodicek, E., Carpenter, K. J., Bradfield, J. R. G. and Sellers, K. C., folic acid deficiency and lesions of liver and spleen; Nieweg, H. O. and Arends, A., kidney lesions and liver necrosis; Brožek, J., psychological aspects of nutrition; Verzár, F., nutrition and addiction; Gunther, M., first responses to feeding; Mauron, J., effects of *iso*-nicotinic acid hydrazide and vitamin B_6 on liver transaminase; Schnieden, H. and Blackmore, K. E., diuretics in rats with experimental protein deficiency; Keys, A., Fidanza, F. and Keys, M. H., serum cholesterol of healthy Italian men; Cuthbertson, D. P., plane of nutrition and growth and reproduction in farm stock; Frazer, A. C., lipid absorption; Blomstrand, R., fat absorption from intestine in man; Raoul, Y., calcium fixation by steroids related to vitamin D; Bieri, J. G., utilisation of carotenoids by rabbit and chick; Clement, G., Clement, J. and Le Breton, E., biochemical study of fatty liver after feeding a carcinogen; Den Hartog Jager, W. A., spinal cord degeneration in malnourished guineapigs; Sobel, A. E., composition of bones and teeth in relation to blood and diet; De Wijn, J. F. and Donath, W. F., effects in man of completely vegetarian diets; Wokes, F., Badenoch, J. and Sinclair, H. M., vitamin B_{12} deficiency in man; Bacharach, A. L., non-nutrient foreign chemical substances in foods; Barnes, J. M., assessment of the toxicity of food adjuncts; Druckrey, H., harmful and harmless dyes for foods; Catron, D., antibiotics in animal nutrition; Van Esch, G. J., toxicity of gallic acid esters as anti-oxidants; Frazer, A. C., interpretation of tests of toxicity of food additives; Truffert, L., trace elements in foodstuffs; Van Genderen, H., pesticides and food contamination; Wagner, K. H., lead in sulphite yeast; Reith, J. F., international legislation on food; Sobel, A. E., Rosenberg, A., Bradley, D. K. and Parnell, J., absorption of vitamin A through skin; Chanda, R., Clapham, H. M. and Owen,

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Hypothalamus and Pituitary. Hamilton, J. B. (nail growth) method for measurement of growth and replacement of cells (man) ; Ralli, E. P. and Laken, B., effect of salt intake on fluid retention in rats on low-sodium diets.

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Reproduction and Sex Hormones. Smith, T. C. and Richterich, B., respiration of mammary gland slices during pregnancy and lactation (guineapig).

Adrenals and Adrenocortical Steroids. D'Angelo, S. A., Stevens, C. E., Paschkis, K. E. and Cantarow, A., effect of hydrocortisone and ascorbic acid on adrenal function in exposure to cold (guineapig) ; Dury, A., effect of cortisone and high cholesterol diet on lipid components and phospholipid turnover of plasma, liver and aorta (rabbit).

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Norris, L. C., Edwards, H. M. (Jr.) and Chin, D., unidentified vitamins, problems; Reid, J. T., cattle growth, reproduction and lactation, effect of nutrition level; Scott, M. L., amino-acid requirements of turkeys; Singsen, E. P., Matterson, L. D., Bunnell, R. H., Kozeff, A. and Jungherr, E. L., encephalomalacia and vitamin E requirements of chickens; Sheffy, B. E., Sewell, R. E. and Eggert, R. G., protein and amino-acid requirements of baby pigs; Turk, K. L., feed texture, effect on digestibility, palatability and lactation; Williams, H. H., amino-acid requirements, evaluation by carcase analysis.

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C., pasture investigation techniques with dairy cows; Branton, C., Johnston, J. E., Miller, G. D., Vizinat, J. J. and Frye, J. B. (Jr.), heat tolerance and milk production of cows; Murley, W. R., Waugh, R. K., Edwards, J. R. and Whisenhunt, M. R., simple and complex starters and hay for dairy calves; Hardison, W. A., Graf, G. C., Linkous, W. N. and Engel, R. W., Sudan grass silage for milking cows; Johnston, J. E., Naelapaa, H., Stone, E. J., Vizinat, J. J. and Frye, J. B. (Jr.), effect of nutrition and climate on summer milk production of cows; Seath, D. M., Lassiter, C. A. and Rust, J., hay supplement for milk cows on pasture; Lassiter, C. A., Denton, T. W., Brown, L. D. and Rust, J. W., pelleted calf feeds; Rusoff, L. L., Landagora, F. T. and Harris, B. (Jr.), streptomycin for dairy calves; Musgrave, S. D., Montgomery, R., Poitras, P. E., Kiern, O. and Ronning, M., low phosphorus and semen production of young dairy bulls; Lassiter, C. A., Taylor, J. A.; Davis, C. L. and Denton, T. W., chromogen and chromic oxide studies with dairy bullocks; Marshall, S. P. and Somers, H. L., temporary and permanent pastures for dairy heifers; Loewenstein, M., Cenco moisture tester for milk analysis; Whitaker, W. M., Van Horn, A. G., Lush, R. H. and Throop, B. T., effect of grazing on alfalfa-orchard pasture; Davis, C. L., Lassiter, C. A., Seath, D. M. and Rust, J. W., dicyandiamide and urea for dairy cattle; Leighton, R. E. and Rupel, I. W., milk-replacer formula for dairy calves; McCullough, M. E., winter pasture for dairy heifers; Thomason, E. L. (Jr.) and Ronning, M., grain feeding and milk production; Vizinat, J. J., Johnston, J. E. and Frye, J. B. (Jr.), effect of temperature and humidity on lactating cows; Underwood, L. M., Miller, W. J., Dalton, H. L. and Rogers, T. H., Tift Sudan and Starr Millet pastures for milking cows in summer; Driggers, J. C., fish body oils in chick rations; West, J. W., amino-acid and protein supplements for cottonseed meal in broiler rations; Huston, T. M., artificial light for turkeys; Naber, E. C. and Morgan, C. L., feather meal for poultry; Creech, B. G., Elam, J. F., Jacobs, R. L. and Couch, J. R., antibiotics in laying rations; Smith, R. M., range and confinement for laying pullets; Patrick, H., enzymes in poultry rations; Harris, A. J., Holmes, C. E. and Bywaters, J. H., granite grit for chicks; White-Stevens, R. H. and Jukes, T. H., antibiotics for chickens; Kent, O. B., restricted feeding of chickens; Guidry, B., controlled and full feeding of pullets; Watts, A. B., restricted and full feeding of chickens; Sullivan, T. W. and Stephenson, E. L., feather meal for broilers; Greene, D. E. and Stephenson, E. L., amino-acid supplements and protein level of broiler rations; Camp, A. A., Quisenberry, J. S. and Couch, J. R., vitamin A supplements for broilers; Patrick, H., Schweitzer, G. K. and Stow, G., vitamin D storage, response and digestion time in chicks and eggs measured using ^{45}Ca.

Proceedings of the 15th International Veterinary Congress, Stockholm, 1953. Part 1, 517–652.

There are 22 papers, on ruminants except where otherwise shown: Phillipson, A. T., digestion; Oyaert, W.

and Bouckaert, J. H., amino-acids in rumen ; Loussee, A., N metabolism ; Robertson, A. and Thin, C., ketosis ; Talsma, D., acetonaemia *post partum* ; Alström, I., P metabolism (rat) ; Jovanovic, M., P metabolism (rat) ; Field, H. I., Cu and growth ; Bouckaert, J. H. and Oyaert, W., Mg in blood ; Allcroft, R., Mg in blood ; Alvarez Betes, J., P deficiency ; Schofield, F. W., muscular dystrophy ; Ludvigsen, J., muscular degeneration (pig) ; Bolle, W., vitamins and protein in enzoötic heart failure (pig) ; Perry, F. A. and Gilman, J. P. W., riboflavin deficiency and reproduction (rat) ; Forenbacher, S., vitamin B_1 deficiency (horse) ; Saatçioglu, S., racecourse disease and vitamin C (horse) ; Sengir, E., tuberculosis and vitamin C (guineapig) ; Schoop, G., vitamin A deficiency and infection (young animals) ; Ender, F. and Helgebostad, A., yellow fat disease (fur animals) ; Hoflund, S., Holmberg, J. and Nihlén, H., fat necrosis ; Reinius, L., biosynthesis of linoleic acid (rat).

9. FOOD AND AGRICULTURE ORGANIZATION (AND OTHER ORGANIZATIONS) OF THE UNITED NATIONS

Monthly Bulletin of Agricultural Economics and Statistics. Vol. 4, No. 9, September 1955, pp. 44. Price $0.50. Vol. 4, No. 10, October 1955, pp. 62. Price $0.50. P. 1. The postwar recovery of agriculture. A summary of Part 1 of *The state of food and agriculture*, 1955. *Review of a decade and outlook.* See p. 1140, Vol. 25.

Vol. 4, No. 11, November 1955, pp. 48. Price $0.50.

Yearbook of Fishery Statistics. 1952–53, Vol. 4, Part 2. International trade. Rome, Italy, 1955, pp. xi + 328. Price $3.00.

1952–53, Vol. 4, Part 1 (1954 Supplement). Selected catch and landings statistics, 1938, 1947–54. Rome, Italy, 1955. Price $1.00.

Food Balance Sheets. Second Issue. Rome, Italy, 1955.

This second issue of food balance sheets refers to 33 countries and gives 83 balances of which 21 are for pre-war years. They can be regarded as final since none refers to a year later than 1952. The tables include the data under 17 headings and conclude with an assessment of the daily consumption of total protein, with the proportion from animal and vegetable sources, of total fat and of energy per head of population. For the first issue see p. 501, Vol. 19.

Grain Exports by Source and Destination, July 1954-June 1955. Rome, Italy, October 1955, pp. 33. Mimeographed. Price $0.25.

Commodity Policy Studies No. 8. The international effects of national grain policies. Rome, Italy, September 1955, pp. 20. Price $0.25.

Commodity Reports. Fats and Oils No. 6. Rome, Italy, October 1955, pp. 67. Price $0.25.

Agricultural Development Paper No. 51. Problems of animal feeding in Europe. Rome, Italy, June 1955, pp. 147. Price $1.50. (See Abst. 1320, Vol. 26).

Legislation and other measures in European countries on the manufacture of and trade in compound feeds. Rome, Italy, March 1955, pp. vii + 81. Price $1.50.

The laws which operate at present in 16 European countries for controlling the manufacture of and trade in compound feedingstuffs are cited and summarised. For most of the countries there is provided also an evaluation of the legislation.

Problems of food and agricultural expansion in the Far East. Rome, Italy, November 1955, pp. vii + 78. Price $0.75.

This publication is in 2 parts. The first is the Report of the FAO Regional Consultation on the Selective Expansion of Production and Consumption in the Far East. The meeting was held at Kandy in June 1955 and was attended by delegates from Burma, Ceylon, India, Japan, Pakistan, Philippines, Thailand and Viet-Nam. They described recent developments in agricultural practice in their countries and the change in consumption of wheat at the expense of rice which has occurred in the region was found to be of consequence to both exporting and importing countries. Expansion of consumption and of agricultural production within the territories and complementary developments within the region were discussed on the basis of the paper prepared for the Consultation by FAO and published with its 6 annexes as Part 2 of this publication. It reviews the trends of agricultural production and of food consumption, considers how the pattern of production is influenced by consumption and emphasises the need for integration in the approach to the problems of production.

Activities of FAO under the Expanded Technical Assistance Program 1954-55. Rome, Italy, 1955, pp. viii + 99. Price $1.00.

This report differs from earlier annual reports in format and in its being presented in relation to the Organization's five departments, Agriculture, Economics, Fisheries, Forestry and Nutrition. An introductory statement describes the effects which the continuance and, in some cases, the increase of their financial support, given by 61 countries at the Pledging Conference in November 1954, had on the FAO programme of work. In agricultural spheres examples of efforts in plant production, animal disease control, pasture management and dairying are cited. In those of nutrition, education and training schemes, joint undertakings with UNICEF in feeding children and the organisation of national nutrition and home economics services are described.

N.A. and R., January 1956

10. DEPARTMENTAL AND OTHER REPORTS

UNITED KINGDOM.

Rowett Research Institute, Bucksburn, Aberdeenshire, Scotland. Report for the academic year 1954-1955. Pp. 49.

Utilisation of protein and nitrogenous compounds by ruminants.
Nitrogen metabolism of rumen micro-organisms.
Nitrogenous constituents of leaves, peptides, etc.
Soluble carbohydrate of grass.
Polysaccharides of rumen bacteria : serological identification of rumen organisms.
Availability of copper in herbage.
Properties of ciliate protozoa of sheep's rumen.
Holotrich carbohydrate enzymes.
Fermentation of hemicelluloses by rumen bacteria.
Urease-positive rumen bacteria.
Saccharolytic bacteria of rumen.
Lipase (esterase) activity of rumen bacteria.
Metabolism of phospholipids in mammary gland.
Rumen bacterial fat.
Milk fat, blood lipids and muscular dystrophy.
Chromatography of fatty acids.
Absorption from the alimentary tract of sheep.
Metabolism of short-chain fatty acids by tissues of the sheep.
Calorimetry : gradient layer calorimeter.
Adrenal physiology of the sheep.
Microflora of the caeca of chickens.
Activity and control of the stomach of sheep : rumination : effect of acid solution in rumen.
Chemical study on diet change in sheep.
Protein metabolism : specific activity and time curves for normal, fractured and cortisone-treated rats after injection of a hydrolysate of ^{14}C-labelled protein.
Effect of nutrition on an outbreak of Tyzzev's disease in mice.
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Plane of nutrition and haematological findings (rat).
Protein, vitamin and energy requirements of pigs.
Proteins in poultry rations, evaluation.
Dietary energy and poultry nutrition.
Studies on skeleton and dentition of hill sheep.
Evaluation of roughage as source of energy for sheep.
Distribution of vitamin D in sheep.
Effect of level of mineral, energy and vitamin D intake on mineral reserves of sheep.
Effect of different planes of nutrition during first two years of life on growth, yield and health of cows.
Effect of high levels of vitamins and of penicillin in rations of pigs housed in warm and cold pens.
Interaction between planes of feeding and genetic type of pig.
Copper sulphate in rations for growing bacon pigs.
Efficiency of food conversion for mutton and milk in two crossbreeds of sheep.
Value of heather, according to age and season, to the grazing sheep.
Effect of constant daylight/darkness rhythm on wool production of sheep.
Radiological study of the skeleton and dentition of hill sheep.

NEW ZEALAND

Department of Agriculture. Annual Report of the Director-General of Agriculture for the Year ended 31 March 1955. Pp. 164.

Rickets-producing factor in green feed.
Effect of lowering the level of nutrition and starvation in sheep.
Effect of excess vitamin A on hogget thrift.
Growth of hoggets on white clover and perennial ryegrass.
Post-lambing nutrition of ewes.
Measurement of feed intake of grazing sheep.
Effect of plane of nutrition on lifetime production of sheep.
Non-protein nitrogen and amino-acid nitrogen in blood of beef cattle grazing pasture.
Uniformity trials with identical and fraternal twins.
Rearing calves on different planes of nutrition, lifetime project.
Short-rotation and perennial ryegrass for milk production.
Estimation of body fat of pasture-fed beef cattle from measurement *in vivo* of body water by means of antipyrine.
Cobalt deficiency in soils.
Goitrogenic action of kale.
Copper and molybdenum in pastures and soils.
Rumen chemistry of the lamb and of older sheep.
Rumen flora studies on sheep : variation in microbial end-products, rumen function in thrifty and unthrifty hoggets ; effect of level of feeding on microbial concentrations.
Chemical composition of ewe's milk.

THE COMMONWEALTH BUREAU OF ANIMAL NUTRITION

NUTRITION ABSTRACTS AND REVIEWS

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THE DISTRIBUTION OF VITAMINS WITHIN THE TISSUES OF COMMON FOODSTUFFS

BY

W. I. M. HOLMAN

MEDICAL RESEARCH COUNCIL DEPARTMENT OF EXPERIMENTAL MEDICINE, CAMBRIDGE

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DURING the past twenty years a large amount of information about vitamins in foods has accumulated. The main object of most investigators has been to determine the average concentration in whole foods, but the literature contains also many references to the distribution of vitamins in particular tissues. Information on this question has not, perhaps, received as much attention as it deserves, in view of its practical importance in relation to the conservation of vitamins during the preparation and processing of food, and of its interest for plant and animal physiology.

An attempt has therefore been made to assemble the recorded facts in an accessible form, and to outline any general patterns of vitamin distribution in different kinds of food. Where possible, physiological factors responsible for the observed patterns of distribution, and practical applications of present knowledge, are discussed.

SCOPE OF SURVEY

The present review is based primarily on a survey of literature covering the period from the beginning of 1938 to the middle of 1954. Some of the most important earlier studies have been included also. Though the emphasis is on foods commonly used for human consumption in the United Kingdom, imported as well as locally grown materials have been included and most of the foods studied are widely used in other countries also. Unless otherwise stated, all information given refers to the fresh food, as produced on the farm, or as purchased.

Some aspects of vitamin distribution in the tissues of foods have previously been discussed by Fenton (1940), Cruickshank (1940–41), Simpson (1943), Holman (1945–46) and Blaxter and Brown (1952); in addition, Waisman and Elvehjem (1941) prepared a useful compilation of their own and other workers' values for the average concentrations of vitamins in animal tissues. No recent detailed survey of the literature appears to have been made.

The present review is concerned more with the relative differences between the concentrations of vitamins in tissues than with the concentrations themselves, but some of the recorded values have been assembled in tabular form. The values selected (see Tables 1 to 7) are in each case those of investigators who examined a variety of different tissues from a particular plant or animal product and who used methods of analysis based on well established principles. The values chosen illustrate the main trends in vitamin distribution, but it should be noted that they do not necessarily represent the best available figures for the *average* concentrations in the particular foods.

A wide variety of methods has been used for the examination of tissues, including qualitative histochemical techniques as well as biological and chemical methods of vitamin estimation. In many instances the same general conclusion has been reached by a number of investigators, providing some assurance that the methods used are suitable and the findings valid. Where, from the nature of the techniques used, it seemed possible that the results obtained might be misleading, attention has been drawn to the methods employed.

The term vitamin A, as used in the present review, refers to the pre-formed vitamin, the expression "vitamin A activity" being used where it was uncertain from the evidence supplied whether the particular food contained pro-vitamins A also. The expression "total carotenoids" is used where it was stated that the total pigment extractable by a fat solvent was estimated colorimetrically in terms of β-carotene, and "carotene" where it appeared that the fraction analysed approximated to β-carotene, or to utilisable or total carotene.

With vitamin C, though many of the methods used measured the total vitamin activity, it was ascorbic acid alone that was estimated in a number of instances. Since, however, most fresh plant materials contain very little dehydroascorbic acid, and since many workers provided evidence that no appreciable amount of the latter was present, the term "vitamin C" has been generally used, and the term "ascorbic acid" adopted only in a few instances where it appeared that ascorbic acid alone was estimated and where relatively little confirmatory information was available.

With vitamin E, the term "vitamin E activity" has been used when biological tests were made, and the term "tocopherols" when tocopherols present were estimated by chemical methods and the results were given for each tocopherol individually or for mixed or total tocopherols.

EVIDENCE CONCERNING FOODS OF PLANT ORIGIN

The information summarised about foods of plant origin deals chiefly with members of the vitamin B complex and with vitamins C and E, but some information is given also about the distribution of the pro-vitamins A (carotenoids), which are common constituents of plants. Vitamin A itself does not occur in plant tissues, and vitamin D does not appear to be present in living tissues of higher plants, although its presence has been detected in a number of sun-dried plant products.

Cereals

It has long been known from animal feeding tests on milling products that vitamin B_1 is distributed unevenly within cereal grains, being concentrated in the germ and bran. Some information about the distribution in cereals of other vitamins also has been obtained through the analysis of milling fractions.

In recent years special techniques have been developed for the examination of individual grains and much has been discovered about the exact sites of maximum vitamin concentration.

Vitamin B_1. Hinton (1942), working at the Cereals Research Station, St. Albans, first showed by dissection of wheat grains and analysis of the dissected fractions that vitamin B_1 is concentrated in the scutellum portion of the germ, a finding which was confirmed by Ward (1943) and by Jackson, Doherty and Malone (1943). It was estimated that the scutellum, although representing only a small proportion of the weight of the grain, contributed about 60 per cent. of the total vitamin B_1 (Jackson *et al.*, 1943; Hinton, 1944; van der Mijll Dekker, 1951). By further use of the dissection technique, Hinton (1947) showed that most of the remainder of the vitamin (32 per cent. of the total in the wheat grain) was present in the aleurone layer. In studies of other cereals, Hinton (1944) showed that the scutellum contributed 49, 82, 85, and 28 per cent. of the total vitamin B_1 in the hull-free kernels of barley, rye, maize, and oats, respectively.

Somers, Coolidge and Hamner (1945) used an entirely different technique for examining wheat grains, based on conversion of the vitamin B_1 present in a cut surface of the grain into thiochrome *in situ* by treatment with alkaline

ferricyanide, and measurement of the relative intensity of fluorescence in ultraviolet light of the different parts of the grain. They concluded that the vitamin B_1 in wheat is located chiefly in the aleurone layer, in the endosperm cells adjoining the aleurone cells at the base of the crease, in the scutellum, and in the endosperm adjoining the scutellum. Their findings were later confirmed by Pollock and Geddes (1951) using the same technique.

Holman and Godden (1947) analysed dissected fractions of oat grains and found that the hull of the ripe grain contained no measurable amount of vitamin B_1, and the central endosperm very little. Most of the vitamin B_1 was located in the bran and germ fractions, the former contributing slightly more of the total vitamin of the grain than the latter. It was estimated that the bran fraction contributed from 44 to 61, the scutellum from 25 to 27, and the whole germ from 36 to 42 per cent. of the total vitamin B_1 in the hull-free kernel.

Pulkki and Puutula (1947) examined grains of several cereals by analysing successive fractions removed by an emery scouring machine, as well as by dissection, and confirmed that most of the vitamin B_1 in wheat, barley and rye is located in or near the germ. They concluded that vitamin B_1 is more evenly distributed in the kernels of oats than in those of wheat and barley, that oat bran is rich in vitamin B_1, and that oat hulls contain only small amounts of the vitamin.

Detailed dissections made by Hinton (1948) on two samples of rice showed that the scutellum contributed from 44 to 50, the aleurone layer from 33 to 35, the embryo from 10 to 12 and the endosperm from 6 to 9 per cent. of the total vitamin B_1 of the grain. Simpson (1951), using the technique of Somers *et al.* (1945), found that the vitamin B_1 in rice was concentrated in the germ, particularly in the scutellum and adjacent cells of the endosperm.

Riboflavin. There is much evidence to show that the distribution of riboflavin in the wheat

TABLE 1

CONCENTRATION OF B VITAMINS IN AIR-DRY TISSUES OF MATURE CEREAL GRAINS

Cereal	Tissue	Vitamin B_1 (mg. per 100 g.) Sample 1	Vitamin B_1 (mg. per 100 g.) Sample 2	Nicotinic acid (mg. per 100 g.) Sample 1	Nicotinic acid (mg. per 100 g.) Sample 2	Authority
Wheat	Embryo	0·84[a]	—	3·85[b]	5·2[b]	
	Scutellum	15·6	—	3·82	3·8	
	Pericarp and testa	0·06	—	2·57	2·0	
	Aleurone layer	1·65	—	74·1	61·3	(a) Hinton (1947)
	Endosperm, outer	0·03	—	2·72	1·5	
	Endosperm, middle	0·015	—	0·98	0·82	(b) Heathcote *et al.*
	Endosperm, inner	0·009	—	0·55	0·47	(1952)
Barley	Embryo	1·5	—	—	—	
	Scutellum	10·5	—	—	—	
Oats	Embryo	1·44	—	—	—	Hinton (1944)
	Scutellum	6·6	—	—	—	
Rye	Embryo	0·69	—	—	—	
	Scutellum	11·4	—	—	—	
Maize	Embryo	2·61[a]	—	1·92[b]	2·38[b]	
	Scutellum	4·2	—	1·54	1·59	
	Pericarp	—	—	0·44	1·28	(a) Hinton (1944)
	Aleurone layer	—	—	35·3	37·1	
	Endosperm, outer	—	—	2·45	5·43	(b) Heathcote *et al.*
	Endosperm, middle	—	—	0·93	1·38	(1952)
	Endosperm, inner	—	—	0·13 to 0·18	0·25	
Rice	Plumule	4·65[a]	2·58[a]	—	—	
	Radicle	6·45	4·71	—	—	
	Epiblast	7·80	2·34	—	—	(a) Hinton (1948)
	Coleorhiza	9·45	3·12	—	—	
	Whole embryo	—	—	5·33[b]	4·43[b]	
	Scutellum	18·9	13·08		8·33	(b) Hinton and
	Pericarp and aleurone layer	3·15	—	74·8	86·5	Shaw (1954)
	Endosperm, outer	0·14	0·015 to *	8·70	9·38	
	Endosperm, inner	0·03	0·03	0·37	0·37	

* Not stated whether outer or inner endosperm, presumably the latter.

grain is more uniform than that of vitamin B_1 (Hinton, 1942; Jackson *et al.*, 1943; Somers *et al.*, 1945). From examination of a cut surface of the grain in ultraviolet light Somers *et al.* (1945) concluded that the germ and aleurone layer were the regions of highest concentration, that there was a uniform distribution in different parts of the germ, and that the bran appeared to contain some riboflavin. Pollock and Geddes (1951) confirmed the conclusions of Somers *et al.* (1945) with respect to wheat, and Simpson (1951) concluded that in rice the maximum concentration of riboflavin was in the germ, the distribution within the germ being more uniform than that of vitamin B_1.

Nicotinic acid. There is considerable evidence that the nicotinic acid in the wheat kernel is located chiefly in the bran. Andrews, Boyd and Gortner (1942) reached that conclusion from a study of milling fractions of wheat, and Jackson *et al.* (1943) from analyses of millstreams and dissected fractions of the grain. More recently, Heathcote, Hinton and Shaw (1952) showed by dissection that the aleurone layer contributed 82 and the scutellum only 1·3 per cent. of the total nicotinic acid in two samples of wheat.

It has been demonstrated (see, *e.g.*, Chaudhuri and Kodicek, 1950) that wheat bran contains a precursor of nicotinic acid, which is readily converted to the free acid by hydrolysis with alkalis, but more slowly with acids. Heathcote *et al.* (1952) found no increase in their values when alkaline, instead of their usual method of acid, digestion was used, showing that their results must have included the nicotinic acid derived from this precursor, as well as that present as the acid and its amide.

With maize, the concentration of nicotinic acid is higher in whole grains of sugary varieties than in those of ordinary starchy varieties (Mather and Barton-Wright, 1946). The finding has been subsequently confirmed by a number of investigators and evidence has been produced that the nicotinic acid concentration is an endosperm character related to specific genes carried by the seed (see, *e.g.*, Richey and Dawson, 1951; Teas and Newton, 1951). Heathcote *et al.* (1952) examined by dissection grains of both these kinds of maize. Their results showed that in the aleurone layer and scutellum there was no appreciable difference in the concentration of nicotinic acid between the sugary and starchy varieties, but that in the endosperm the concentration was considerably higher in the sugary than in the starchy variety. In both, the aleurone layer was much richer in nicotinic acid than the scutellum or the endosperm and contributed from 59 to 63 per cent. of the total nicotinic acid in the whole grain.

Hinton and Shaw (1954) examined two varieties of rice and found that from 79 to 86 per cent. of the total nicotinic acid was in the pericarp and aleurone layer and from 12 to 18 per cent. in the endosperm. There was a notable decrease from the outer to the inner portion of the endosperm. The whole germ (embryo and scutellum) contributed only from 2 to 4 per cent. of the total nicotinic acid.

Vitamin C. The seeds of cereals, like those of many other species of plants, are devoid of vitamin C when in the mature, dry state (see *e.g.*, Daniel and Munsell, 1937).

Vitamin E. As early as 1925 Evans and Burr reported that vitamin E activity is low in the endosperm but high in the germ of wheat, maize and oats (Evans and Burr, 1925). More recently, Binnington and Andrews (1941) extracted the oil from each of the milling products of a hard and a durum wheat, and estimated tocopherol in the oil by a chemical method. They did not estimate the several tocopherols individually. It was concluded that in both wheats about 55 per cent. of the tocopherol was in the germ. In the hard wheat most of the remainder was in the endosperm adjacent to the bran, but in the durum wheat it was fairly evenly distributed throughout the endosperm.

General Conclusions

The available evidence shows that in mature cereal grains vitamin B_1 is concentrated in the scutellum portion of the germ and in the aleurone layer. In most cereals a higher proportion of the total vitamin B_1 of the grain is contributed by the scutellum than by the aleurone layer, but in oats the bran fraction, which includes the aleurone layer, supplies more than the scutellum. The endosperm contains very little vitamin B_1.

The germ and the aleurone layer appear to be the regions where the highest concentration of riboflavin occurs in the kernels of wheat and rice, but the distribution of riboflavin in the tissues is more even than that of vitamin B_1.

The nicotinic acid in the kernels of wheat, maize and rice is located chiefly in the aleurone layer; very little is contributed by the germ.

Vitamin E is concentrated in the germ of wheat, maize and oats.

Fruits

Apples and Pears

B vitamins. James (1944) found that the concentration of riboflavin in the peel and core of both apples and pears was higher than in the flesh, but that the flesh contributed the greater part of the total riboflavin of the fruit. In apples and pears, respectively, the flesh (cortex) contributed from

54 to 64 and 79, the peel from 20 to 27 and 15, and the core (including the calyx, placenta and seeds) from 16 to 19 and 6 per cent. of the total riboflavin.

Teply, Strong and Elvehjem (1942) reported that the concentration of nicotinic acid was much higher in apple and pear peelings than in the corresponding peeled fruits and Toepfer, Zook, Orr and Richardson (1951) that the concentration of folic acid in apple peelings greatly exceeded that in peeled fruit.

Vitamin C. Much evidence has accumulated to show that the concentration of vitamin C is higher in the skin or peel of the apple than in the cortex. The evidence relates to Bramley's Seedling and Newton Wonder apples (Bracewell, Kidd, West and Zilva, 1931), two United States varieties (Fellers, Isham and Smith, 1932), five English varieties (Birch, Harris and Ray, 1933), Bramley's Seedling (Olliver, 1936), Bramley's Seedling and Cox's Orange Pippin (Chappell, 1940), sixteen United States varieties (Eheart, 1941), New Zealand apples (Keys, 1943), 3 varieties of cider apples (Pollard, Kieser and Bryan, 1945; Kieser and Pollard, 1946), numerous varieties of English apples (Kieser and Pollard, 1947), and 24 Canadian varieties (Grant, 1947). Chappell (1940), however, found a lower concentration of ascorbic acid in the peel of market-purchased Worcester Pearmain apples than in the cortex. In the United States varieties the concentration was from 3 to 10 times higher in the peel than in the cortex (Eheart, 1941) and in New Zealand apples it was from 5 to 14 times higher in the skin than in the cortex (Keys, 1943). There is some evidence that the concentration is higher in the outer flesh than in the flesh near to the core (Bracewell *et al.*, 1931).

In the pear, also, it has been reported that the concentration of vitamin C is higher in the peel than in the cortex (Olliver, 1936; Chappell, 1940).

Citrus Fruits

Vitamin C. Many reports are available to show that the concentration of vitamin C is higher in the peel than in the juice of citrus fruits. The evidence relates to tangerines and Seville and sweet oranges (Bacharach, Cook and Smith, 1934), Seville oranges (Olliver, 1936), several species of citrus fruit grown in Japan (Fujita and Ebihara, 1939), Spanish and Jaffa oranges (Chappell, 1940), and South African oranges (Lampitt and Baker, 1942). Bacharach *et al.* (1934) found no difference in ascorbic acid concentration between the whole peel and juice of the lemon, but Deaker (1952) found a higher concentration in the peel than in the juice of New Zealand lemons of the Meyer and Standard types. The difference was less pronounced in the former than in the latter type.

Bacharach *et al.* (1934) showed that in both the orange and the lemon the concentration of ascorbic acid was much higher in the outer yellow skin of the peel (flavedo) than in the inner white skin (albedo), and that the pips of Seville oranges contained no measurable amount. In Seville oranges 40 per cent. of the total ascorbic acid was located in the flavedo, 45 per cent. in the albedo, and 15 per cent. in the juice.

It was reported by Chappell (1940) that when oranges were cut longitudinally into quarters and the quarters analysed separately, there were slight differences in ascorbic acid concentration of both peel and juice between one quarter and another. In one sample of Brazilian oranges but not in another Chappell found a slightly higher concentration in the juice than in the peel.

Lampitt and Baker (1942) found no difference in vitamin C concentration between the pulp and the juice of South African oranges.

Other Fruits

Carotene. Ellis and Hamner (1943) reported that the concentration was higher at the stem than at the blossom end of ripe tomato fruits.

B vitamins. The evidence of James (1944) showed that the concentration of riboflavin was higher in the peel and core of the tomato than in the flesh, but that the flesh contributed the greater part of the total riboflavin of the fruit. It was estimated by James that the flesh including the placenta contributed 65, the core, including the endocarp and seeds, 20, and the peel 15 per cent. of the total riboflavin. There is also some evidence that the concentration of nicotinic acid is higher in tomato peelings than in the peeled fruit (Teply *et al.*, 1942).

In the pineapple, Haagen-Smit, Strickland, Jeffreys and Kirchner (1946) found variations in vitamin B_1 concentration from one part of the interior of the fruit to another. A higher concentration was found at or near the core than near the shell, and a slightly higher concentration at the bottom than at the centre or top of the fruit.

Vitamin C. In the tomato Maclinn and Fellers (1938) reported that the concentration of vitamin C was highest in the seeds and gelatinous material of the locule, but that the outside flesh and skin contributed most of the total vitamin C of the fruit. Wokes and Organ (1943) found that the concentration in the seeds was much less than in the whole fruit and the concentration in the skin higher than in the flesh or juice. Le Riche and Burger (1946), who analysed the skin, flesh and pulp (all parts of the fruit except the seeds) separately, reported that in immature as well as in ripe tomatoes the skin had the highest concentration and the flesh the lowest.

In the ripe fruits of paprika (*Capsicum annuum*) examined by Beckley and Notley (1943) the concentration of ascorbic acid was higher in the pericarp than in the placentas, which in turn were much richer than the seeds. It was estimated that the pericarp contributed from 88 to 92, the placentas from 7 to 12, and the seeds from 0·3 to 0·4 per cent. of the total ascorbic acid of the fruit.

In several other species of fruit also it has been found that the concentration of vitamin C is higher in the outer than in the inner tissues. Thus, Olliver (1938) and Burkhart and Lineberry (1942) found that the concentration was higher in the cortex than in the medulla of the strawberry, and Kirk and Tressler (1941) and Schroder, Satterfield and Holmes (1943) that the concentration in the skin of the peach exceeded that in the flesh. According to Schroder *et al.* (1943) the concentration was higher in the outer flesh than next to the pit. In papayas (*Carica papaya*), Fujita and Ebihara (1939) found that the concentration was higher in the skin than in the flesh, and Robinson and Courtice (1940) that the concentration in the portion of the fruit just under the skin exceeded that in the inner portion.

In peeled bananas Thornton (1943) found a uniform distribution of vitamin C between different parts of individual fingers, different fingers, and different hands of the same lot, provided that all were at the same stage of ripeness. The concentration in all parts rose slightly in the early stages of yellowing, and then decreased steadily with advancing ripeness.

According to Haagen-Smit *et al.* (1946) the concentration of vitamin C is higher in the core of the pineapple than in the flesh near the core or near the shell, and higher at the bottom than at the centre or top of the fruit.

General Conclusions

In many fruits (*e.g.*, apples, pears, citrus fruits, papayas, peaches and tomatoes) the concentration of vitamin C is higher in the outer skin or peel than in the inner flesh or pulp. A similar relation may apply to riboflavin and to nicotinic acid, at

TABLE 2

CONCENTRATION OF VITAMIN C IN FRESH TISSUES OF FRUITS *

Fruit	Tissue or part of fruit	Vitamin C (mg. per 100 g.) Sample 1	Sample 2	Sample 3	Authority
Apple					
Bramley's Seedling	Peel	50·0	83·3		Olliver (1936)
	Cortex	13·9	16·7		
Cox's Orange Pippin	Peel	10	9·6		Chappell (1940)
	Cortex	1·4	1·8		
Orange					
Samples 1 and 2, Seville	Flavedo	220	180	130	Bacharach *et al.* (1934)
Sample 3, sweet	Albedo	72	77	69	
	Whole peel	190	86	101	
	Juice	46	22	72	
	Pips	< 1	< 1		
Peach					
11 varieties, 1 sample of each	Skin	Range 14 to 41			Kirk and Tressler (1941)
	Pulp	Range 6 to 14			
Pear	Peel	6·6[a]	1·89[b]	2·71[b]	(a) Olliver (1936) (b) Chappell (1940)
	Cortex	3·1	0·8	1·2	
Strawberry	Cortex	113	105	132	Olliver (1938)
	Medulla	66	57	66	
Tangerine	Whole peel	69			Bacharach *et al.* (1934)
	Juice	15			

* Values based on chemical estimation of ascorbic acid.

any rate in the apple, pear and tomato. The proportion of the total vitamin C of the whole fruit which is present in the outer tissues has not always been determined, and may be small in thin-skinned fruits. In citrus fruits it is known to be considerable.

In apples, pears and tomatoes the concentration of riboflavin is higher in the core than in the flesh. The available evidence suggests that a similar relation may apply to vitamin C in tomatoes. Variations in vitamin C concentration within the flesh have been recorded in a number of species of fruits; in the apple, peach and papaya the concentration is higher in the outer than in the inner flesh. In oranges and paprika fruits the seeds contain little or no vitamin C.

Vegetables

Legumes

Vitamin C. The results of Olliver (1936) for green peas and of Lampitt, Baker and Parkinson (1943) for runner beans show that the concentration of vitamin C is higher in the seeds of immature legumes than in the pods. Mature, dry peas are devoid of the vitamin (Harris and Ray, 1933) (*cf.* vitamin C in cereals), but Shaw and Pascoe (1949) reported the presence of vitamin C in dry seeds of the broad bean.

Nicotinic acid. According to Terroine and Desveaux-Chabrol (1947), 96 per cent. of the total nicotinic acid in the mature, dry seeds of beans is in the cotyledons.

Leafy Vegetables

Carotene. The values of Munsell and Kennedy (1935) show that the concentration of carotene in green outer leaves of lettuce is much higher than that in white inner leaves, and according to Bartlett, Cotton, Henry and Kon (1938) the concentration in leaves of thousand-headed kale is higher than in stalks. In cooked broccoli Booher and Marsh (1941) found evidence that the concentration was higher in leaves than in buds. Sheets, Leonard and Gieger (1941) reported that the concentration of carotene was much higher in green outer than in white inner leaf blades of cabbage, and in leaf blades than in leaf stalks of spinach.

In unblanched celery Wilcox and Galloway (1951) found that the leaves were much richer than the stalks, and that outside leaves were richer than inside leaves, and outside stalks than inside stalks.

B vitamins. Flavier and Genevois (1939) reported that the concentration of riboflavin was much the same in heart and outer leaves of cabbage, but that the concentration of vitamin B_1 was higher in the former than in the latter. Wood, Collings, Stodola, Burgoin and Fenton (1946) confirmed the conclusion with respect to vitamin B_1 but found that heart were slightly richer in riboflavin than outer leaves. The concentrations of both vitamins decreased steadily from the centre to the periphery of the plant. In lettuce Flavier and Genevois (1939) found little difference between outer and heart leaves with respect to vitamin B_1 or riboflavin concentration. According to Jones, Wood, Phillips, Fenton and Harris (1944), the concentrations of vitamin B_1 and riboflavin were higher in the buds of commercially frozen broccoli than in the stalks.

The results of Robbins, Hervey and Stebbins (1950; 1951) show that, in comparison with micro-organisms and animals, higher plants are very poor sources of vitamin B_{12}, and that most of the vitamin B_{12} present is in the roots. In cabbage, broccoli, kale, celery and leeks the leaves were devoid of vitamin B_{12} and the stems contained no more than a trace.

Vitamin C. (1) *Cabbage and Brussels sprouts.* In a series of comparisons between heart and outer leaves of market-purchased cabbage, Chappell (1940) found that the concentration of vitamin C was higher in the heart. Robinson and Courtice (1940), however, found that green leaves just under the outermost leaves were richer than the middle leaves or the innermost leaves, and Sheets *et al.* (1941) that the blades of green, outer leaves of fresh cabbage were richer than the blades of white, inner leaves. In the samples analysed by Lampitt *et al.* (1943), green, outer leaves were richer than heart leaves, but heart leaves were, in two out of three instances, richer than leaves immediately beneath the outermost leaves.

Le Riche (1946–47*b*) compared green and white leaves of cabbage in two successive seasons and found the average concentration of vitamin C significantly higher in green than in white leaves in the first year, but slightly higher in white than in green leaves in the second year. Le Riche stated that the weather was hotter and drier and growth was slower in the second than in the first year, and suggested that the difference in weather conditions between the two seasons may have influenced the distribution of the vitamin.

Higher concentrations in green outer leaves than in heart and core were found in most of the cabbage heads studied by Beckley and Notley (1941), Olliver (1947) and Branion, Roberts, Cameron and McCready (1948), but Hallsworth and Lewis (1949) found a higher concentration in the heart and core than in the outer leaves, and Branion *et al.* (1948) state that the concentration of ascorbic acid in the outer green leaves was much reduced if they were faded. The studies of Beckley and Notley (1941),

Wood *et al.* (1946), Olliver (1947), Branion *et al.* (1948) and Hallsworth and Lewis (1949) were more detailed than those of other workers, and their results show clearly that there is a zone of minimum vitamin C concentration between the outer leaves and the heart.

Lampitt *et al.* (1943) and Hallsworth and Lewis (1949) found a higher concentration in leaf blades than in midribs, but Le Riche (1946–47*b*) found no appreciable difference between the concentrations in the midrib and the leafy tissue, and Wood *et al.* (1946) reported higher values for the rib than for the blade, at any rate in outer green leaves.

From the available evidence it appears that the concentration of vitamin C in the cabbage is at a minimum in the layers roughly midway between the periphery and the core. The outer leaves and the heart and core are the richest parts of the head, the first being frequently but not invariably the area of maximum concentration. Wilting reduces the vitamin C content of the outer leaves.

In Brussels sprouts Olliver (1936) found no marked differences in vitamin C concentration between one part of the sprout and another, but the value obtained for the heart leaves was slightly higher and for the stem slightly lower than the values for the inner and outer leaves. A slightly higher concentration in heart than in outer leaves was recorded by Chappell (1940).

(2) *Broccoli and Cauliflower.* In fresh broccoli Wheeler, Tressler and King (1939) and Fujita and Ebihara (1939) found a higher concentration of vitamin C in the buds than in the stalks, and Lampitt *et al.* (1943) a slightly higher concentration in the heads than in the leaves. According to Fujita and Ebihara (1939) the concentration is higher in the mesophyll tissue of the leaves than in the veins. With commercially frozen broccoli it has been found that the concentration of vitamin C in the stalks is higher than in the buds (Barnes and Tressler, 1943 ; Jones *et al.*, 1944), suggesting that a redistribution of the vitamin occurs during processing, probably when the vegetable is scalded before freezing.

In fresh cauliflower Wheeler *et al.* (1939) reported that the concentration of vitamin C was, on the average, slightly higher in the buds than in the stalks, and Chappell (1940) that the concentration was much higher in the buds than in the leaves. Beckley and Notley (1941) made a detailed study of a cauliflower plant and found that the concentration was higher in the outer leaves than in the head ; within the head the stalks of the inner buds were much richer than the buds themselves, but the outer buds were slightly richer than their stalks.

(3) *Spinach, Kale, Seakale, Lettuce and Watercress.* In spinach, Olliver (1936) reported that the concentration of vitamin C in small centre leaves was higher than in a medium-sized inner leaf or a large outer leaf from the same plant. Stems were much poorer in vitamin C than leaves, a finding confirmed by Tressler, Mack and King (1936), Ijdo (1936) and Sheets *et al.* (1941). Olliver (1936) bisected single spinach leaves by cutting along or at right angles to the midrib and analysed the halves separately. The results showed that the distribution of the vitamin in a single leaf was fairly even, but that the concentration varied considerably from one leaf to another. Fujita and Ebihara (1939) found that the concentration of vitamin C was much higher in the mesophyll tissue of the leaf than in the veins.

The results of Chappell (1940) showed that the concentration of vitamin C was higher in inner leaves of curly kale than in outer leaves, which in turn were richer than heart leaves. Still lower values were obtained for midribs from the lower ends of outer leaves. Murphy (1944) also reported higher values for inner than for outer leaves of kale, but Werder and Antener (1938) found outer leaves richer than inner leaves.

The analysis of seakale made by Chappell (1940) showed no great difference in vitamin C concentration between outer leaves, inner leaves, and the heart cluster, but there was a slight tendency for the values to be higher at the centre than at the periphery of the plant.

In lettuce Werder and Antener (1938) found that green leaves were richer than white heart, and Le Riche (1946–47*a*), who analysed a cabbage-type lettuce, that green leaves were richer than white leaves, but Lampitt *et al.* (1943) found that the concentration was higher in the heart of lettuce than in the outer leaves. Sheets *et al.* (1941) reported that the concentration of vitamin C was much higher in the blades than in the stalks of the leaves.

In watercress the concentration of vitamin C in the leaves greatly exceeded that in the stalks (Lampitt *et al.*, 1943).

(4) *Celery and Rhubarb.* Several investigators have shown that the leaves of celery are much richer in vitamin C than the stalks (Osterman, 1938 ; Chappell, 1940 ; Wilcox and Galloway, 1951). Chappell (1940) found no appreciable difference between the upper and lower ends of a stalk, between inner and outer stalks, or between stalks and heart, and Lampitt *et al.* (1943) found almost no difference between green and white stalks. Wilcox and Galloway (1951), however, found higher concentrations in the outside than in the inside leaves and in the inside than in the outside stalks of unblanched celery. Osterman (1938) also reported higher values for inside than for outside stalks of celery.

In rhubarb also it was found that the concentration of vitamin C was much higher in the leaves

than in the stalks (Chappell, 1940). The available evidence shows that the concentration is higher at the top of the stalk than at the base (Chappell, 1940; Brown, Schuele and Fenton, 1941), and Brown *et al.* (1941) stated that the skin was slightly richer than the interior of the stalk.

(5) *Asparagus.* The concentration of vitamin C decreased from the tip down the stem in fresh, mature shoots (Olliver, 1936; 1938; Clifcorn and Heberlein, 1944), and also in immature shoots before the tips had become green, as well as in stored asparagus (Olliver, 1938).

(6) *Leek and Onion.* In two tests Chappell (1940) found that the concentrations of ascorbic acid at the top and at the base of leek stems were almost the same, but in a third comparison the concentration was found to be higher at the top.

In bulbs of 10 varieties of onion the concentration of ascorbic acid was higher in the central than in the peripheral tissue (Murphy, 1941).

Vitamin E. There is evidence that in kale the concentration of tocopherols is much higher in the leaves than in the stems (Brown, 1953).

Root Vegetables

Carotene. The results of Booth (1951*a*) for 16 varieties of carrot show clearly that the concentration of total carotenoids in the cortex (phloem) is much higher than that in the core (xylem). Harper and Zscheile (1945) found in the one variety studied by them that cross-sectional slices taken from the tip and centre of a root were alike in total carotenoid concentration, but that those from the top were 50 per cent. richer. In centre slices the outer phloem was richer than the inner phloem.

B vitamins. Streightoff, Munsell, Ben-Dor, Orr, Leonard, Ezekiel and Koch (1946) found evidence that the concentrations of vitamin B_1, riboflavin and nicotinic acid were much higher in the portion of the carrot root removed by machine peeling than in the remainder of the root. Streightoff, Munsell, Ben-Dor, Orr, Cailleau, Leonard, Ezekiel, Kornblum and Koch (1946) stated also that the concentrations of riboflavin and nicotinic acid were higher in the peelings of potatoes than in the peeled tuber. Teply *et al.* (1942), however, found a slightly lower concentration of nicotinic acid in potato peelings than in peeled tubers.

Meiklejohn (1943) concluded that vitamin B_1 was concentrated in the centre, not in the skin layer of the potato tuber, and at the bud end, not at the stem end. During storage there was a loss from the centre of the tuber, particularly in spring after sprouting had begun.

According to Toepfer *et al.* (1951), the concentration of folic acid is higher in potato peelings than in the remainder of the tuber.

Vitamin C. In carrots, according to Beckley and Notley (1941), the concentration of ascorbic acid was slightly higher at the top end of the root than at the middle or tip, but in parsnips the concentration of vitamin C was higher in the tip than in the upper portion of the root (Mayfield and Richardson, 1940; Brown and Fenton, 1942). Olliver (1941) found that the concentration was lower in the peel of old parsnips than in the remainder of the root, and Brown and Fenton (1942) that the cortex of fresh parsnips was poorer than the medulla.

Much evidence is available concerning the distribution of vitamin C in the potato tuber, showing for the most part that the concentration tends to be lower in the skin or peel than in the interior of both new and old tubers (Paech, 1938; Olliver, 1941; Esselen, Lyons and Fellers, 1942; Murphy, Dove and Akeley, 1945; Branion, Roberts and Cameron, 1947). Chappell (1940), however, reported a slightly higher concentration at the periphery than at the centre of new Cyprus potatoes, and Rolf (1940) and Lampitt, Baker and Parkinson (1945) could find no appreciable difference between the concentrations in the periphery and interior of potatoes during storage. Lampitt *et al.* (1945) suggested that oxidation of vitamin C in the peel during sampling may have been responsible for the finding, by other workers, of lower values in the peel than in the interior; but this explanation does not appear to be applicable to Paech's (1938) work, where special precautions were taken to avoid error from oxidation, or to that of Branion *et al.* (1947), whose conclusions were based on the difference between values for unpeeled and peeled tubers as well as on direct analysis of peel. Lampitt *et al.* (1945) took relatively thick ($\frac{1}{8}$-inch) samples of peel for analysis and it is possible, as they themselves suggest, that their samples of peel included too much of the interior of the tuber for a small difference between skin and interior to be detected.

Evidence is available also that the concentration of vitamin C may be higher at the bud end of the tuber than at the stem end. Such a relation was found in stored and in fresh potatoes (Rolf, 1940), in stored, sprouting potatoes (Smith and Gillies, 1940), and in 21 out of 26 samples of potatoes in the early stages of storage (Baird and Howatt, 1948). Lampitt *et al.* (1945) obtained inconclusive results in tests on one variety of new and two varieties of old potatoes but found that in sprouted potatoes the concentration of vitamin C was often greater in the sprouts and in the peel surrounding the eyes than in the remainder of the peel or in the interior of the potato. Paech (1938) and Esselen *et al.* (1942) could find no appreciable difference between the concentrations of vitamin C in the outer, intermediate, and inner portions of peeled tubers.

Fungi

No appreciable difference in ascorbic acid concentration was found by Chappell (1940) between stems, gills, peel and white flesh of the mushroom.

General Conclusions

The available evidence shows that the concentration of carotene is higher in the leaves than in the stalks of a number of plant species and is higher in green, outer leaves and stalks than in inner leaves and stalks. In the root of the carrot the concentration is much higher in the outer tissue than in the core.

Information about members of the vitamin B complex is too meagre for many conclusions to be reached, but it appears that the concentration of vitamin B_1 may be lower, and the concentrations of riboflavin and folic acid higher, at the periphery than in the interior of the potato tuber.

In many species of leafy vegetables there is a tendency for the concentration of vitamin C to be higher in green, outer leaves than in inner leaves, and in areas of active growth, such as the heart or core or the tips of shoots, than in more mature tissues. Leaf blades tend to be richer than midribs, petioles and stems, and the mesophyll tissue of the blades than the veins; buds are often richer than their stalks. The relative extent to which these tendencies are demonstrated varies from one species to another, and even between individual plants of the same species.

TABLE 3

CONCENTRATION OF VITAMIN C IN FRESH TISSUES OF SOME COMMON VEGETABLES *

Vegetable	Tissue or part of vegetable	Vitamin C (mg. per 100 g.) Sample 1	Sample 2	Sample 3	Authority
Asparagus	Tip	83·3	45·0	165·4	Olliver (1936)
	Middle green stem	37·5	23·7	71·7	
	White stem	17·0	8·0	25·6	
Beans, runner	Seeds	50			Lampitt *et al.* (1943) †
	Pods	29			
Broccoli, 4 varieties	Blossoms		av. 146		Wheeler *et al.* (1939) †
	Stems		av. 109		
Cabbage	Outer green leaves	85·7	63·0	104·6	Beckley and Notley (1941)
	Curled green leaves	68·9	49·4	55·2	
	White leaves	45·2	46·0	32·5	
	Heart leaves	78·0	65·7	55·0	
	Core	77·9	66·3	56·7	
Celery, 3 varieties in 4 seasons	Outside stalks	Range 7·8 to 11·1			Wilcox and Galloway (1951)
	Inside stalks	,, 7·7 to 21·6			
	Inside leaves	,, 26·7 to 52·2			
	Outside leaves	,, 25·9 to 108·7			
Potato, 6 tubers	Central portion		av. 13·1		Esselen *et al.* (1942) †
	Median portion		av. 12·9		
	Epidermal portion		av. 13·4		
	Skin		av. 10·4		
Rhubarb	Base of stalk	10·6	10·3		Chappell (1940)
	Middle of stalk	10·7	10·3		
	Top of stalk including leaf stem	17·5	14·4		
	Leaf	42·0	40·8		
Spinach, 4 samples	Leaves	Range 32·1 to 60·0			Olliver (1936)
	Stems	,, 8·8 to 16·4			

* Values based on chemical estimation of ascorbic acid.
† Values stated to have been checked by biological tests or H_2S reduction.

In immature legumes the concentration of vitamin C is higher in the seeds than in their pods. In the subterranean parts of plants studied, namely, parsnip roots and potato tubers, the concentration of vitamin C tends to be higher in the interior than at the periphery. In the mushroom there seems to be an even distribution of vitamin C.

Discussion

The information given in the preceding sections covers numerous aspects of vitamin distribution and includes a number of detailed studies, but much more attention has been paid to some foods than to others, and interest has usually centred round a relatively small number of the vitamins.

Some of the main findings are briefly discussed below, but no attempt has been made to include all aspects of the subject. In some instances the evidence is not as yet sufficiently detailed or well enough confirmed to justify further consideration; in others a full discussion of the facts is already available in reference works on the vitamins.

Conditions possibly affecting Distribution

Cereals. It is not certain where the B vitamins of cereal grains are originally formed. For wheat and oats there is evidence which suggests that vitamin B_1 is not formed *in situ* in the kernels, but is translocated to them from the leaves (see Holman, 1945–46, for references). There is evidence also to show that light is required for the synthesis of vitamin B_1 in plants, and that in the tomato plant the vitamin is translocated from the leaves to the growing point of the shoot (see Hinton, 1947, for references).

It can be seen from Table 1 (p. 279) that, although the concentration of vitamin B_1 in the scutellum and of vitamin B_1 and nicotinic acid in the aleurone layer may become extremely high in mature kernels, the endosperm of cereals is extremely poor in those vitamins when compared with the remainder of the grain or, on a dry matter basis, with many other vegetable tissues (*cf.* Cheldelin and Williams, 1942). The concentration tends to be higher in the outer than in the inner endosperm and may be relatively high in cells adjacent to the aleurone layer and scutellum.

The findings just quoted suggest that water-soluble vitamins may diffuse from the centre of the grain towards the periphery during dehydration of the kernel in the final stages of ripening. The hypothesis was originally proposed by Sherwood, Nordgren and Andrews (1941), and has received some support from the work of Pollock and Geddes (1951). The latter workers, studying the distribution of vitamin B_1 and riboflavin in kernels of wheat at different stages of maturity, found evidence of some movement of vitamins away from the endosperm. Yet the concentrations in the cells of the aleurone layer, round the crease and in the scutellum were independent of the stage of maturity.

Discussing the probable role of vitamin B_1 in the scutellum, Hinton (1947) pointed out that the scutellum is usually considered to be the first leaf of the embryonic plant and may, therefore, like the growing points of plant stems, have a high vitamin B_1 requirement during its development. He suggested that vitamin B_1 might later accumulate when the scutellum passes out of the meristematic condition.

It has long been recognised that the aleurone layer and the columnar epithelium of the scutellum play an important part during the germination of cereals by producing enzymes required for the digestion of the endosperm, and that the soluble nutrients formed pass through the scutellum to the embryo (see, *e.g.*, Percival, 1921). Whether the high concentrations of B vitamins stored in the scutellum and aleurone layer have any special significance in the processes of germination is not clear from existing evidence. It is not likely that vitamin B_1 is required for the conversion of starch to maltose. Hinton (1947) found that the concentration of vitamin B_1 in the scutellum decreased after germination, but not during the early stages. He concluded that vitamin B_1, although probably not important for the mobilisation of carbohydrates, may be required for the development of the growing tips of the seedling, before vitamin B_1 has been synthesised in the leaves in sufficient amount to be available for transport. The work of Burkholder and McVeigh (1942) and Klatzkin, Norris and Wokes (1948) shows that synthesis of a number of B vitamins may take place during the germination of cereal grains, but it appears that vitamin B_1 is synthesised then to a less extent than many other B vitamins, if at all. Vitamin C is synthesised during germination (see, *e.g.*, Harris and Ray, 1933).

The vitamin E in cereal grains is concentrated in the germ in association with the lipids. Since it is generally believed that plants have no mechanism for the transportation of fat-soluble materials (see, *e.g.*, Rosenberg, 1942) it seems probable that vitamin E is formed *in situ* in the kernel.

Fruits and Vegetables. β-Carotene is invariably present in green tissues, being one of the plastid pigments of plants, and its formation, like that of the chlorophylls, is stimulated by light (see, *e.g.*, Rosenberg, 1942), so it is not surprising that green outer parts of plants should usually be richer in carotene than paler, inner tissues.

The presence of high concentrations of carotenoids in the root of the carrot seems remarkable because chlorophyll is absent and the tissues

receive no light. It seems unlikely that the carrot plant can transport carotenoids from the leaves to the root, since these pigments are insoluble in water (*cf.* p. 287, col. 2, paragraph 3). It therefore appears probable that the carotenoids are formed *in situ* in the root either by total synthesis or from a water-soluble precursor transported from the leaves. The recent finding of Booth (1951*b*) that synthesis of carotenoids may take place during storage in carrot roots detached from the leaves supports that view.

It is not proposed to give a full account of the conditions which may affect the distribution of vitamin C in plants, since the subject has recently been reviewed by Mapson (1954). The evidence shows that vitamin C is present in all plant tissues except seeds and woody parts, but it is not yet clear whether it is synthesised by all tissues. The fact that stalks are frequently poorer in vitamin C than leaves may be attributed, in part at least, to the presence of more lignified tissue in the former than in the latter. The concentration of the vitamin in a particular tissue probably depends not only on synthesis there and diffusion to or from other tissues, but also on the rate at which the vitamin is destroyed by oxidation. That a high concentration may be required during intense metabolic activity is suggested by the fact that tissues are often richer when young and actively growing than when mature.

There is much evidence that light stimulates the production of vitamin C in plants. In the cabbage, the concentration of the vitamin in the leaves has been found to increase after exposure of the plant to sunlight (see Hallsworth and Lewis, 1949). A similar increase has been reported in fruits such as the tomato and strawberry (see, *e.g.*, Robinson, 1949; Somers, Hamner and Kelly, 1950). The tendency for outer leaves to be richer in vitamin C than middle leaves, as in the cabbage, may thus be related to the amount of light received before harvest. The presence of chlorophyll is apparently not necessary for synthesis of the vitamin (*cf.* vitamin C in asparagus, p. 285).

Practical Applications of Knowledge about Distribution

Information about the distribution of vitamins in the constituent tissues of plants has a number of possible applications, some of which are listed and will now be briefly discussed.

Applications in food analysis. Consideration must be given to the distribution of vitamins if representative samples of food are to be obtained for analysis, particularly when the size of the sample taken is small relative to that of the whole tissue being examined. With cereal grains, which are small, little difficulty is likely to be experienced, even though the distribution within the grain is uneven, provided that the sample is finely ground and none of the resulting powder is discarded before mixing. Satisfactory sampling of fruits and vegetables is frequently difficult. No single method is generally applicable, owing to the wide differences in morphology and vitamin distribution between individual foods in those classes. In selecting methods for particular foods the information contained in the previous sections of the present review should be taken into account.

Applications in food preparation and processing. In many established methods of food preparation for human consumption particular tissues are discarded. From a knowledge of vitamin distribution in foods it can be judged whether in any particular instance large amounts of potentially available supplies are being lost. Thus, little loss of vitamin C probably occurs in the peeling of potatoes, since the skin usually has a lower concentration than the flesh, but the rejection of tissues which are outstandingly rich in vitamin C such as the outer leaves of vegetables or the skin of fruits may mean the loss of considerable amounts.

In the processing of cereals, loss of vitamins is unimportant if no particular tissue of the kernel is preferentially removed during milling; in the manufacture of oatmeal (see Holman and Godden, 1947) or the production of wholemeal flours, for example, there is no fractionation. But in the preparation of rice and of white flours from wheat, rye and maize, much of the bran and germ, which are particularly rich in a number of B vitamins, are excluded and the concentration of B vitamins in the milled product is consequently low.

With wheat, the identification of the site of maximum concentration of vitamin B_1 in the grain has stimulated interest in recent years in the possibility of retaining more of the vitamins in white wheaten flour without simultaneously raising the fibre content of the flour or adversely affecting its keeping and baking qualities. Modifications of the milling process have been described, designed to direct more of the scutellum into the flour and to extract more of the vitamin B_1 from the bran layers without increasing the fibre content (see Holman, 1945–46, for references and further discussion).

EVIDENCE CONCERNING FOODS OF ANIMAL ORIGIN

The distribution of vitamins in the tissues and secretions of animals has been widely investigated, and there is now a large amount of information about a number of different species. The information summarised in the following sections is restricted to findings on animal products commonly

used as human food. Others that are of physiological interest and have some bearing on the interpretation of the present data are beyond the scope of this review.

The information given below is confined to tissues of normally fed animals, as produced commercially for human food, and includes only a few references to the effects of undernutrition and of specific vitamin deficiencies on the composition of the tissues.

The vitamins discussed here comprise vitamins A and D, the vitamin B complex and vitamins C and E, for all are found in animal products. Vitamin D is abundant only in certain species of fish, and information about its distribution in many products is meagre.

Beef, Mutton and Pork

Vitamin A. The livers of the ox, sheep and pig are all rich in vitamin A (see, *e.g.*, Gillam, 1938; Booher and Marsh, 1941; Moore and Payne, 1942; McGillivray, 1949). Small amounts of carotene may accompany vitamin A in the liver, especially in beef liver (see, *e.g.*, von Euler and Virgin, 1932; Moore and Payne, 1942). In beef, there is evidence that some vitamin A activity is present also in kidney, heart and suet (Booher and Marsh, 1941), and in the fat covering of a rib cut (Hewston, Dawson, Alexander and Orent-Keiles, 1948). According to Booher and Marsh (1941), in all three species lean muscle is devoid of measurable activity, but Munsell (1940) concluded from a study of the literature that lean muscle of beef and pork contains small amounts of the vitamin.

Vitamin B_1. Higher concentrations of vitamin B_1 in beef heart and kidney than in liver have been recorded by Mickelsen, Waisman and Elvehjem (1939*a*), Cheldelin and Williams (1942), and Scheid, Bennett and Schweigert (1953), and a higher concentration in beef liver than in skeletal muscle by Mickelsen *et al.* (1939*a*), Cheldelin and Williams (1942) and McIntire, Schweigert, Herbst and Elvehjem (1944). According to Fornaroli (1951) the concentration is higher in the ventricles and intraventricular septum of beef heart than in the auricles.

In mutton the concentration appears to be slightly higher in heart than in liver (McGillivray, 1949; Scheid *et al.*, 1953); both heart and liver are richer in vitamin B_1 than skeletal muscle (Pyke, 1940; McGillivray, 1949).

The skeletal muscles of the pig are particularly rich in vitamin B_1 compared with those of other mammals (see Mickelsen *et al.*, 1939*a*; Pyke, 1940) and in this animal the concentration of the vitamin is higher in the skeletal muscles than in the liver (Mickelsen *et al.*, 1939*a*; Miller, Pence, Dutcher, Ziegler and McCarty, 1943; Heinemann, Ensminger, Cunha and McCulloch, 1946; Erikson and Boyden, 1947*a*; Hewston *et al.*, 1948; Hartzler, Ross and Willett, 1949).

There is some evidence that the muscles of pork ham and loin are slightly richer than those of the shoulder (see, *e.g.*, Miller *et al.*, 1943; Rice, Daly, Beuk and Robinson, 1945; Heinemann *et al.*, 1946; Erikson and Boyden, 1947*a*); but Hartzler *et al.* (1949) obtained slightly higher values for shoulder than for loin.

Pyke (1940) showed that vitamin B_1 is not distributed evenly between individual skeletal muscles of the pig; the highest concentration was found in psoas muscle and the lowest in the muscles of the fore leg. The concentration in psoas muscle was consistently higher than in longissimus dorsi muscle. Tongue was poorer in vitamin B_1 than any of the skeletal muscles studied. The concentration was higher in the ventricles than in the auricles of the pig's heart.

Brady, Peterson and Shaw (1944*a*) reported that the concentration of vitamin B_1 was slightly higher, on the average, in the lumbar than in the thoracic part of longissimus dorsi muscles from 8 pork loins. Rice *et al.* (1945) estimated B vitamins in 24 skeletal muscles from each of several carcases and found that muscles rich in vitamin B_1 were often rich also in nicotinic acid, but relatively poor in riboflavin and pantothenic acid (see Table 5 for results from one carcase). Muscles which were rich in vitamin B_1 in one animal tended to be rich also in other animals. Of the muscles studied, the longissimus dorsi, gluteus profundus and semimembranosus were among the richest in vitamin B_1, and the brachialis, obliquus internus and deltoideus among the poorest. Rose and Peterson (1948) found much less variation in the concentration of vitamin B_1 between 10 samples of longissimus dorsi muscle from one carcase than between samples from 11 different carcases.

Heinemann *et al.* (1946) found that, of the pork tissues studied by them, loin and ham were the richest, usually followed by shoulder, heart, liver and kidney. The values of Scheid *et al.* (1953) for the concentrations in organs also are higher on the average for heart than for kidney or liver (see Table 5, p. 291).

Riboflavin. Beef liver is richer in riboflavin than kidney or heart (Schormüller, 1939*b*; Cheldelin and Williams, 1942; Brady *et al.*, 1944*b*; Scheid *et al.*, 1953), and much richer than skeletal muscle (Lunde, Kringstad and Olsen, 1938; Mickelsen *et al.*, 1939*b*; Cheldelin and Williams, 1942; Cheldelin, Woods and Williams, 1943; McIntire, Schweigert, Herbst and Elvehjem, 1944; Brady *et al.*, 1944*b*; Hewston *et al.*, 1948).

Brady *et al.* (1944*b*) analysed 20 muscles from each of 12 beef carcases and found marked differences in riboflavin concentration between different

muscles (see Table 4). The muscles with the highest average concentrations were the transversus abdominis, trapezius thoracalis, psoas major and deltoideus, and those with the lowest average concentrations were semitendinosus, serratus dorsalis, longissimus dorsi and serratus thoracis. Differences in riboflavin concentration were much less between cuts of beef, each of which contained a number of muscles, than between individual muscles. Cover, Dilsaver, Hays and Smith (1949) found higher average values for biceps femoris and semimembranosus muscles than for semitendinosus and longissimus dorsi muscles, an observation which is in agreement with the findings of Brady *et al.* (1944*b*) given in Table 4.

With mutton the concentration of riboflavin is higher in liver than in kidney or heart (McGillivray, 1949; Scheid *et al.*, 1953), or skeletal muscle (Lunde *et al.*, 1938; McGillivray, 1949).

In pork tissues the concentration is higher in liver than in heart or kidney (Peterson, Brady and Shaw, 1943; Heinemann *et al.*, 1946; Scheid *et al.*, 1953), and much higher in liver than in skeletal muscle (Lunde *et al.*, 1938; Peterson *et al.*, 1943; Miller *et al.*, 1943; Heinemann *et al.*, 1946; Erikson and Boyden, 1947*a*; Hewston *et al.*, 1948; Hartzler *et al.*, 1949). There is some evidence that ham and shoulder muscles may be richer than loin muscle (see, *e.g.*, Miller *et al.*, 1943; Rice *et al.*, 1945; Heinemann *et al.*, 1946; Erikson and Boyden, 1947*a*; Hartzler *et al.*, 1949), but Jackson, Crook, Malone and Drake (1945) recorded slightly higher values, on the average, for loins than for butts.

Higher concentrations in triceps brachii and psoas major muscles of pork than in longissimus dorsi, adductor and semitendinosus muscles were found by Peterson *et al.* (1943), and higher average values were reported by Brady *et al.* (1944*a*) for psoas major than for longissimus dorsi muscles in 10 loins. Brady *et al.* concluded that there are differences within the same muscle, as well as between different muscles from the same animal and between the same muscles of different animals fed on the same diet. Rice *et al.* (1945) found differences in riboflavin concentration between individual pork muscles (see Table 5) and Cover *et al.* (1949) reported higher values for semimembranosus and biceps femoris than for longissimus dorsi muscles.

Nicotinic acid. Among beef tissues liver is richer in nicotinic acid than heart or kidney (Bandier, 1939; Waisman, Mickelsen, McKibbin and Elvehjem, 1940; McIntire, Waisman, Henderson and Elvehjem, 1941; Dann and Handler, 1942; Cheldelin and Williams, 1942; Scheid *et al.*, 1953) or skeletal muscle (Bandier, 1939; Waisman *et al.*, 1940; McIntire *et al.*,

TABLE 4

CONCENTRATION OF B VITAMINS IN THE LEAN PART OF FRESH TISSUES OF BEEF AND MUTTON

Tissue	Vitamin B_1 (mg. per 100 g.)	Riboflavin (mg. per 100 g.)	Nicotinic acid (mg. per 100 g.)	Pantothenic acid (mg. per 100 g.)
Beef				
liver *	0·18	2·51	11·9	6·45
kidney *	0·27	1·95	5·47	3·31
heart *	0·23	0·77	6·61	2·10
chuck, 6 muscles †		0·145 to 0·202		
rib, 4 muscles †		0·144 to 0·210		
loin, 5 muscles †		0·130 to 0·228		
round, 5 muscles †		0·120 to 0·182		
Lamb				
liver *	0·29	3·90	12·1	8·14
kidney *	0·38	2·18	6·77	4·33
heart *	0·31	0·86	4·55	3·00
Mutton				
liver ‡	0·45	3·00	16·7	6·5
kidney ‡	0·46	2·05	8·5	
heart ‡	0·50	0·65	6·0	2·4
neck muscle ‡	0·13	0·29	4·45	0·38
8 other muscles (av.) ‡	0·20	0·31	4·9	0·41

* Average values of Scheid *et al.* (1953) for vitamin B_1, riboflavin and nicotinic acid, and of Schweigert and Guthneck (1953) for pantothenic acid, in tissues of the same 10 commercial carcases (pantothenic acid after storage at — 10° C.).

† Average values of Brady *et al.* (1944*b*) for individual muscles of 12 Hereford yearlings.

‡ Values of McGillivray (1949) for tissues of a mature Romney × Southdown ewe.

1941 ; Cheldelin and Williams, 1942 ; Dann and Handler, 1942 ; Hale, Davis and Baldwin, 1942 ; Hewston *et al.*, 1948). According to Bandier (1939) the concentration of the vitamin is slightly higher in the cortex of the kidney than in the medulla.

Lamb's liver is richer in nicotinic acid than kidney or heart (McGillivray, 1949 ; Scheid *et al.*, 1953). All three organs are richer than skeletal muscle (McIntire *et al.*, 1941 ; McIntire, Schweigert, Herbst and Elvehjem, 1944 ; McGillivray, 1949).

In pork the concentration is higher in liver than in kidney or heart (Bandier, 1939 ; Waisman *et al.*, 1940 ; McIntire *et al.*, 1941 ; Scheid *et al.*, 1953) or skeletal muscle (Bandier, 1939 ; Waisman *et al.*, 1940 ; McIntire *et al.*, 1941 ; Dann and Handler, 1942 ; Erikson and Boyden, 1947*a* ; Hewston *et al.*, 1948 ; Hartzler *et al.*, 1949).

The available evidence does not show any clear, consistent difference in nicotinic acid concentration between loin and ham muscles (see, *e.g.*, Waisman *et al.*, 1940 ; McIntire *et al.*, 1941 ; McIntire, Schweigert, Henderson and Elvehjem, 1943 ; Jackson *et al.*, 1945 ; Erikson and Boyden, 1947*a*). Hartzler *et al.* (1949) found a slightly higher average concentration in loin than in shoulder, but the values of Erikson and Boyden (1947*a*) are, if anything, slightly higher for shoulder than for loin. Rice *et al.* (1945) found differences in nicotinic acid concentration between shoulder, loin and ham muscles in individual carcases, but the differences were not consistent from one carcase to another.

The results of Rose and Peterson (1948) show much less variation between different samples of longissimus dorsi muscle from the same animal

TABLE 5

CONCENTRATION OF B VITAMINS IN THE LEAN PART OF FRESH PORK TISSUES

Tissue	Vitamin B_1 (mg. per 100 g.)	Riboflavin (mg. per 100 g.)	Nicotinic acid (mg. per 100 g.)	Pantothenic acid (mg. per 100 g.)
Liver *	0·25	2·97	18·1	5·88
Kidney *	0·26	1·84	8·51	3·12
Heart *	0·33	0·79	7·95	2·39
Shoulder muscles †				
Deltoideus (13)	0·97	0·34	6·1	1·00
Biceps brachii (15)	1·08	0·27	6·5	0·73
Extensor carpi radialis (11)	1·05	0·26	6·4	0·59
Brachialis (21)	0·65	0·22	6·5	0·92
Deep pectoral, anterior (17)	0·82	0·38	8·4	1·00
Loin muscles †				
Longissimus dorsi, anterior (4)	1·36	0·21	9·8	0·33
Longissimus dorsi, central (2)	1·45	0·21	9·0	0·31
Longissimus dorsi, posterior (3)	1·68	0·21	9·4	0·31
Flank muscles †				
Deep pectoral, posterior (8)	1·25	0·26	5·5	0·65
Latissimus dorsi (6)	1·32	0·28	8·5	0·70
Rectus abdominis (7)	1·18	0·26	8·4	0·78
Obliquus externus (5)	1·35	0·22	7·6	0·70
Obliquus internus (18)	1·03	0·36	6·7	0·95
Transversus abdominis (20)	1·17	0·27	6·1	0·73
Ham muscles †				
Biceps femoris (14)	1·33	0·29	8·5	0·44
Semitendinosus (9)	1·36	0·29	7·3	0·53
Semimembranosus (19)	1·19	0·33	9·3	0·39
Gastrocnemius (16)	0·94	0·28	7·8	0·60
Gluteus medius (1)	1·15	0·21	8·5	0·53
Tensor fasciae latae (24)	1·18	0·31	8·2	0·42
Gracilis (10)	1·25	0·26	8·3	0·60
Rectus femoris (22)	1·06	0·32	7·5	0·69
Gluteus profundus (12)	1·53	0·24	9·0	0·31
Obturator externus (23)	1·11	0·34	6·4	0·77

* Average values of Scheid *et al.* (1953) for vitamin B_1, riboflavin and nicotinic acid, and of Schweigert and Guthneck (1953) for pantothenic acid, in tissues of the same 10 commercial pigs (pantothenic acid after storage at — 10° C.).

† Values of Rice *et al.* (1945) for one commercial pig. Numbers in brackets indicate the relative redness of the muscles, No. 1 being the least red and No. 24 the reddest.

than between samples from different animals. Cover *et al.* (1949) found higher average concentrations in semimembranosus and longissimus dorsi muscles than in biceps femoris muscle.

Pantothenic acid. In beef tissues, a higher concentration of the vitamin in liver than in kidney or heart was recorded by Cheldelin and Williams (1942), Waisman, Henderson, McIntire and Elvehjem (1942) and Schweigert and Guthneck (1953), and a higher concentration in liver than in skeletal muscle by Cheldelin and Williams (1942), Waisman *et al.* (1942), Cheldelin *et al.* (1943), Meyer, Hinman and Halliday (1947) and Schweigert and Guthneck (1953). Cover *et al.* (1949) found a higher average concentration in biceps femoris than in semimembranosus muscle, which in turn was richer than semitendinosus or longissimus dorsi muscle.

Lamb's liver is richer in pantothenic acid than heart (McGillivray, 1949) or kidney (Schweigert and Guthneck, 1953), and all three organs are much richer than skeletal muscle (Waisman *et al.*, 1942 ; McGillivray, 1949 ; Schweigert and Guthneck, 1953).

In the pig, there is evidence that the liver is richer in pantothenic acid than the kidney, heart or skeletal muscle (Waisman *et al.*, 1942 ; Schweigert and Guthneck, 1953). Rice *et al.* (1945) found considerable differences in concentration between individual muscles (see Table 5) and Cover *et al.* (1949) found higher concentrations in semimembranosus and biceps femoris muscles than in longissimus dorsi muscle, a finding supported by the data of Rice *et al.* (1945) (Table 5).

Vitamin B_6. In beef tissues the concentration is higher in liver than in kidney or heart (Henderson, Waisman and Elvehjem, 1941 ; Cheldelin and Williams, 1942 ; McIntire, Schweigert and Elvehjem, 1944) or skeletal muscle (Henderson *et al.*, 1941 ; Cheldelin and Williams, 1942 ; Atkin, Schultz, Williams and Frey, 1943 ; McIntire, Schweigert and Elvehjem, 1944).

Little evidence is available about tissues of mutton and pork. Henderson *et al.* (1941) found lamb's liver slightly richer in vitamin B_6 than muscle, and they and Atkin *et al.* (1943) reported a higher concentration in pork muscle than in pork liver.

Biotin. Beef liver is richer in biotin than beef heart (Cheldelin and Williams, 1942) and is much richer than skeletal muscles of the same species (Cheldelin and Williams, 1942 ; Cheldelin *et al.*, 1943). In carcases of mutton McGillivray (1949) found a higher concentration of biotin in liver than in heart. Both organs were much richer than skeletal muscle.

Folic acid. Beef liver is richer than beef kidney (Schweigert, Pollard and Elvehjem, 1946 ; Toepfer *et al.*, 1951), heart (Cheldelin and Williams, 1942 ; Toepfer *et al.*, 1951) or skeletal muscle (Cheldelin and Williams, 1942 ; Cheldelin *et al.*, 1943 ; Schweigert *et al.*, 1946 ; Toepfer *et al.*, 1951). For mutton and pork also, there is evidence that liver tissue is much richer in folic acid than muscle (Schweigert *et al.*, 1946 ; Toepfer *et al.*, 1951).

Vitamin B_{12}. In all three species the concentration of vitamin B_{12} is higher in liver than in kidney or heart (Scheid and Schweigert, 1954). Among beef tissues, liver and kidney are much richer in vitamin B_{12} than skeletal muscle (Scheid and Schweigert, 1951 ; Scheid, Andrews and Schweigert, 1952). Beef muscles and organs are richer in vitamin B_{12} than the corresponding tissues of pork (Register, Lewis, Thompson and Elvehjem, 1949 ; Scheid and Schweigert, 1954).

Vitamin B complex in general. From the evidence just given on the distribution of B vitamins in the ox, pig and sheep it can be seen that, in general, riboflavin, nicotinic acid, pantothenic acid, vitamin B_6, biotin, folic acid and vitamin B_{12} are present in higher concentrations in the liver than in the kidneys, heart or skeletal muscles, but it should be noted that the amount of information available about some of the B vitamins is small.

The distribution of vitamin B_1 is less consistent. In cattle and sheep the liver, though richer in vitamin B_1 than the skeletal muscles, appears to be somewhat poorer in it than the heart and, in cattle, the kidney. In the pig, the concentration is usually higher in the skeletal muscles than in the heart, liver or kidney.

Individual muscles from the same carcase show wide differences in riboflavin in beef and in vitamin B_1, riboflavin, and nicotinic and pantothenic acids in pork, and there is some evidence in the pig of variation in vitamin B_1 concentration within a particular muscle.

In a comprehensive study of paired muscles of beef and pork, Cover, Dilsaver and Hays (1948) showed that the concentrations of vitamin B_1, riboflavin, and nicotinic and pantothenic acids in muscles from one side of a carcase do not differ significantly from the concentrations in the corresponding muscles from the other side of the same carcase.

The concentrations of B vitamins present in nuclei which had been separated by fractional centrifuging from disintegrated, dry, beef heart tissue, were compared by Isbell, Mitchell, Taylor and Williams (1942) with the concentrations in the whole tissue. Their results showed that the concentrations of vitamin B_1, riboflavin, nicotinic acid, pantothenic acid and folic acid, when expressed on a dry matter basis, were 3 or 4 times higher in the nuclei than in the whole tissue, but that the concentration of pyridoxine in the two fractions was about the same and that of biotin twice as high in whole tissue as in nuclei.

Vitamin C. Of numerous different tissues of beef and mutton analysed by Giroud, Leblond, Ratsimamanga and Gero (1938) the adrenal and pituitary glands were richest in vitamin C. Liver, though poorer than those glands, was richer than kidneys, which in turn were much richer than skeletal muscle.

With pork, Bessey and King (1933) found that, of the tissues studied by them, the adrenal glands and corpus luteum were the richest in vitamin C. Giroud *et al.* (1938) analysed only the adrenal glands, liver and kidneys of pork, but found the distribution of vitamin C between those tissues like that in beef and mutton.

Vitamin D. The vitamin is present in the liver of all three species (see, *e.g.*, Daniel and Munsell, 1937; Waisman and Elvehjem, 1941), but relatively little information is available about its distribution in other tissues.

Vitamin E. The pioneer work of Evans and Burr (1925; 1927) showed that vitamin E is widely distributed in the animal body, but is not present in very great concentration in any particular organ or tissue. Vitamin E activity was demonstrated in liver, body fat and muscles of beef and pork, and in mutton fat. Karrer, Jaeger and Keller (1940) and Chipault, Lundberg and Burr (1945) confirmed the presence of tocopherols in pork fat, and Karrer *et al.* (1940) and Harris, Quaife and Swanson (1950) found a higher concentration of tocopherols in liver than in muscle of beef. Bratzler, Loosli, Krukovsky and Maynard (1950) analysed tissues of pigs which had received a diet low in vitamin E, with or without a supplement of vitamin E, and found that the concentration of tocopherols was usually highest in body fat and liver. Tocopherol supplements increased the concentration in all the tissues studied.

Rabbit

Since the rabbit differs from many other mammals, including those discussed in the previous section, in having clearly defined "red" and "white" muscles (see p. 298), it seems desirable to consider this animal separately. In many respects vitamin distribution in the rabbit resembles that in beef, mutton and pork tissues.

Vitamin A. There is evidence that the liver is rich in vitamin A (see, *e.g.*, Gillam, 1938; Edisbury, Morton, Simpkins and Lovern, 1938). The latter workers estimated that 95 per cent. of the total vitamin A of the carcase is in the liver and that the mammary gland of the female is the next most important source.

Vitamin B_1. Pyke (1940) found the concentration higher in red muscles (soleus and pectineus, than in white (vastus lateralis, gluteus maximus, gastrocnemius, longissimus dorsi, gracilis), and a higher concentration in heart muscle than in skeletal muscle.

Riboflavin. A higher concentration in spleen and adrenal glands than in liver, and in liver than in heart, kidney or muscle was recorded by Isikawa, Kawai and Kimura (1937). Schormüller (1939*a*) found red muscle richer in riboflavin than white muscle.

Nicotinic acid. The results of Dann and Handler (1942) show that rabbit liver is richer in nicotinic acid than kidneys, which in turn are slightly richer than leg muscle. The distribution between red and white muscles does not, however, appear to have been studied.

Pantothenic acid. Kaplan and Lipmann (1948) estimated the bound form of pantothenic acid (coenzyme A) in tissues and found the concentration greater in liver than in kidney or heart. All three organs were much richer than skeletal muscle.

Vitamin C. The results of Bessey and King (1933) and Giroud *et al.* (1938) show that the pattern of distribution resembles that in beef, mutton and pork tissues, the concentration of the vitamin being higher in liver than in skeletal muscle, but lower in liver than in adrenal glands.

Vitamin E. Hines and Mattill (1943) found that in normally fed rabbits the concentration of tocopherols was slightly higher in muscle than in liver, but that rabbits with a very high or low intake of the vitamin had a higher concentration in liver than in muscle.

Poultry

Vitamin A. The presence of vitamin A activity in the liver of the chicken and the turkey was demonstrated by Guilbert and Hinshaw (1934), but Booher and Marsh (1941) found no measurable activity in lean chicken muscle. Deuel, Hrubetz, Mattson, Morehouse and Richardson (1943) showed that the liver and body fat of the chicken contain both vitamin A and carotenoids.

Vitamin B_1. There is much evidence that the concentration of vitamin B_1 is higher in dark than in light muscles of the chicken (Booher and Hartzler, 1939; Mickelsen *et al.*, 1939*a*; Rice, Strandine, Squires and Lyddon, 1946; Campbell, Hiltz and Robinson, 1946; Millares and Fellers, 1949; Erdsiek, Kanapaux, Richmond, Weis and Bisbey, 1951) and turkey (Campbell *et al.*, 1946; Erikson and Boyden, 1947*b*), and that leg muscle is richer than breast muscle in both chicken (Cheldelin and Williams, 1942; Morgan, Kidder, Hunner, Sharokh and Chesbro, 1949) and turkey (Cook, Morgan and Smith, 1949). In the chicken, the concentration of vitamin B_1 has been reported to be higher in liver than in muscle (Campbell *et*

al., 1946 ; Millares and Fellers, 1949 ; Morgan *et al.*, 1949 ; Erdsiek *et al.*, 1951), gizzard (Millares and Fellers, 1949 ; Morgan *et al.*, 1949 ; Erdsiek *et al.*, 1951), heart or skin (Morgan *et al.*, 1949). In the turkey, Cook *et al.* (1949) found the concentration higher in liver than in gizzard or skin, but lower in liver than in heart. Rice *et al.* (1946) made detailed studies of the distribution of B vitamins in thirteen skeletal muscles and in several organs of three chickens and found that the concentration of vitamin B_1 was higher in liver than in gizzard or skin, but lower in liver than in heart and some skeletal muscles (see Table 6 for data from one chicken).

Riboflavin. Dark muscles are richer in riboflavin than light muscles in both chicken (Mickelsen *et al.* 1939*b* ; Rice *et al.*, 1946 ; Hewston *et al.*, 1948 ; Millares and Fellers, 1949 ; Erdsiek *et al.*, 1951) and turkey (Erikson and Boyden, 1947*b*), and leg muscle is richer than breast muscle in the chicken (Hodson, 1940 ; Cheldelin and Williams, 1942 ; Morgan *et al.*, 1949) and turkey (Cook *et al.*, 1949). The concentration has been reported to be higher in liver than in muscle in the chicken (Hodson, 1940 ; 1941 ; Rice *et al.*, 1946 ; Morgan *et al.*, 1949 ; Erdsiek *et al.*, 1951) and turkey (Erikson and Boyden, 1947*b* ; Cook *et al.*, 1949). There is also evidence that liver is richer than heart, gizzard or skin in the chicken (Hodson, 1940 ; Rice *et al.*, 1946 ; Morgan *et al.*, 1949 ; Erdsiek *et al.*, 1951) and turkey (Erikson and Boyden, 1947*b* ; Cook *et al.*, 1949).

Nicotinic acid. Light muscles of the chicken are richer in nicotinic acid than dark muscles (McIntire *et al.*, 1941 ; Rice *et al.*, 1946 ; Hewston *et al.*, 1948 ; Millares and Fellers, 1949 ; Erdsiek *et al.*, 1951), and breast muscle is richer than leg muscle in both chicken (Dann and Handler, 1941 ; 1942 ; Cheldelin and Williams, 1942 ; Denton, Kellogg and Bird, 1947 ; Rice, Squires and Fried, 1948 ; Morgan *et al.*, 1949) and turkey (Cook *et al.*, 1949). In both chicken and turkey liver has roughly the same concentration of nicotinic acid as breast muscle or light meat (Dann and Handler, 1941 ; 1942 ; Rice *et al.*, 1946 ; Denton *et al.*, 1947 ; Millares and Fellers, 1949 ; Morgan *et al.*, 1949 ; Cook *et al.*, 1949 ; Erdsiek *et al.*, 1951). It appears also that the liver is richer in nicotinic acid than heart, gizzard or skin in the chicken (Rice *et al.*, 1946 ; Millares and Fellers, 1949 ; Morgan *et al.*, 1949 ; Erdsiek *et al.*, 1951) and the turkey (Cook *et al.*, 1949), but Morgan *et al.* (1949) found skin in one case richer than liver.

TABLE 6

CONCENTRATION OF B VITAMINS IN THE LEAN PART OF FRESH CHICKEN TISSUES *

Tissue	Vitamin B_1 (mg. per 100 g.)	Riboflavin (mg. per 100 g.)	Nicotinic acid (mg. per 100 g.)	Pantothenic acid (mg. per 100 g.)
Liver	0·09	2·17	13·9	2·20
Heart	0·22	1·05	2·91	1·26
Gizzard	0·04	0·21	4·56	0·28
Skin	0·01	0·09	1·63	0·12
Breast muscles				
Pectoralis superficialis (2) †	0·05	0·05	12·48	0·12
Pectoralis profundus (3)	0·05	0·07	12·5	0·15
Biceps brachii (1)	0·04	0·07	8·2	0·11
Triceps brachii (4)	0·06	0·10	9·68	0·22
Leg muscles				
Biceps femoris (6)	0·09	0·10	7·56	0·20
Semitendinosus (8)	0·09	0·19	6·85	0·40
Quadriceps femoris (11)	0·10	0·18	5·90	0·33
Gluteus group (9)	0·10	0·19	6·68	0·26
Semimembranosus (5)	0·09	0·10	7·56	0·24
Adductor (10)	0·13	0·35	6·18	0·40
Gastrocnemius (9)	0·11	0·11	5·68	0·29
Peroneus longus (8)	0·10	0·12	5·83	0·24
Tibialis cranialis (7)	0·08	0·21	7·50	0·24

* Values of Rice *et al.* (1946) for tissues of a 4-month-old White Rock cockerel which had received a normal commercial diet.

† Numbers in brackets indicate the relative darkness in colour of the muscles, No. 1 being the lightest and No. 11 the darkest.

Pantothenic acid. Waisman *et al.* (1942) and Rice *et al.* (1946) found dark muscles of the chicken richer than light muscles, and Cheldelin and Williams (1942) and Pearson, Melass and Sherwood (1946) found a higher concentration in leg muscle than in breast tissue. Rice *et al.* (1946) noted that there was considerable variation in pantothenic acid concentration between the thirteen different muscles studied by them. They further found that liver was much richer than heart, gizzard, skin or any of the muscles. Pearson *et al.* (1946) also noticed a much higher concentration in liver than in either type of muscle studied.

Vitamin B_6. According to Cheldelin and Williams (1942) the concentration of vitamin B_6 is higher in breast of chicken than in leg.

Biotin. Cheldelin and Williams (1942) and Cheldelin *et al.* (1943) found leg muscle of chicken richer than breast, but Schweigert, Nielsen, McIntire and Elvehjem (1943) found no great difference between the concentrations in dark and light meat. Their value for light meat was slightly greater than for dark meat.

Folic acid. Cheldelin and Williams (1942) and Cheldelin *et al.* (1943) found no marked difference in folic acid concentration between leg and breast muscle of the chicken and Toepfer *et al.* (1951) no appreciable difference between light and dark meat, but the values obtained by each of these groups of workers for breast or light meat tended to be slightly higher than the corresponding values for leg or dark meat. The results of Moore, Lepp, Luckey, Elvehjem and Hart (1947) and Toepfer *et al.* (1951) indicate that liver is much richer than muscle.

Vitamin B_{12}. According to Elvehjem (1950) the concentrations in the dry matter of chicken leg and breast are much the same.

Vitamin B complex in general. From the above evidence it appears that liver of the chicken and turkey, although usually richer in vitamin B_1 than gizzard and skin, is occasionally poorer than heart and some of the skeletal muscles. The concentration of riboflavin is higher in liver than in skeletal muscle, but the concentration of nicotinic acid is usually about the same in liver and breast muscle. Dark muscles of both species are richer in vitamin B_1 and riboflavin, but poorer in nicotinic acid, than light muscles. Evidence about other B vitamins is meagre, but it appears that liver of chicken is much richer in pantothenic acid than heart, gizzard, skin or skeletal muscle, and that dark muscles are richer in it than light muscles.

Vitamin C. Bessey and King (1933) found that the adrenal glands of the chicken are much richer in vitamin C than the brain, liver, testes, kidney or heart. The liver, though poorer than the adrenal glands and brain, was richer than the other organs studied and was much richer than the muscles. Giroud *et al.* (1938) analysed the adrenal glands, liver and kidneys of eight species of bird, including the chicken, duck, goose and partridge. The adrenal glands were in all instances much richer in vitamin C than the liver, and the liver, in all species except the goose, was richer than the kidneys.

Vitamin D. The vitamin is present in chicken liver (see, *e.g.*, Daniel and Munsell, 1937 ; Waisman and Elvehjem, 1941).

Vitamin E. Criddle and Morgan (1951) reported that tocopherols are widely distributed in the tissues of the turkey, and that the concentration is higher in liver and heart than in gizzard or skeletal muscle, and in leg muscle than in breast. The addition of tocopherol to the diet increased the concentrations in liver, heart, gizzard and muscle, but the total amount of the supplement retained was extremely small.

Fish and Shellfish

Little attention has been paid in recent years to the distribution of vitamins in the tissues of fish and present knowledge is for the most part based on investigations made before 1940. Nothing appears to be known about the distribution within the muscular tissues.

Vitamin A. It has long been known that the livers of many species of fish are rich in vitamin A and much information has accumulated on the relative concentrations in different species (see, *e.g.*, Daniel and Munsell, 1937 ; Fixsen and Roscoe, 1939–40). It was not at first realised, however, that the livers of some species contain, in addition to vitamin A itself, a biologically active compound of similar chemical structure, to which Edisbury, Morton and Simpkins (1937) gave the name vitamin A_2. Moreover, the detailed studies of Edisbury, Morton, Simpkins and Lovern (1938) on the distribution of vitamin A in the viscera of a number of species, including the herring, haddock, cod, halibut, turbot, salmon, trout and perch, showed that vitamin A is frequently concentrated in the walls of the intestinal tract as well as in the liver. The pyloric caeca were found to be particularly good sources of the vitamin and, although the stomach usually contained little or none, the intestines were moderately rich in it. In the conger eel half of the vitamin A was present in the liver and most of the remainder in the body fat and adipose tissue of the gonads.

Edisbury *et al.* (1938) further showed that the eyes of many vertebrate fish, including the haddock, hake, whiting, halibut and herring, contain vitamin A and that exceptionally high concentrations are present in the eyes of the goldfish. That the eyes of crustaceans contain vitamin A was demonstrated by Neilands (1947) for the American

lobster (*Homarus americanus*), and by Fisher, Kon and Thompson (1952) for different species, including the common lobster (*H. vulgaris*).

In the oyster a higher concentration of carotenoids in the visceral mass than in the mantle and gills was found by Brooks and Paulais (1939).

Few studies have been made of the distribution of vitamin A within individual tissues. Lovern and Morton (1939) examined the coats of the intestine of the halibut and found that vitamin A is sharply localised in the mucosa and in particular in the tunica propria layer of the mucosa. In an examination of fish liver by fluorescence microscopy, vitamin A fluorescence was seen in medium-sized fat droplets which fill the cytoplasm of the cells, but not in the Kupffer cells (see Popper, 1944). The distribution in fish liver differed from that in mammalian liver, the Kupffer cells of which show fluorescence.

Vitamin B_1. The results of Lunde *et al.* (1938) show that in a number of species of marine vertebrates, including the cod, flounder, haddock and mackerel, the concentration of vitamin B_1 is higher in hard roe than in liver. The same workers showed that the concentration is higher in hard than in soft roe of cod, and in liver than in muscle of cod, flounder, haddock and mackerel, but not herring.

Riboflavin. Lunde *et al.* (1938) found higher concentrations in hard roe than in liver of a number of species, including cod and ling but not flounder, and higher concentrations in hard than in soft roe of cod, and in liver than in muscle of cod and flounder. A higher concentration in the visceral mass than in the gills and mantle of the oyster was reported by Brooks and Paulais (1939).

Vitamin B_{12}. Of tissues from the sockeye salmon analysed by Tarr, Southcott and Ney (1950), the kidneys had much the highest concentration of vitamin B_{12}, expressed on a dry matter basis. The concentration in the liver was lower than in the spleen or pyloric caeca. In the ling cod the concentration was much higher in the dry matter of liver than of muscle.

Vitamin C. The investigations of Giroud *et al.* (1938) have shown that in several species of vertebrate fish the liver has a higher concentration of vitamin C than the muscles, and that in molluscs and crustaceans the hepato-pancreas is richer than the muscle. In the oyster a higher concentration in the visceral mass than in the gills and mantle was reported by Brooks and Paulais (1939). The results of Matsubara and Chuda (1937) show that the concentration of vitamin C is higher in the roe than in the liver or muscle of a number of species of fish inhabiting Japanese waters.

Vitamin D. It is well known that the body oils as well as the liver oils of fish are important sources of vitamin D (see, *e.g.*, Bills, 1935, for a summary of information and references). The concentration of vitamin D in the liver oil varies widely from one species to another and also between individual fish of the same species. In a given species the concentration in the liver oil tends to be inversely related to the yield of oil (see, *e.g.*, Hess, Bills and Honeywell, 1929). The amounts of body oil are relatively large in many species, but the concentrations of vitamin D are, in general, lower in body oils than in the corresponding liver oils. The muscles and the liver are the chief sites of fat deposition in fish, but the viscera and head also contain some oil. The milt and roe of cod and other species contain important amounts of vitamin D (Hess, Bills, Weinstock, Honeywell and Rivkin, 1928).

Eggs

Vitamin A. It was shown by Munsell as early as 1924 that the vitamin A activity of the hen's egg is confined to the yolk. Little attention has been paid to the question in later years.

Vitamin B_1. There is much evidence to show that vitamin B_1 is almost but not entirely confined to the yolk (Chick and Roscoe, 1929; Baker and Wright, 1935; Bethke, Record and Wilder, 1936; Booher and Hartzler, 1939; French, Abbott and Townsend, 1951).

Riboflavin. It was shown by Chick and Roscoe (1929) and Bethke *et al.* (1936) that riboflavin is present in both yolk and white of eggs. More recent investigation has shown that the concentration is usually but not invariably higher in the yolk than in the white of fresh eggs (see, *e.g.*, Norris and Bauernfeind, 1940; Stamberg, Petersen and Lampman, 1946*a*; French *et al.*, 1951; Evans, Butts and Davidson, 1952). The investigations of Stamberg *et al.* (1946*b*) showed that out of 279 eggs from farm flocks consisting of 4 common breeds of hens, 74 per cent. of the eggs had a higher concentration of riboflavin in the yolk than in the white; on the average, the concentration in the yolk was 1·22 times that in the white. Adrian (1952) also found a higher average concentration in the yolk than in the white of eggs from Rhode Island Red hens kept under controlled conditions, but equal concentrations in the yolk and white of commercial eggs.

Nicotinic acid. Available evidence shows that nicotinic acid is present in both the yolk and the white of fresh eggs and that the concentration is higher in the white than in the yolk (Teply *et al.*, 1942; Charkey, Dyar and Wilgus, 1947; French *et al.*, 1951; Evans, Butts and Davidson, 1951*a*; Adrian, 1952).

Pantothenic acid. Several investigators have shown that the concentration of pantothenic acid is much higher in the yolk than in the white of

fresh eggs (Jukes, 1941 ; Snell, Aline, Couch and Pearson, 1941 ; Evans, Davidson and Butts, 1952 ; Adrian, 1952).

Vitamin B_6. Charkey *et al.* (1947) found that the concentration of vitamin B_6 was higher in the yolk than in the white of fresh eggs, but, in the microbiological method of analysis used, the test organism did not respond equally to pyridoxal, pyridoxamine and pyridoxine. Evans *et al.* (1951*b*) used a method which gave equivalent responses to the three forms of vitamin B_6 and they too found a higher concentration of total vitamin B_6 activity in the yolk than in the white. Rabinowitz and Snell (1948) estimated the three forms of vitamin B_6 separately in fresh eggs and found much higher concentrations of pyridoxal, pyridoxamine and total vitamin B_6 in the yolk than in the white. The concentration of pyridoxine was very low in both yolk and white, the value being higher, on the average, for the latter than for the former.

Biotin. Recent evidence shows that the concentration of biotin is much higher in the yolk than in the white of both fresh and stored eggs (Evans *et al.*, 1953*a*).

Folic acid. A much higher concentration of folic acid in egg yolk than in egg white has been reported by Charkey *et al.* (1947) and by Evans *et al.* (1953*b*), but neither group of workers used a preparation from pig or chick pancreas for the liberation of bound folic acid, and it is possible that the vitamin may not have been completely extracted. Toepfer *et al.* (1951), however, used a chick pancreas preparation and they also found yolk richer than white.

Vitamin B_{12}. According to Yacowitz, Miller, Norris and Heuser (1952) almost all the vitamin B_{12} in the egg is present in the yolk.

Vitamin C. Neither yolk nor white of the fresh egg contains vitamin C (Hauge and Carrick, 1925 ; Ray, 1934 ; Satterfield, Bell, Cook and Holmes, 1947).

Vitamin D. As early as 1923 it was demonstrated that egg yolk has pronounced antirachitic properties and that egg white is devoid of activity, thus indicating that vitamin D is confined to the yolk (Hess, 1923).

Vitamin E. Small amounts of vitamin E are present in eggs (see, *e.g.*, Barnum, 1935, for biological results, and Harris *et al.*, 1950, for chemical

TABLE 7

AVERAGE CONCENTRATION OF B VITAMINS IN THE YOLK AND WHITE OF FRESH EGGS PRODUCED BY HENS ON NORMAL LAYING RATIONS

Vitamin	No. of eggs analysed	Breed of hen	Average concentration of vitamin in egg: yolk (mg. per 100 g.)	Average concentration of vitamin in egg: white (mg. per 100 g.)	Authority
Vitamin B_1	not stated	New Hampshire	0·234	0·002	French *et al.* (1951)
	,,	White Leghorn	0·286	0·002	
Riboflavin	156	White Leghorn	0·471	0·384	Stamberg *et al.* (1946*b*)
	24	Rhode Island Red	0·410	0·474	
	54	New Hampshire	0·492	0·388	
	45	Barred Plymouth Rock	0·420	0·299	
	24	White Leghorn	0·415*	0·314*	Evans, Butts and Davidson (1952)
Nicotinic acid	24	White Leghorn	0·016 *	0·093 *	Evans *et al.* (1951*a*)
Total vitamin B_6 (as pyridoxine)	30	White Leghorn	0·308	0·217	Evans *et al.* (1951*b*)
Pantothenic acid	24	White Leghorn	3·06 *	0·304 *	Evans, Davidson and Butts (1952)
Biotin	30	White Leghorn	0·052 *	0·007 *	Evans *et al.* (1953*a*)
Folic acid	30	White Leghorn	0·0232	0·0016	Evans *et al.* (1953*b*)

* Eggs boiled before analysis.

results). It is probable that, being fat-soluble, tocopherols are confined to the yolk (*cf.* vitamins A and D in eggs), but there appears to be no clear evidence on the point.

Vitamin distribution in albumin. Charkey *et al.* (1947) analysed separately two different fractions of the albumin of fresh eggs, namely, the firm albumin and the combined inner and outer fluid albumin. Their results showed that the firm and fluid portions did not differ appreciably in their concentration of nicotinic acid, vitamin B_6 or folic acid.

Effect of cold storage on eggs. Evans and co-workers showed in a series of investigations that transference of B vitamins may take place from the portion of higher to that of lower concentration during prolonged storage of eggs at 0° C. There was a slight transference of nicotinic acid from white to yolk (Evans *et al.*, 1951*a*), and of riboflavin (Evans, Butts and Davidson, 1952), pantothenic acid (Evans, Davidson and Butts, 1952) and folic acid (Evans *et al.*, 1953*b*) from yolk to white, but no transfer of biotin between yolk and white even after storage for 12 months at 0° C. (Evans *et al.*, 1953*a*).

Discussion

In the preceding sections many aspects of vitamin distribution in animal products have been mentioned about which the information available is often too meagre to warrant further discussion at the present time. The discussion which follows has been limited to a few topics, about which a reasonably large amount of information is now available, and which have not been extensively reviewed elsewhere.

A discussion of metabolic factors which may influence vitamin distribution in organs such as the liver and the kidneys has not been included. For further information on that question there are reference works such as those of Williams, Eakin, Beerstecher and Shive (1950) and Sebrell and Harris (1954).

Distribution of Vitamins in Muscular Tissues

It is well known that the B vitamins present in animal tissues are derived for the most part at any rate from dietary supplies, which may be supplemented through biosynthesis by micro-organisms in the intestinal tract. Synthesis by the tissues cannot be entirely excluded, for it appears that the liver is able to synthesise nicotinic acid from tryptophan. There is much evidence to show that vitamin B_1, riboflavin, and nicotinic and pantothenic acids are required for many processes in carbohydrate metabolism including fat synthesis, but it seems probable that vitamin B_1 is not needed for the utilisation of pre-formed fat as a source of energy. Thus, a sparing effect of dietary fat on the vitamin B_1 requirement of the animal body has been reported. In the muscles those four B vitamins, although playing no part in muscle contraction itself, are required for the production from glucose of the high-energy phosphate bonds which form the immediate source of energy for muscular activity (see, *e.g.*, Williams *et al.*, 1950).

The fact that the dark meat of the chicken is constantly richer in vitamin B_1, riboflavin and pantothenic acid but poorer in nicotinic acid than the light meat is of particular interest because clear-cut histological and functional differences exist between the two types of striated muscle. The dark muscles of the leg, which consist of so-called red fibres, are muscles of posture required to remain contracted over long periods of time; the light-coloured breast muscles, on the other hand, are composed of white fibres and are required for rapid but intermittent use, as in flight (see Cowdry, 1938; Clark, 1945). It seems unlikely that the differences in B vitamin concentration between the two types of muscle can be attributed solely to differences in the amounts of fat and connective tissue present. It, therefore, seems probable that red and white muscle fibres differ consistently in B vitamin concentration in the chicken. There is a further suggestion that the amounts present in each particular sort of muscle cell may be related to the type of work performed.

Similar conclusions probably apply to the turkey. There appears to be no information about other species of birds, but it would be interesting to know if the breast muscles of flying birds such as the pigeon differ appreciably in B vitamin concentration from those of the chicken and turkey which rarely fly. Gruber and Ruys (1951) estimated thiamine pyrophosphate, which accounts for most of the vitamin B_1 activity of animal organs, in breast muscle, heart and liver of carrier pigeons immediately after a long flight and in similar resting birds, but they did not examine other muscles. No evidence was found in any of the tissues studied of a lower concentration of thiamine pyrophosphate in flying than in resting birds. It was calculated that over 80 per cent. of the energy needed for the flight must have come from sources other than glycogen and glucose, and in explanation of the findings it was suggested that fat, which, as stated previously, probably does not require vitamin B_1 for its utilisation, must have formed the main source of energy.

In the rabbit, as well as the chicken, a number of muscles consist entirely of either red or white fibres (see, *e.g.*, Clark, 1945). It is of interest to note that in the rabbit also muscles composed entirely of red fibres, such as the soleus, tend to be

richer in vitamin B_1 and riboflavin than muscles composed of white fibres. The distribution of nicotinic and pantothenic acids in the muscles of the rabbit has unfortunately not been determined.

In most other mammals red and white fibres are intermingled in the muscles. Red fibres tend to predominate in some muscles and white fibres in others, but the morphological and functional differences between individual muscles are much less clearly defined than in the rabbit and the chicken. Moreover, a particular muscle may vary in colour and function from one species to another (see Hammond and Appleton, 1932 ; Clark, 1945). It is therefore difficult in the ox and pig to judge to what extent the recorded differences in B vitamin concentration between individual muscles are related to the relative proportions of red and white fibres present or to the type of muscular work performed.

The finding of much higher concentrations of vitamin B_1 in the skeletal muscles of the pig than in those of other mammals suggests that factors other than muscular activity probably influence the amounts of B vitamins which accumulate in muscle cells. Pyke (1940) considered that, since vitamin B_1 is involved in the utilisation of glucose by cells, its concentration may be related to that of glycogen, and he produced some evidence of an inverse relation between the amounts of the two substances present in muscles. For pork muscle which is rich in vitamin B_1 Pyke cited evidence that the amount of glycogen present is low and is rapidly depleted by exercise. Heinemann *et al.* (1946) showed that the amount of vitamin B_1 in pork muscle is much increased when the diet is rich in vitamin B_1, and is reduced when the diet is deficient, and they concluded that the muscles of the pig are an important storage depot for the vitamin.

It would be of interest to know whether or not the wild pig, which is both leaner and more active than the domestic pig, is capable of storing vitamin B_1 in its muscles in a similar way, but there appears to be no information on the point. There is evidence that vitamin B_1 is required for fat synthesis (see, *e.g.*, Williams *et al.*, 1950) ; fat deposition is greatly reduced in vitamin B_1 deficiency in the pig (Heinemann *et al.*, 1946). Since, however, the latter effect may be due merely to reduced feed intake, and since other B vitamins, which do not accumulate to any great degree in pork muscle, are required also for lipid synthesis, a relation between muscle storage of vitamin B_1 and lipogenesis seems improbable in the pig on the basis of the present evidence.

The fact that the concentration of vitamin B_1 is much higher in heart than in skeletal muscle of a number of species suggests that individual fibres in the two kinds of muscle may contain very different amounts of the vitamin and, further, that the differences may to some extent be associated with the type of work performed. The finding of a higher concentration of vitamin B_1 in the ventricles than in the auricles of the heart is also of interest, for the former do more work than the latter. The possibility cannot be excluded, however, that this difference in vitamin B_1 concentration may arise merely through the presence of more connective tissue and, consequently, of relatively less muscular tissue in the auricular than in the ventricular wall (see, *e.g.*, Maximow and Bloom, 1948).

Distribution of Vitamins in the Egg

In considering the distribution of vitamins between the yolk and the white, account must be taken of the fact that these two portions of the egg are laid down at different times and in different parts of the reproductive tract of the hen (see, *e.g.*, Sturkie, 1954), and that they differ in basic composition, the former containing more fat but less water than the latter (see Needham, 1931).

Available evidence shows that the fat-soluble vitamins are deposited in the yolk with most of the lipids, and remain exclusively in that part. With some of the water-soluble vitamins also, namely vitamin B_1, pantothenic acid, folic acid and biotin, deposition apparently takes place mainly in the yolk, and subsequent equilibration by diffusion from yolk to white does not occur to any great extent in spite of the fact that the vitelline membrane is permeable to water (see Needham, 1931 ; 1942). On the basis of the present evidence it cannot be definitely decided whether or not equilibration plays a part in the distribution of riboflavin, nicotinic acid and vitamin B_6 between yolk and white in the fresh egg. The slight tendency in stored eggs towards equilibration of riboflavin and nicotinic, pantothenic and folic acids may be associated with degenerative changes in the vitelline membrane. The movement of water from white to yolk which takes place during cold storage (Evans and Davidson, 1951) may assist the passage of nicotinic acid from white to yolk, but would, if anything, impede the movement of those B vitamins which migrate in the opposite direction.

It is probable that many of the B vitamins in the egg are present, at least in part, in a bound form which is not readily diffusible. Thus, György and Rose (1942) showed that egg yolk contains an undialysable but biologically active bound form of biotin. The finding is of particular interest in view of the fact that avidin, the anti-biotin factor which binds biotin in a form unavailable to animals, is present in egg white (see, *e.g.*, Eakin, Snell and Williams, 1941, for references).

There is evidence that the greater part of the protein of egg white is deposited in the portion of the hen's oviduct known as the magnum (see Sturkie, 1954, for references). Whether the B vitamins of egg albumin are laid down with the protein, or whether they are added later in the uterus with the water and salts which diffuse in through the shell and shell membrane at that stage, has not yet been definitely established. The uterine fluid contains very little nitrogenous matter (Beadle, Conrad and Scott, 1938) and it seems unlikely that diffusion through the shell is the chief mode of entry of the B vitamins. Bolton (1952) has recently produced evidence that riboflavin is deposited while the egg is in the magnum. Fraps, Hertz and Sebrell (1943) have shown that avidin is present in the magnum of the laying hen and not in the lower portions of the reproductive tract.

Though the thin and the thick albumin of the laid egg differ in viscosity, they contain similar proportions of water (Holst and Almquist, 1931 ; Charkey *et al.*, 1947). The fact that they do not differ in B vitamin concentration suggests that equilibration takes place during the period in which the egg is in the uterus, or after it has been laid.

It is well known that the yolk supplies much of the food material required by the growing embryo, but evidence is available also that the white is utilised (see Needham, 1931 ; 1942). Whether or not the distribution of vitamins between yolk and white has a special significance in the embryological development of the chick is not as yet clear. Information about the distribution of vitamins within the egg at different stages during incubation would be of interest in this connection, but is at present almost entirely lacking. There is evidence that vitamin C although absent from the fresh egg is present in the embryo soon after incubation begins (Ray, 1934).

SUMMARY

Available information is summarised on the distribution of vitamins in the tissues of each of a wide range of foodstuffs. There is evidence in many foods of an uneven distribution of vitamins between the constituent tissues, the vitamins in some cases being confined almost entirely to one particular tissue.

In cereal grains vitamin B_1 is concentrated in two very narrow regions, the scutellum portion of the germ and the aleurone layer, and nicotinic acid is largely confined to the aleurone layer.

In many fruits vitamin C is present in a higher concentration in the outer skin or peel than in the inner tissues, but the proportion of the total vitamin C of the fruit which is contained in the outer tissues is not necessarily high in thin-skinned fruits.

In leafy vegetables the concentrations of carotene and vitamin C are usually higher in the leaves than in the stalks, and that of carotene is higher in the outer than in the inner leaves. In subterranean parts of plants, such as parsnip roots or potato tubers, the concentration of vitamin C tends to be higher in the interior than at the periphery.

Among animal tissues liver and kidney are conspicuously rich in vitamins and skeletal muscles are as a rule relatively poor. The muscles of the pig are exceptionally rich in vitamin B_1.

In many species of animals there are consistent differences between individual skeletal muscles, but it has been found that corresponding muscles from opposite sides of the same carcase have similar concentrations of B vitamins.

In the chicken and the turkey the dark muscles are richer in vitamin B_1 and riboflavin but poorer in nicotinic acid than the light muscles, and in the rabbit the red muscles are richer in vitamin B_1 and riboflavin than the white muscles. In the pig, muscles rich in vitamin B_1 tend to be rich also in nicotinic acid and poor in riboflavin and pantothenic acid.

The lumbar part of the longissimus dorsi muscle in pork loin is slightly richer in vitamin B_1 than the thoracic part, and the ventricular wall of beef and pork heart is slightly richer than the auricular wall.

The vitamins A, B_1, and D of the hen's egg are confined almost entirely to the yolk. A number of other B vitamins are present in both the yolk and the white, but with most of them the concentration is higher in the former than in the latter. The concentration of nicotinic acid is consistently higher in the white than in the yolk.

A number of morphological, biochemical and physiological conditions which may influence vitamin distribution in plant and animal tissues, and some practical applications of the findings recorded in this review, are enumerated and briefly discussed.

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CHEMICAL

APPARATUS

1369

LHOTKA, J. F. **A modified Soxhlet extractor for histological and histochemical use.** *Stain Technol.*, 1955, **30**, 235–238. [Dept. Anat., Univ. Oklahoma Sch. Med.]

Tissue being extracted in a Soxhlet apparatus was prevented from damage by the addition of a water jacket around the extraction chamber. Tissue so treated was less friable and had less structural distortion than when the unmodified apparatus was used.—A. Hepburn.

1370

ZIMMERMANN, M. H. **Microextraction for paper chromatography.** *Science*, 1955, **122**, 766. [Cabot Found., Harvard Univ., Petersham, Mass.]

A small-scale apparatus on the Soxhlet principle is described.—H. G. Bray.

1371

SANDERS, E. T. **A fraction collector for chromatography.** *J. Sci. Instruments*, 1955, **32**, 392–393. [Uniliver, Ltd., Port Sunlight, Cheshire.]

See also Absts. 1393, 1397, 1904.

ANALYTICAL METHODS

General

1372

MERRILL, A. L. and WATT, B. K. **Energy value of foods—basis and derivation.** *U.S. Dept. Agric., Agric. Handbook* No. 74; March 1955, pp. 105.

In the United States Department of Agriculture Handbooks Nos. 8 and 34 (Absts. 4782, Vol. 20; 1686, Vol. 22) the system of calculation of energy from protein, carbohydrate and fat contents involved the use of factors, more specific than 4, 4 and 9, which " have been developed along the lines of Atwater's plan but take into consideration the more recent literature on digestibility and physiological energy value of foods ". These newer data have been summarised and are presented in a massive table running to 40 pages of this Handbook. In the text there is an interesting analysis of Atwater's book, which was completed 50 years ago, and a reproduction of some of his original data. From it all a table is derived of the factors which, on the basis of the experimental work now available, are thought suitable for the calculation of the energy available to the body from 47 individual foods or types of foodstuff.

D. Harvey.

1373

WIERZCHOWSKI, J. and KASIŃSKI, W. Metodyka badań i ocena wartości kalorycznej najpospolitszych krajowych konserw rybnych. [**A method for testing and evaluating the energy value of the most common Polish canned fish products.**] *Rocz. Państwowego Zakl. Hig.*, 1955, **6**, 235–242. Russian and English summaries.

1374

STREULI, H. Elution farbiger Flecken von Papierchromatogrammen. [**Elution of coloured spots from chromatograms on paper.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1955, **46**, 340. [Zürich.] French and English summaries.

The technique described is designed to use a minimum volume of eluting solvent. A square of the developed chromatogram containing the spot is cut out and again developed by ascending chromatography with a solvent in which the compound to be eluted has an R_F value of unity. For this purpose a beaker containing glass beads almost covered with solvent is used, the beads serving to support the paper vertically. After the second development the uppermost horizontal strip of the paper, containing the desired compound, is cut off, wedged by means of a glass-wool plug in the stem of a glass funnel and eluted by the addition of small amounts of solvent.

H. G. Bray.

1375

GANGULI, N. C. **An improved method in circular paper chromatography.** *Naturwissenschaften*, 1955, **42**, 486. [Dept. Appl. Chem., Univ. Coll. Sci. Technol., Calcutta.]

A modified type of irrigating wick is described.

H. G. Bray.

1376

CHAKRABORTY, K. P. and GANGULI, N. C. **Separation of biologically active compounds by circular paper chromatography.** *Naturwissenschaften*, 1955, **42**, 580–581. [Chittaranjan Cancer Hosp., Calcutta.]

1377

BUSSARD, A. and PERRIN, D. **Electrophoresis in agar plates.** *J. Lab. Clin. Med.*, 1955, **46,** 689–701. [Inst. Pasteur, Paris.]

The agar is supported on glass plates and connected to electrodes by gauze pads impregnated with agar. Evaporation is prevented by covering the plates with a layer of plastic. Agar solutions containing the substances being examined are placed in holes in the plate and allowed to gel before electrophoresis. After the run the plastic layer is removed and the plates are printed on filter paper, which is then sprayed with appropriate detecting reagents. Alternatively, for proteins, the plate may be stained directly. After staining, the plates may be dried and scanned photometrically. Tailing of proteins does not occur.

H. G. Bray.

1378

FRANKEN, F. H. and KOMMERELL, B. Ein neues Transparenzverfahren zur photoelektrischen Auswertung von Papierelektrophoresestreifen. **[A new method of making paper electrophoresis strips transparent for photo-electric evaluation.]** *Deutsch. med. Wochenschr.*, 1955, **80,** 1817. [Inn. Klin., Krankenhaus Stuttgart, Bad Cannstatt.]

The stained strips are treated with a solution of a lacquer and a hardening agent and dried for from 6 to 8 hr. before examination.—H. G. Bray.

Carbohydrate Constituents

1379

KITSON, J. A., STRACHAN, C. C. and CAIN, R. F. **Rapid sugar extraction procedure for analysis of candied fruits, jams and fresh fruits.** *J. Agric. Food Chem.*, 1955, **3,** 862–864. [Fruit and Veg. Processing Lab., Summerland, B.C.]

The ground and mixed sample is extracted with ice-cold water, adjusted to volume, blended with asbestos and filtered through a sintered glass filter. Reducing sugar and sucrose are estimated in aliquots of the filtrate.—H. G. Bray.

1380

GARDNER, K. J. **Use of acid-base indicator for quantitative paper chromatography of sugars.** *Nature*, 1955, **176,** 929–930. [Res. Lab., Mars, Ltd., Slough, Bucks.]

After the application of circular chromatography the paper is dried and sprayed with a solution of bromocresol purple and boric acid in aqueous methanol containing borax. The sugars are revealed as yellow bands against a blue background. The sugars are not destroyed and can be eluted and estimated. Solvent mixtures suitable for the separation of most sugars found in foods are described.—H. G. Bray.

1381

HAMERMAN, D., BARTZ, K. W. and REIFE, A. **Separation of mixture of nine monosaccharides by two-dimensional ascending paper chromatography.** *Anal. Chem.*, 1955, **27,** 1524–1525. [U.S. Army Med. Nutrit. Lab., Fitzsimons Army Hosp., Denver, Colo.]

Rhamnose, fucose, ribose, xylose, arabinose, fructose, mannose, glucose and galactose were separated from galacturonic and glucuronic acids by using *n*-butanol : pyridine : water, 3 : 2 : 1·5, as first solvent, followed by phenol saturated with water. Other solvents suitable for the first separation are described.—H. G. Bray.

1382

WHISTLER, R. L. and HICKSON, J. L. **Determination of some components in corn sirups by quantitative paper chromatography.** *Anal. Chem.*, 1955, **27,** 1514–1517. [Dept. Biochem., Purdue Univ., Lafayette, Ind.]

Glucose, maltose, *iso*maltose, maltotriose, *iso*-maltotriose, maltotetraose, maltopentaose, maltohexaose and maltoheptaose have been tentatively identified in maize syrup, using paper chromatography with *n*-butanol : ethanol : water (2 : 1 : 1) as developing solvent. The components were eluted and estimated absorptiometrically after hydrolysis to glucose, with 3 : 5-dinitrosalicylic acid and phenol or sulphuric acid and phenol as colouring reagent. Other solvents suitable for the separations are described. Anthrone and ferricyanide methods can also be used.—H. G. Bray.

1383

HADORN, H. and SUTER, H. Zur Untersuchung diätetischer Nährmittel. 4. Über die Anwendung der komplexometrischen Zuckerbestimmung nach Potterat - Eschmann auf die biochemische Zuckertrennung nach van Voorst. **[Investigation of commercial food preparations. 4. Application of the complexometric method of Potterat and Eschmann for estimating sugar to the biochemical separation of sugars by the method of van Voorst.]** *Mitt. Geb. Lebensmittel. Hyg.*, 1955, **46,** 341–355. [Lab. VSK, Basle.] French and English summaries.

A procedure is described for the estimation of lactose and maltose in mixtures, including foodstuffs, in the presence or absence of dextrins. The mixture is first fermented with *Saccharomyces cerevisiae*, which ferments maltose, sucrose, glucose and fructose, but not lactose or dextrins, or *Candida pseudotropicalis*, which ferments lactose, sucrose, glucose and fructose, but not maltose or dextrins. Reducing sugars are then estimated before and after hydrolysis, by a Fehling's solution method (Title 2489, Vol. 16) or the complexometric

method of Potterat and Eschmann (Abst. 1568, Vol. 25).—H. G. Bray.

1384

SECOR, G. E. and WHITE, L. M. **Microscopic identification of microgram quantities of L-arabinose and L-fucose. Direct synthesis of crystalline 2, 4-dinitrophenylhydrazone and 1, 1-diphenyl-hydrazone derivatives by solvent diffusion technique.** *Anal. Chem.*, 1955, **27**, 1998–1999. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 10, Calif.]

1385

HEYWORTH, R. and BACON, J. S. D. **The use of paper chromatography for *in vitro* studies of lactose metabolism in mammary-gland preparations.** *Biochem. J.*, 1955, **61**, 224–232. [Dept. Biochem., Univ. Sheffield.]

A mixture of *iso*butyric acid and ammonia was used to separate adenosine monophosphate from inosine monophosphate and adenosine from hypoxanthine. *n*-Butanol : pyridine : water (6 : 4 : 3) was used to separate lactose from monosaccharide phosphates. [No R_F values are given.]

H. G. Bray.

1386

SÜDHOF, H., KELLNER, H. and SCHWEER, G. Das Erfassen der Glykoproteide bei der Eiweisszuckerbestimmung im Blutserum in Abhängigkeit von der Fällungsmethode. [**The inclusion of glycoproteins in estimation of protein-bound sugars in blood serum as related to method of precipitation.**] *Deutsch. med. Wochenschr.*, 1955, **80**, 1658; 1661. [Med. Klin., Univ. Göttingen.]

Ethanol and trichloroacetic acid precipitations are compared.—H. G. Bray.

1387

ROBOZ, E., MURPHY, J. B., HESS, W. C. and FORSTER, F. M. **Isolation and determination of the glycoproteins in cerebrospinal fluid.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 691–694. [Dept. Biol. Chem., Sch. Med., Georgetown Univ., Washington, D.C.]

A procedure involving extraction with organic solvents permitted separation of glycoproteins, lipids and free sugars in cerebrospinal fluid. The glycoproteins were shown by paper chromatography to contain mannose, galactose, fucose and glucosamine. Hexose and hexosamine in the glycoprotein and γ-globulin and neuraminic acid were estimated quantitatively. Values are given for these in patients with multiple sclerosis, non-demyelinating diseases and brain tumours.

A. Hepburn.

1388

HAMERMAN, D. **Staining methods in chromatography of acidic and neutral mucopolysaccharides.** *Science*, 1955, **122**, 924–925. [Med. Nutrit. Lab., Fitzsimons Army Hosp., Denver, Colo.]

Toluidine blue is used for staining acidic mucopolysaccharides and mucicarmine for acidic and neutral mucopolysaccharides. The procedures recommended are described in detail.—H. G. Bray.

1389

CIFONELLI, J. A. and SMITH, F. **Turbidimetric method for the determination of yeast mannan and glycogen.** *Anal. Chem.*, 1955, **27**, 1639–1641. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

The method depends on the precipitation of the polysaccharides by means of the jack bean globulin concanavalin A. It is suggested that the method may be suitable for estimating α-amylase.

H. G. Bray.

1390

HALL, R. D., HARRIS, G. and MACWILLIAM, I. C. **The determination of starch in barley and malt.** *Chem. and Indust.*, 1955, No. 46, 1483–1484. [Brewing Indust. Res. Found., Nutfield, Surrey.]

Methods of extracting starch from grains were investigated and perchloric acid was found to be the most suitable reagent. The starch is then precipitated by means of iodine and after regeneration estimated by an anthrone method.—H. G. Bray.

1391

FULLER, C. H. F., LAMPITT, L. H. and COTON, L. **Studies in starch structure. 1. Analytical methods.**

COTON, L., LAMPITT, L. H. and FULLER, C. H. F. **2. The determination of iodine absorption by amperometric titration.** *J. Sci. Food Agric.*, 1955, **6**, 656–660; 660–664. [Lyons Labs., 149 Hammersmith Rd., London, W. 14.]

1392

HERSHBERGER, T. V., BENTLEY, O. G. and MOXON, A. L. **A rapid volumetric method for the determination of cellulose in studies with rumen microorganisms *in vitro*.** *J. Animal Sci.*, 1955, **14**, 725–730. [Ohio Agric. Exp. Stat., Wooster.]

Cellulose was estimated volumetrically by measurement in 10-ml. centrifuge tubes specially calibrated from 0·0 to 1·0 ml. in 0·1-ml. divisions. The method was as accurate as a gravimetric method for measuring the recovery of cellulose from fermentation experiments, and much more rapid.—A. Hepburn.

See also Abst. 1974.

Nitrogenous Constituents

1393

KIRSTEN, W. J. and GRUNBAUM, B. W. **Dumas nitrogen determination on the decimilligram scale.** *Anal. Chem.*, 1955, **27,** 1806–1809. [Inst. Med. Chem., Univ. Upsala.]

High-temperature volatilisation and combustion over nickel oxide are used. The apparatus required is described in detail.—H. G. Bray.

1394

VALLENTYNE, J. R. **The Boell and Shen method for determining nitrogen in water.** *Analyst*, 1955, **80,** 841–842. [Dept. Biol., Queen's Univ., Kingston, Ont.]

This is an ultramicro-Kjeldahl method applicable to 2 ml. water. The sample is mixed with the digestion mixture (50 per cent. H_2SO_4 containing copper sulphate, potassium sulphate and selenium dioxide) and water is removed by desiccation over H_2SO_4 and P_2O_5 before digestion.

H. G. Bray.

1395

SCHEURER, P. G. and SMITH, F. **Colorimetric submicromethod for determination of ammonia.** *Anal. Chem.*, 1955, **27,** 1616–1618. [Div. Biochem., Univ. Minnesota, St. Paul.]

A modification of the phenol - hypochlorite method. The reagents used are hypochlorous acid and sodium phenate in the presence of a trace of manganous ion. The method was used to estimate compounds which readily give rise to ammonia on hydrolysis with caustic soda, *e.g.*, amides and cyanohydrins of sugars and polysaccharides.—H. G. Bray.

1396

ZITTLE, C. A. and DELLAMONICA, E. S. **Separation of proteins by gradient solvent extraction of a protein precipitate.** *Arch. Biochem. Biophys.*, 1955, **58,** 31–36. [E. Reg. Res. Lab., Philadelphia, Pa.]

A mixture of bovine serum albumin and human Hb precipitated by ammonium sulphate was serially extracted with $(NH_4)_2SO_4$ solution continuously diluted with water.

The method showed that α-lactalbumin which had been dried from the frozen state and stored at 25° C. had reduced solubility.—A. Hepburn.

1397

HOBART, M. H. and ROSE, C. F. M. **A simple method for the continuous electrophoresis of serum proteins.** *J. Clin. Pathol.*, 1955, **8,** 338–340. [S.A. Courtauld Inst. Biochem., Middlesex Hosp. Med. Sch., London.]

The main part of the apparatus is an upper trough containing buffer from which hangs a sheet of filter paper with its lower sides dipping into 2 silver electrode compartments. Phenol red is used as indicator and the protein fractions are collected at the bottom of the paper in tubes and identified by staining the dried paper. About 7 ml. serum can be fractionated in 1 week provided the electrodes are changed every 24 hr.

A. Hepburn.

1398

DE JONG, E. B. M. Eine genaue Methode zur papierelektrophoretischen Auswertung von Proteinen. [**An accurate method for the paper-electrophoretic estimation of proteins.**] *Rec. Trav. chim. Pays-Bas*, 1955, **74,** 1290–1300. [Klin. Chem. Lab., St. Elizabeth Krankenhaus, Tilburg.]

A critical study was made of the staining of proteins by Amidoschwarz 10B, the elution of stained proteins and their spectrophotometric estimation. The results of the application of the method to normal serum proteins are given.

H. G. Bray.

1399

WALSH, J. R., HUMOLLER, F. L. and DUNN, A. L. **Comparative studies in quantitative filter paper electrophoresis.** *J. Lab. Clin. Med.*, 1955, **46,** 772–780. [Med. Serv., Med. Res. Lab., Veterans Admin. Hosp., Omaha, Nebr.]

Conditions suitable for obtaining reproducible results in paper electrophoresis of blood proteins are considered.—H. G. Bray.

1400

AULL, J. C. and MCCORD, W. M. **A simple, rapid procedure for the estimation of albumin and alpha, beta, and gamma globulin in serum.** *J. Lab. Clin. Med.*, 1955, **46,** 476–483. [Dept. Chem., Med. Coll. S. Carolina, Charleston.]

The method depends on the measurement of the turbidity produced when the serum is mixed with different phosphate buffers.—H. G. Bray.

1401

SCHEIFFARTH, F., BERG, G. and GÖTZ, H. Plasma-Elektrophorese auf Filtrierpapier. [**Plasma electrophoresis on filter paper.**] *Hoppe-Seyler's Ztschr.*, 1955, **302,** 126–128. [Med. Klin., Univ. Erlangen.]

A procedure is described by means of which fibrinogen can be separated and estimated.

H. G. Bray.

1402

NEALE, F. C. **The demonstration of the iron-binding globulin (transferrin) in serum and urine proteins by use of ^{59}Fe combined with paper electrophoresis.** *J. Clin. Pathol.*, 1955, **8,** 334–337. [Dept. Biochem., Queen Elizabeth Hosp., Birmingham.]

Paper electrophoresis followed by auto-radiography of serum and urine to which ^{59}Fe had been added showed that patients with the nephrotic syndrome or congestive cardiac failure lost transferrin in the urine. The attachment of iron to transferrin was specific and abnormal proteins did not interfere.—A. Hepburn.

1403

MONTENOVESI, P. Le vert malachite pour l'évaluation des glycoprotéines du sérum colorées avec le PAS (periodic acid Shiff). [**Use of malachite green to evaluate glycoproteins of serum stained with PAS (periodic acid Schiff).**] *Presse méd.*, 1955, **63,** 1497. [Serv. Pédiat., Hôp. Alessandri, Verona.]

1404

HONDA, K., SATO, T., OGAWA, M. and KONNO, S. **Preliminary eporrt on an electrophoretic method for analyzing liver proteins.** *Tohoku J. Exp. Med.*, 1955, **62,** 147–150. [Prof. M. Muto's Surg. Clin., Tohoku Univ., Sendai.]

1405

SATO, T. **Electrophoretic studies of liver components. Studies on protein fraction. 8.** *Tohoku J. Exp. Med.*, 1955, **62,** 151–160. [Prof. M. Muto's Surg. Clin., Tohoku Univ., Sendai.]

Fresh liver tissue was extracted with 0·9 per cent. NaCl; the extract was precipitated with absolute ethanol, treated with ether, vacuum-dried and dissolved in 0·5 per cent. NaOH. The resulting solution after dialysis against a carbonate buffer at *p*H 9·6 gave clear electrophoretic patterns. The 2 main fractions contained protein and carbohydrate, respectively.—A. Hepburn.

1406

SOBEL, H., MYERS, S. M. and MARMORSTON, J. **A procedure for the quantitative determination of protein of the rat heart.** *Circulation Res.*, 1955, **3,** 454–458. [Dept. Biochem., Cedars of Lebanon Hosp., Los Angeles, Calif.]

Four similar procedures are described. The heart is ground with sand at 0° C. and the resulting paste is extracted under varying conditions with sucrose-Versene solution, differentially centrifuged and then extracted with phosphate-pyrophosphate buffer. The fractions obtained are termed "low ionic strength extractives", shown by electrophoresis to contain 5 sub-fractions, mitochondrial fraction, and "high ionic strength extractives", containing 3 sub-fractions.—H. G. Bray.

1407

HAUGAARD, N. and HAUGAARD, E. S. **Separation of peptides from salt solutions by an ion exchange method.** *C.R. Lab. Carlsberg (Sér. chim.)*, 1955, **29,** No. 20, 347–349.

The resin used is Dowex-50 in the ammonium form. The column is washed with a citrate buffer, *p*H 3·3, before application of the solution to be desalted; it is then treated with 0·01 *N* acetic acid and the peptides are eluted with ammonium hydroxide.—H. G. Bray.

1408

KAINZ, G. and SCHÖLLER, F. Zur Bestimmung des Aminostickstoffs in synthetischen Polypeptiden. [**Estimation of amino-nitrogen in synthetic polypeptides.**] *Biochem. Ztschr.*, 1955, **327,** 292–295. [2. Chem. Lab., Univ. Vienna.]

The sources of error due to secondary reactions of the peptide are discussed. They can be avoided by using dilute HNO_2 in presence of KI.

H. G. Bray.

1409

RAMACHANDRAN, L. K., EPP, A. and MCCONNELL, W. B. **Infrared spectra of 3-phenyl-2-thiohydantoins of amino acids and their application to identification of *N*-terminal groups in peptides.** *Anal. Chem.*, 1955, **27,** 1734–1737. [Prairie Reg. Lab., Nat. Res. Counc. Canada, Saskatoon, Sask.]

Infrared spectra of the phenylthiohydantoins of 22 amino-acids are given and experiments with 5 peptides are described which suggest that the formation of compounds of this type may be of value in the identification of N-terminal groups.

H. G. Bray.

1410

DEANE, K. R. and TRUTER, E. V. **The identical behaviour of some peptides and amino-acids in paper chromatography.** *Biochim. biophys. Acta*, 1955, **18,** 435–436. [Textile Chem. Lab., Univ. Leeds.]

In a study of human sweat and suint from wool certain components which behaved as identifiable amino-acids in one- and two-dimensional paper chromatography were shown to be peptides in that on hydrolysis they gave rise to more than one amino-acid.—H. G. Bray.

1411

THOMPSON, A. R. **Amino acid sequence in lysozyme. 2. Elution chromatography of peptides on ion-exchange resins.** *Biochem. J.*, 1955, **61,** 253–263. [Lab. Study Hereditary Metabol. Disorders, Univ. Utah Coll. Med., Salt Lake City.]

For part 1 see *Biochem. J.*, 1955, **60,** 507.

The resin used for chromatography of lysozyme hydrolysates was Dowex-50 and the eluting solutions were ammonium formate buffers, *p*H 2·49 to 4·28, followed by ammonium acetate buffers, *p*H 4·50 to 6·81. After removal of ammonia, peptides and amino-acids were estimated in the eluates by a ninhydrin method.—H. G. Bray.

1412

BISERTE, G., PLAQUET, R. and BOULANGER, P. Chromatographie sur papier des acides aminés et polypeptides des milieux biologiques. 4. Isolement d'une forme combinée de l'acide γ - aminobutyrique dans l'urine humaine. [**Paper chromatography of amino-acids and polypeptides of biological media. 4. Isolation of a combined form of γ-aminobutyric acid in human urine.**] *Bull. Soc. Chim. biol.*, 1955, **37**, 831–837. [Lab. Chim. Biol., Fac. Méd. Pharm., Cité Hospitalière, Lille.]

For part 3 see Abst. 43, Vol. 23.

Application of chromatographic, ion-exchange and electrophoretic techniques to human urine led to the isolation of a fraction which was shown to contain γ-aminobutyric acid as the only amino-acid. Comparison with a synthetic specimen suggested that it was homopantothenic acid.

H. G. Bray.

1413

GARCIA-BLANCO, J. and PASCUAL-LEONE, A. M. La reducción del ácido crómico en solución sulfúrica por los diversos aminoácidos naturales. [**Reduction of chromic acid in solution in sulphuric acid by natural amino-acids.**] *Rev. española Fisiol.*, 1955, **11**, 143–147. [Lab. Fisiol. Gen., Fac. Med., Valencia.] English summary.

The amino-acids were dissolved in water or HCl solution. The test solution was prepared by slow addition of 1 ml. 0·5 *N* or 0·25 *N* potassium chromate to 20 ml. concentrated H_2SO_4, and 1 ml. of this was added immediately to 1 ml. amino-acid solution, in a boiling-water bath. The reduction of yellow chromate to blue-green indicates the end-point of the reaction. The smallest amount of amino-acid capable of reducing the potassium chromate in 10 min. was found.

The concentrations of amino-acid necessary, in mg. per ml., were *iso*leucine 0·125, leucine, tyrosine, lysine and serine 0·185, arginine 0·25, cystine, cysteine and valine 0·375, phenylalanine and methionine 0·5, histidine 1, proline 2, aspartic and glutamic acids 60, alanine 100 and glycine 200.

D. Duncan.

1414

GARCIA-BLANCO, J. and PASCUAL-LEONE, A. M. Diferenciación de algunos aminoácidos naturales por su capacidad reductora del ácido vanádico a sal de vanadilo. [**Differentiation of some natural amino-acids by their capacity to reduce vanadic acid to a vanadyl salt.**] *Rev. española Fisiol.*, 1955, **11**, 149–152. [Lab. Fisiol. Gen., Fac. Med., Valencia.] English summary.

The reagent consisted of 10 mg. ammonium vanadate mixed with 1 ml. water and then 9 ml. concentrated sulphuric acid, added slowly. To 1 ml. amino-acid solution was added 1 ml. reagent. A positive reaction is characterised by change of colour from orange to blue.

The amino-acids which gave positive reactions, and the amounts in mg. necessary to reduce 1 mg. vanadate, were cysteine 0·25 to 0·125, cystine 0·5 to 0·25, methionine 0·5 to 0·25 and tyrosine [" thyroxine " in the English summary must be an error] 4 mg. Tryptophan, 0·125 mg., gave an intense dark brown colour. No reaction was given by glycine, alanine, serine, valine, leucine, *iso*-leucine, phenylalanine, lysine, arginine, aspartic acid, glutamic acid or histidine.—D. Duncan.

1415

GERLAXHE, S. and CASIMIR, J. Note concernant la séparation des acides ω aminés par chromatographie sur papier en présence de tampon. [**Note on the separation of ω-amino-acids by paper chromatography in the presence of a buffer.**] *Bull. Inst. agronom. Gembloux*, 1955, **23**, 352–354. [Lab. Chem. Gén., Centre Nat. Chim. Org.]

β-Alanine, γ-aminobutyric acid, δ-aminovaleric acid and ϵ-aminocaproic acid were separated by paper chromatography using butanol saturated with buffer as the solvent. Four buffers were tried and *p*H seemed to have little effect on the R_F values. A boric acid-NaOH buffer at *p*H 8·5 gave the best separation.—A. Hepburn.

1416

MÜLLER, R. and KRAMPITZ, G. Beiträge zur Aminosäurebestimmung in biologischem Material. 1. Prinzipielles zur Trennung von ninhydrin-positiven Substanzen mittels Säulenchromatographie. [**Estimation of amino-acids in biological material. 1. Principles of separation of ninhydrin-positive substances by column chromatography.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10**, 223–228. [Inst. Anat. Haustiere, Univ. Bonn.]

1417

PIEZ, K. A. and EAGLE, H. **Systematic effect of C^{14} labeling on ion-exchange chromatography of amino acids.** *Science*, 1955, **122**, 968–969. [Nat. Inst. Dent. Res., Bethesda, Md.]

It was shown that the presence of ^{14}C in a molecule of an amino-acid reduces its rate of movement on a Dowex-50 column, so that some resolution of labelled and unlabelled acid occurs during chromatography. The practical significance of this observation is discussed.—H. G. Bray.

1418

SCHNEIDER, F., REINEFELD, E. and MÜLLER, H. Zur schnellen quantitativen Bestimmung von

Aminosäuren, insbesondere von Glutaminsäure. [**Rapid quantitative estimation of amino-acids, especially glutamic acid.**] *Biochem. Ztschr.*, 1955, **327,** 189–194. [Inst. Landwirtsch. Technol., Tech. Hochsch., Brunswick.]

An electrophoretic method is described. The separation is performed at *p*H 3·7, the separated acids are stained with ninhydrin and the colours are measured photometrically. Glutamic, aspartic and α-aminobutyric acids alone or in beet molasses may be estimated with an error which is usually less than 4 per cent.—H. G. Bray.

1419

ROCHE, J., MICHEL, R. and NUÑEZ, J. Séparation chromatographique de divers acides aminés iodés au moyen de solvants volatils tamponnés. Application au constituants iodés du corps thyroïde. [**Chromatographic separation of some iodinated amino-acids by buffered volatile solvents. Application to iodinated constituents of the thyroid.**] *Bull. Soc. Chim. biol.*, 1955, **37,** 809–817. [Lab. Biochim. Gén., Coll. de France, Paris.]

1420

KHAN, N. A., BAKER, B. E. and VAN HORN, W. F. **Paper chromatography in routine determination of glutamic acid in production.** *J. Agric. Food Chem.*, 1955, **3,** 853–855. [Macdonald Coll., Quebec.]

Buffered filter paper, *p*H 12, is used, and the solvent is phenol saturated with the same buffer and containing 5 per cent. 2-butanol. Spots of the solution being analysed are run alongside standards and after development are detected by means of ninhydrin and estimated densitometrically. It is concluded that 8 replicate estimations are needed to give a reasonably reliable value for the glutamic acid content of a sample.—H. G. Bray.

1421

SELIM, A. S. M., EL-WAHAB, M. E. A. and EL-SADR, M. M. **A new method for the direct isolation of glycine from protein hydrolysates.** *Biochem. J.*, 1955, **61,** 177–179. [Dept. Biochem., Abbassia Fac. Med., Cairo.]

A sulphuric acid (8*N*) hydrolysate of gelatine is neutralised with $Ca(OH)_2$ and sulphate ions are removed with baryta and calcium ions with oxalic acid. The filtrate is concentrated *in vacuo* and treated with copper picrate and the glycine-copper picrate which crystallises is separated. Glycine is isolated from this by treatment with H_2SO_4, picric acid being extracted with benzene and Cu precipitated by H_2S. The filtrate is freed from H_2SO_4 with baryta and concentrated and glycine is precipitated by ethanol.—H. G. Bray.

1422

SCHWARTZ, T. B., ROBERTSON, M. C. and HOLMES, L. B. **A microdiffusion method for the determination of plasma glycine.** *J. Lab. Clin. Med.*, 1955, **46,** 657–661. [Med. Serv., Veterans Admin. Hosp., Duke Univ., Durham, N.C.]

Plasma, 1 ml., is diluted with 4 ml. picric acid solution and centrifuged and the glycine content of the supernatant fluid is estimated in a Conway unit. The liquid is evaporated to dryness and ethyl phosphate and ninhydrin are added. The formaldehyde formed diffuses into a chromotropic acid reagent and the colour produced is measured spectrophotometrically.—H. G. Bray.

1423

HUNTER, A. **A method of histidine determination based upon a modified Knoop reaction. 2.** *J. Biol. Chem.*, 1955, **216,** 391–394. [Res. Inst., Hosp. Sick Child., Toronto.]

The colorimetric estimation of histidine (see Abst. 1519, Vol. 22) was shown to be affected by the concentration of Br^- and the temperature at which colour developed. The method was modified by adding KBr to the bromine solution in tertiary butanol and keeping the temperature at 25° C. until the colour was fully developed. The best results were obtained with solutions containing from 0·12 to 0·28 mg. histidine per 5 ml.

A. Hepburn.

1424

COWGILL, R. W. **Colorimetric method for analysis of histidine and certain related imidazole compounds.** *Anal. Chem.*, 1955, **27,** 1521–1523. [Dept. Biochem., Univ. California, Berkeley.]

The method depends on the reaction of *p*-nitrobenzoyl chloride in acetone solution with imidazole derivatives to give derivatives of 1 : 2-di(*p*-nitrobenzamido)-ethylene. Interference by bases and phenols is not serious unless they are present in relatively large amounts. The method is applicable to as little as 4 μg. histidine if a spectrophotometer is used for the estimation.—H. G. Bray.

1425

PASIEKA, A. E. and MORGAN, J. F. **The detection of homocysteine in biological systems.** *Biochim. biophys. Acta*, 1955, **18,** 236–240. [Lab. Hyg., Dept. Nat. Health Welfare, Ottawa.] French and German summaries.

Homocysteine gave a cherry-red spot surrounded by deep blue on paper chromatograms sprayed with ninhydrin and then treated with mercuric nitrate. Inorganic salts, including chloride, phosphate and bicarbonate, catalysed the reaction. Nearly 80 other compounds, including homocysteine thiolactone and homocystine, failed to give this reaction.—A. Hepburn.

1426

BLACKBURN, S. and LEE, G. R. **The determination of lanthionine in amino-acid mixtures: the separation of its diastereoisomers on columns of ion-exchange resin.** *Analyst*, 1955, **80**, 875–879. [Wool Indust. Res. Assoc., Torridon, Headingley, Leeds 6.]

Lanthionine is isolated from protein hydrolysates or amino-acid mixtures by chromatography on Dowex-50, from which it is eluted between serine and glutamic acid. This procedure separates L- and *meso*lanthionine. A method is described for the colorimetric estimation of lanthionine by means of ninhydrin in acid solution; under the conditions described most common amino-acids give no reaction, proline and lysine being exceptions.—H. G. Bray.

1427

ROSENTHAL, H. L. **Determination of urea in blood and urine with diacetyl monoxime.** *Anal. Chem.*, 1955, **27**, 1980–1982. [Clin. Pathol. Labs., Div. Biochem., Rochester Gen. Hosp., N.Y.]

See also Abst. 1567.

Lipoid Constituents

1428

CROCKER, W. P., JENKINS, D. I., PROVAN, A. L., MACDONALD, F. J., ROWLAND, S. J. and WHITE, J. C. D. **A comparison of the Gerber and Röse Gottlieb methods for the determination of fat in milk.** *J. Dairy Res.*, 1955, **22**, 336–339. [The Nestlé Co., Ltd., Hayes, Middlesex.]

The fat percentage in 208 samples of milk with a range of 2·5 to 6·0 per cent. obtained by the Gerber method (G) and the Röse Gottlieb method (RG) satisfied the equation $G = 1{\cdot}036\,RG - 0{\cdot}097$ (*cf.* Abst. 3058, Vol. 21). It is suggested that if the capacity of the Gerber milk pipette were reduced from 11·04 to 10·94 ml. the methods would agree for milks with a fat content of 3·6 per cent. and over the normal range of fat content there would be only a difference negligible for most purposes. Tables are given from which a correction can be applied if desired.—A. Hepburn.

1429

BOTTINI, E. and CAMPANELLO, F. L'olio idrogenato di delfinidi svelato nei burri per mezzo della cromatografia su carta. [**Detection of hydrogenated dolphin oil in butters by means of paper chromatography.**] *Ann. Sper. agrar.*, 1955, **9**, 11–20. [Staz. Chim. Agrar. Sper., Turin.] English summary.

Dolphin oil contains much *iso*valeric acid, 7·8 per cent. in the sample tested, and less butyric acid than butter. *iso*Valeric acid could be detected by paper chromatography when the butter contained as little as 3 per cent. hydrogenated dolphin oil.—D. Duncan.

1430

WUNDERLY, C. and WIEME, R. J. A propos du dosage des lipoïdes après électrophorèse sur papier. [**Estimation of lipids after electrophoresis on paper.**] *Arch. internat. Physiol.*, 1955, **63**, 318 – 327. [Med. Klin., Univ. Zürich.]

A critical study of the use of Sudan black and oil red to stain lipids separated by paper electrophoresis.—H. G. Bray.

1431

KIBRICK, A. C. and SKUPP, S. J. **Estimation of lipid fractions of blood plasma: system using the Allen volumetric method.** *Clin. Chem.*, 1955, **1**, 317–323. [Clin. Labs., Veterans Admin. Hosp., New York.]

The Allen method (*Proc. Soc. Exp. Biol. Med.*, 1934, **31**, 991), which depends finally on the measurement of a column of fat in a capillary tube, is calibrated for the recovery of known amounts of fat rather than by means of mercury. A procedure is described for the estimation of phospholipins, cholesterol and cholesterol esters, neutral fat, total lipids and total fatty acids.—H. G. Bray.

1432

JENCKS, W. P. and DURRUM, E. L. (with JETTON, M. R.) **Paper electrophoresis as a quantitative method: the staining of serum lipoproteins.** *J. Clin. Invest.*, 1955, **34**, 1437–1448. [Dept. Pharmacol., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

The separated lipoprotein is stained with oil red O or Sudan black and the adsorbed dye is eluted and estimated spectrophotometrically. The composition of the stains used and the solubility of the stained lipid in staining solvents are discussed.—H. G. Bray.

1433

PERILÄ, O. **Separation of saturated straight chain fatty acids. 2. Qualitative paper ionophoresis.** *Acta chem. scand.*, 1955, **9**, 1231–1232. [Finland Inst. Technol., Helsinki.]

For part 1 see Abst. 62, Vol. 26.

Acids from acetic to pelargonic can be separated ionophoretically at 25° C. by aqueous NaOH buffered with boric acid at *p*H 9, using a potential of 5 volts per cm. Acids from acetic to palmitic can be separated by means of 0·2 *N* NaOH in glycerol at 90° C.; this procedure is most suitable

for acids above caproic. Lower acids are detected with methyl red and those from valeric with rhodamine B.—H. G. Bray.

1434

WAGNER, H., ABISCH, L. and BERNHARD, K. Zur papierchromatographischen Analyse von Fettsäuregemischen aus gesättigten und ungesättigten Fettsäuren mit 12 bis 22 C-Atomen. **[Paper chromatographic analyses of fatty acid mixtures of saturated and unsaturated fatty acids with 12 to 22 C atoms.]** *Helv. chim. Acta*, 1955, **38**, 1536–1541. [Physiol. Chem. Inst., Univ. Basle.]

Paper impregnated with a petroleum fraction (b.p. 190° to 220° C.) is used, the developing solvent being a mixture of the same fraction with 90 per cent. acetic acid. After development the acids are converted to copper ferrocyanide complexes which can be estimated absorptiometrically on the paper.—H. G. Bray.

1435

VAN DE KAMER, J. H., PIKAAR, N. A., BOLSSENS-FRANKENA, A., COUVÉE-PLOEG, C. and VAN GINKEL, L. **Quantitative determination of the different higher saturated fatty acids in fat from blood, chyle and faeces, by means of partition chromatography on rubber.** *Biochem. J.*, 1955, **61**, 180–186. [Central Inst. Nutrit. Res. T.N.O., Utrecht.]

A column of rubber powder was used, with aqueous acetone of increasing concentration, from 30 to 80 per cent., as developing solvent. Unsaturated fatty acids are oxidised with alkaline permanganate before separation, since they interfere with the separation of saturated acids. This treatment attacks octanoic and decanoic acids and cannot be applied when they are present. Details of the extraction of fat from the materials studied vary and they are described separately. The method was applied to acids from C_6 to C_{22}.

H. G. Bray.

1436

HACK, M. H. **A method for the estimation of fatty acid esters.** *Arch. Biochem. Biophys.*, 1955, **58**, 19–23. [Dept. Med., Tulane Univ., New Orleans, La.]

Carboxylic esters were estimated colorimetrically from the lavender colour produced when the corresponding hydroxamic acid prepared by treatment with alkaline hydroxylamine reacted with ferric perchlorate. A list of esters which react includes fatty acid esters, cholesterol esters, vitamin A acetate, lecithin, cephalin, tributyrin and tristearin. Favourable recoveries were made of some of these substances alone or in binary mixtures.—A. Hepburn.

1437

RAPPORT, M. M. and ALONZO, N. **Photometric determination of fatty acid ester groups in phospholipides.** *J. Biol. Chem.*, 1955, **217**, 193–198. [Div. Labs. Res., New York State Dept. Health.]

1438

ALBERS, R. W. and LOWRY, O. H. **Fluorometric determination of 0·1 to 10 micrograms of cholesterol.** *Anal. Chem.*, 1955, **27**, 1829–1831. [Dept. Pharmacol., Sch. Med., Washington Univ., St. Louis, Mo.]

The method is based on the fluorescence given by cholesterol in the presence of sulphuric acid, acetic anhydride and trichloroethane, which develops in 5 to 10 min. and is stable for about 45 min. Samples of tissue containing from 0·1 to 2·0 μg. cholesterol are extracted with ethanol, the extract is treated with the reagents and the fluorescence is measured by comparison with standard solutions. No substance usually present in tissues interferes seriously with the method. Free and esterified cholesterol give nearly identical degrees of fluorescence.—H. G. Bray.

1439

MICHALEC, Č. **Paper chromatography of cholesterol and cholesterol esters.** *Naturwissenschaften*, 1955, **42**, 509–510. [Univ. Hosp., Prague.]

Ascending paper chromatography on Whatman No. 3 paper impregnated with a 10 per cent. solution of paraffin oil in benzene, with acetic acid as developing solvent, is used. Detection is by 10 per cent. phosphotungstic acid in ethanol or 50 per cent. antimony trichloride in acetic acid. R_F values are given for cholesterol and its acetate, caproate, palmitate, stearate and oleate.

H. G. Bray.

1440

LANGAN, T. A., DURRUM, E. L. and JENCKS, W. P. **Paper electrophoresis as a quantitative method: measurement of alpha and beta lipoprotein cholesterol.** *J. Clin. Invest.*, 1955, **34**, 1427–1436. [Dept. Pharmacol., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

After electrophoresis the paper strips are dried at room temperature. Some are sprayed with Sudan black to locate lipoprotein and segments corresponding to those which stain are cut from the others and eluted with a hot mixture of methanol and chloroform. Cholesterol is estimated in the eluates by means of a mixture of ferric chloride and H_2SO_4 (Abst. 3890, Vol. 23) or by the digitonin precipitation method of Schoenheimer and Sperry. Results obtained by the 2 methods are comparable.

H. G. Bray.

Other Organic Constituents

1441

BONTING, S. L. **Colorimetric determination of pyruvic acid and other α-keto acids in submicrogram quantities.** *Arch. Biochem. Biophys.*, 1955, **58,** 100–108. [Dept. Physiol., Coll. Med., State Univ. Iowa, Iowa City.]

From 0·1 to 1·0 μg. pyruvic acid or other keto-acid in a sample containing at least 2 μg. per ml. was estimated colorimetrically from the yellow colour of the hydrazone extract in Na_2CO_3 solution. Deproteinisation and the use of NaOH were unnecessary. Pyruvic acid could be differentiated from α-ketoglutaric acid or oxaloacetic acid by varying the reaction time and the organic solvent.

A. Hepburn.

1442

ADAMSON, L. F. and GREENBERG, D. M. **Separation of the acid precursors of cholesterol by column chromatography.** *Biochim. biophys. Acta*, 1955, **18,** 516–518. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

By means of the silica gel column and eluting solvents described by Kinnory *et al.* (Abst. 3940, Vol. 25) the following proposed acid precursors of cholesterol were separated: ββ-dimethylacrylic acid, β-hydroxy*iso*valeric acid, β-hydroxy-β-methylglutaric acid, β-methylglutaconic acid and acetic acid. Separate titration peaks were obtained, with the benzene-ether solvent system, for all the acids except acetic and β-methylglutaconic acids, which were eluted together; these acids were resolved by the preliminary use of a 1 : 1 mixture of light petroleum and ether as developing solvent.

G. A. Garton.

1443

ENGLIS, D. T., BURNETT, B. B., SCHREIBER, R. A. and MILES, J. W. **Determination of benzoic and salicylic acids in food products.** *J. Agric. Food Chem.*, 1955, **3,** 964–969. [Dept. Chem., Univ. Illinois, Urbana.]

Benzoic and salicylic acids could be estimated, either alone or in mixtures, by ultraviolet spectrophotometric examination at selected wavelengths. Benzoate was estimated in ketchup, orange base concentrate and margarine.—A. Hepburn.

1444

BLANQUET, P., DUNN, R. W. and TOBIAS, C. A. **Isolation and quantitative estimation of iodide, thyroxine, and substances related to thyroxine by means of an anion exchange resin.** *Arch. Biochem. Biophys.*, 1955, **58,** 502–503. [Donner Lab. Biophys. Med. Phys., Univ. California, Berkeley.]

1445

FAGEN, H. J., KOLEN, E. P. and HUSSONG, R. V. **Spectrophotometric method for determining piperine in oleoresins of black pepper.** *J. Agric. Food Chem.*, 1955, **3,** 860–862. [Kraft Foods Co. Res. Labs., Glenview, Ill.]

1446

FENWICK, M. L. and PARKER, V. H. **The determination of 3 : 5-dinitro-*o*-cresol in the presence of β-carotene in biological tissues.** *Analyst*, 1955, **80,** 774–776. [Fisons Pest Control, Ltd., Bourn, Cambridge.]

See also Abst. 1588.

Inorganic Constituents

1447

THOMPSON, A. and RAVEN, A. M. **Soil contamination of herbage samples.** *J. Sci. Food Agric.*, 1955, **6,** 768–777. [Sch. Agric., King's Coll., Univ. Durham.]

Italian ryegrass was grown in soil-less culture. Soil was added to the dried ground herbage to give a series of samples with up to 10 per cent. contamination. With the soil used (not calcareous), contamination had little effect on the silica-free ash, Ca and Na contents of the samples. K, Cl, Mg and P contents were reduced by 7 to 14 per cent., probably owing to dilution with soil. Cu showed a slight increase but with Fe and Co the increases were so great that soil contamination as low as 2 per cent. more than doubled the amount present in the soil-free grass. With Mn a similar error was obtained at the 10 per cent. contamination level.

Leaching effects from washing herbage were studied, though the efficacy of the treatments in removing contaminating soil was not investigated. Spraying with water for 3 min. caused little loss of ash constituents. A 5-min. soaking removed one-third of the silica and Co. Most constituents showed considerable losses after soaking for 1 hr.

Al content was found to provide a good measure of the degree of soil contamination in herbage. A method for its estimation is described.

J. L. Corbett.

1448

VANATTA, J. C. and LANDERS, R. M. (Jr.) **The determination of total base of urine with an ion exchange resin conditioned as iodate.** *J. Biol. Chem.*, 1955, **216,** 351–355. [Dept. Physiol., Univ. Texas Southwestern Med. Sch., Dallas.]

Urine was diluted and passed through a resin column. Total base was estimated from the amount of iodate liberated (see Abst. 4100, Vol. 24).

Total fixed base, taken as base content after ashing, could not be estimated directly in this way owing to the formation of insoluble Ca and Mg phosphates. Total fixed base estimated in 16 standard solutions after removal of phosphate by precipitation with ferric ammonium sulphate before ashing had errors of less than 2 per cent. Total fixed base plus ammonia differed on the average by 0·1 per cent. from total base concentration in the urines from 9 normal subjects and 6 patients in hospital.
A. Hepburn.

1449

HAMM, R. Über die Bestimmung von Calcium, Magnesium, Zink und Eisen in tierischem Gewebe. [**Estimation of calcium, magnesium, zinc and iron in animal tissues.**] *Biochem. Ztschr.*, 1955, **327,** 149–162. [Chem. Physik. Inst., Bundesforschungsanst. Fleischwirtsch., Kulmbach.]

The material is ashed and the residue is dissolved in HCl. The solution is treated with a cation-exchange resin (Lewatit S 100) which adsorbs Ca, Mg and Zn, allowing phosphate and 90 to 95 per cent. of the Fe to pass through. Ca, Mg and Zn are eluted with HCl and estimated by titration with disodium ethylenediamenetetra-acetate. Fe is estimated spectrophotometrically with *o*-phenanthroline.—H. G. Bray.

1450

WILSON, A. A. **The determination of magnesium and calcium in serum or plasma with ethylenediaminetetra-acetic acid (EDTA).** *J. Comp. Pathol.*, 1955, **65,** 285–290. [Vet. Sci. Div., Res. Dept., Boots Pure Drug Co., Ltd., The Priory, Thurgarton, Notts.]

Ca is precipitated as its oxalate and Mg as magnesium ammonium phosphate. The precipitates are dissolved in 50 per cent. HNO_3 and the solutions are titrated with ethylenediamine tetra-acetic acid at 60° to 80° C. in the presence of KCN at *p*H 10, with solochrome black WDFA as indicator. In order to obtain a sharper end-point in the Ca titration the titrated Mg solution is added to the Ca solution before it is titrated.—H. G. Bray.

1451

DULCE, H. J. Flammenphotometrische Bestimmung von Ca und Mg im Harn. [**Estimation of calcium and magnesium in urine by flame photometer.**] *Hoppe-Seyler's Ztschr.*, 1955, **302,** 102–104. [Physiol. Chem. Inst., Freie Univ., Berlin.]

Ca in urine is precipitated as its oxalate and Mg as ammonium magnesium phosphate before flame photometry is applied.—H. G. Bray.

1452

HARRISON, H. E. and HARRISON, H. C. (with FLEISHMAN, E.) **A micromethod for determination of serum calcium.** *J. Lab. Clin. Med.*, 1955, **46,** 662–664. [Div. Paediat., Baltimore City Hosp., Md.]

In 0·2 ml. serum, Ca is precipitated as its oxalate, which is isolated by centrifuging. Excess ethylenediaminetetra-acetic acid is added and the excess is titrated against $CaCl_2$, with eriochrome black T as indicator.—H. G. Bray.

1453

THIERS, R. E., WILLIAMS, J. F. and YOE, J. H. **Separation and determination of millimicrogram amounts of cobalt.** *Anal. Chem.*, 1955, **27,** 1725–1731. [Pratt Trace Analysis Lab., Dept. Chem., Univ. Virginia, Charlottesville.]

The procedure described is applicable to biological material, *e.g.*, blood. The sample is dry-ashed and the ash is dissolved in HCl, some alkali chlorides and Fe are removed and the cobalt is separated by means of an ion-exchange resin (Dowex 1-X8) and spectrochemically estimated in the eluate.—H. G. Bray.

1454

SCHÜTTE, E. and KIESOW, L. Blausäurebildung als Fehlerquelle bei der Chloridbestimmung nach van Slyke. [**Hydrocyanic acid as source of error in chloride estimation by the Van Slyke method.**] *Hoppe-Seyler's Ztschr.*, 1955, **302,** 96–101. [Physiol. Chem. Inst., Freie Univ., Berlin.]

Hydrocyanic acid is formed from tyrosine and tryptophan during ashing of proteins with HNO_3. It is shown that an error of 60 per cent. is possible in the estimation of low chloride concentrations in protein preparations.—H. G. Bray.

1455

HERRMANN, R. Flammenspektrophotometrische Cu-Bestimmung im Serum. [**Estimation of copper in serum by flame spectrophotometry.**] *Ztschr. ges. exp. Med.*, 1955, **126,** 334–337. [Hautklin., Akad. Med. Forsch., Justus Liebig Hochsch., Giessen.]

Serum is deproteinised by adding HCl and trichloroacetic acid and removing the precipitate by centrifuging. The supernatant fluid is used directly for flame photometry.—H. G. Bray.

1456

ZAUSCH, G. Zur Methodik der Eisen- und Kupferbestimmung im Serum. [**Methods of estimating iron and copper in serum.**] *Klin. Wochenschr.*, 1955, **33,** 954–956. [Bakteriol. Chem. Inst., Städt. Behringkrankenhaus, Berlin-Zehlendorf.]

A study was made of the accuracy and sensitivity of the phenanthroline method for estimating iron, and of the carbamate method for estimating copper, in serum. For Fe, *p*H 2 gave the most satisfactory colour development and stability for comparison with standards for the reaction of the Fe-phenanthroline complex with α-dinitrophenol. In the estimation of Cu it was possible to avoid interference from Fe by using *iso*propanol as solvent and working above *p*H 8.—A. M. Copping.

1457

ODEBLAD, E., MEURMAN, L. and ZILIOTTO, D. **On the analysis of Co^{60}-Fe^{59} mixtures by a coincidence technique.** *Acta radiol.*, 1955, **44,** 337–344. [Isotope Lab., Dept. Gynaecol., Sabbatsberg Sjukhus, Stockholm.]

1458

GAGE, J. C. **The determination of lead in organic material.** *Analyst*, 1955, **80,** 789–796. [Imperial Chemical Industries, Ltd., Indust. Hyg. Res. Labs., The Frythe, Welwyn, Herts.]

Organic matter is destroyed by heating the dry sample in a stream of air and HNO_3 vapour. The ash is dissolved in HCl and the lead converted to its diethyldithiocarbamate derivative, which is extracted into a mixture of toluene and pentanol. The lead is then converted to its dithizone derivative for colorimetric estimation.—H. G. Bray.

1459

DAVIS, S. **A flame photometric method for the determination of plasma magnesium after hydroxyquinoline precipitation.** *J. Biol. Chem.*, 1955, **216,** 643–651. [Med. Res. Lab., Veterans Admin. Hosp., Indianapolis, Ind.]

Oxalated plasma is deproteinised by trichloroacetic acid and Mg is precipitated as its 8-hydroxyquinoline derivative. This is isolated, dried and used for flame photometry.—H. G. Bray.

1460

HERRMANN, R. Flammenspektrometrische Mg-Bestimmung im Serum. **[Estimation of magnesium in serum by flame spectrophotometry.]** *Ztschr. ges. exp. Med.*, 1955, **126,** 371–374. [Hautklin., Akad. Med. Forsch., Justus Liebig Hochsch., Giessen.]

Serum is deproteinised by HCl and the Mg content of the filtrate is estimated directly. The influence of other elements on the estimation is considered.—H. G. Bray.

1461

FUJII, T., NAKANO, M. and HORIGUCHI, M. **[A study of a colorimetric estimation of total phosphorus in biological materials.]** *J. Osaka City Med. Center*, 1955, **4,** No. 1, 40–42; 95. [Dept. Prevent. Med. Pub. Health, Osaka City Med. Sch.] In Japanese: English summary.

Suitable concentrations of $HClO_4$, sodium molybdate and Metol (methyl-*p*-aminophenol sulphate) are defined for estimation by the method of Furukawa *et al.* [reference in Japanese] of amounts of P up to 10 mg. per 100 ml. in biological fluids. (From summary.)—D. Harvey.

1462

DELSAL, J. L. and MANHOURI, H. Étude comparative des dosages colorimétriques du phosphore. Recherche d'une méthode de haute sensibilité applicable au dosage du phosphore organique dans les spots après chromatographie. **[Comparative study of the colorimetric estimation of phosphorus. A highly sensitive method applicable to the estimation of organic phosphorus in the spots after chromatography.]** *Bull. Soc. Chim. biol.*, 1955, **37,** 1041–1054. [Inst. État des Serums et Vaccins Razi, Hessarek, Iran.]

Two procedures are described, depending on the type of spectrophotometer available. A method reading at 635 mμ. is a modification of that of Berenblum and Chain (Abst. 52, Vol. 8) and another at 800 mμ. a modification of the method of Horecker *et al.* (Abst. 3288, Vol. 10). The latter is recommended and its use in the estimation of phosphorus in phosphatides separated by paper electrophoresis is described.—H. G. Bray.

1463

MOIR, K. W. **The preservation of bovine blood for the determination of inorganic phosphate in the diagnosis of aphosphorosis.** *Queensland J. Agric. Sci.*, 1954, **11,** 143–147. [Chem. Lab., Div. Plant Indust.]

The average increase of inorganic P in 18 blood samples stored at a final concentration of 1·5 per cent. trichloroacetic acid at 18° C. for 2 weeks was 0·14 mg. P with a maximum increase in 2 samples of 0·3 mg. P per 100 ml. On return to the laboratory 20 per cent. trichloroacetic acid and fuller's earth were added and the inorganic P was estimated colorimetrically after filtration.

A. Hepburn.

1464

LEWIS, P. R. **The micro-determination of potassium with dipicrylamine.** *Analyst*, 1955, **80,** 768–773. [Physiol. Lab., Cambridge.]

The procedure described is applicable to from 10 to 200 μg. potassium in biological materials. The sample is dry-ashed, the ash is dissolved in water and K is precipitated as its dipicrylamine salt under carefully controlled conditions. The

precipitate is separated by filtration on a filter-stick and dissolved in water, and its extinction is measured. Detailed instructions for making the filter-sticks are given. A procedure without filtration is also described. Interference by other elements which are likely to be present is small and the error in a single analysis is less than $\pm$ 2 per cent.—H. G. Bray.

1465

GLENDENING, B. L., PARRISH, D. B. and SCHRENK, W. G. **Spectrographic determination of rubidium in plant and animal tissues.** *Anal. Chem.*, 1955, **27,** 1554–1556. [Kansas State Coll., Manhattan.]

Interference by other elements may be reduced by the use of flame excitation and an instrument of high dispersion. Interference by K may be reduced by the use of a mask. Under the conditions described, as little as 1 p.p.m. rubidium can be estimated. Of the materials examined soya bean contained most Rb, from 160 to 225 p.p.m. dry weight. The content of other materials examined ranged from under 1 to 140 p.p.m.
H. G. Bray.

1466

RECHENBERGER, J. Zur Bestimmung des Serumzinks. [**Estimation of zinc in serum.**] *Ztschr. ges. inn. Med.*, 1955, **10,** 645–647. [Med. Klin., Univ. Leipzig.]

The micro-method is described in detail. It depends on splitting the Zn ions from the blood proteins with 6*N* HCl and 20 per cent. trichloroacetic acid, conversion of the Zn to Zn dithizonate, and colorimetric estimation of the red substance produced with filter S53.

The method was applied to the serum of 80 normal persons and gave a mean value for the Zn content of 145 μg. per cent. with range 115 to 185. No age or sex difference was found.—E. M. Hume.

Hydrogen Ion Concentration

1467

STANAGE, W. F., BROWN, J. M. and OBERST, B. B. **Colorimetric determination of blood plasma *p*H.** *J. Pediat.*, 1955, **47,** 571–575. [Child. Mem. Hosp., Omaha, Nebr.]

The principle that the colour change of an indicator varies with the *p*H was employed. The colorimetric examination of 3 standard buffers of known *p*H enabled a linear graph to be drawn relating optical density and *p*H. The optical densities at 38° C. of the unknown plasma plus a neutralised saline solution of phenol red under mineral oil and a control without indicator enabled the *p*H to be calculated. Accuracy ranged from 0·00 to 0·03 *p*H unit, average 0·014.—A. Hepburn.

Enzyme Activity

1468

AMMON, R. and ZAPP, F. J. Eine einfache klinisch-chemische Methode zum Nachweis der Cholinesterase im Serum. [**A simple clinico-chemical method for identifying cholesterase in serum.**] *Klin. Wochenschr.*, 1955, **33,** 759–762. [Physiol. Chem. Inst., Univ. des Saarlandes, Homburg.]

1469

HERZFELD, E. and STUMPF, C. Ein neuer Kurztest zur Bestimmung der Serumcholinesteraseaktivität. [**A new quick test for estimating serum cholinesterase activity.**] *Wien. klin. Wochenschr.*, 1955, **67,** 874–876. [Pharmakol. Inst., Univ. Vienna.]

1470

LUCHSINGER, W. W., CUENDET, L. S., BOYER, P. D. and GEDDES, W. F. **A sensitive method for measuring lipase activity and its application to wheat products.** *Cereal Chem.*, 1955, **32,** 395 – 404. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

The amount of glycerol released from a monoolein emulsion by lipase was used to measure the enzyme activity. After inactivation of lipase and destruction of the emulsion, glycerol in the aqueous phase was estimated by cleavage with periodate and measurement of the absorbance of the coloured complex of the resulting formaldehyde with added chromotropic acid. From 0·2 to 18·0 μg. glycerol could be estimated directly. Homogenates of the residues after extraction with light petroleum and ammonium sulphate solution were used to estimate lipase activity in wheat products.—A. Hepburn.

1471

BARTER, R., DANIELLI, J. F. and DAVIES, H. G. **A quantitative cytochemical method for estimating alkaline phosphatase activity.** *Proc. Roy. Soc.* [*B*], 1955, **144,** 412–430. [Med. Res. Counc. Biophys. Res. Unit, King's Coll., London.]

1472

HENLEY, K. S. and POLLARD, H. M. **A new method for the determination of glutamic oxalacetic and glutamic pyruvic transaminase in plasma.** *J. Lab. Clin. Med.*, 1955, **46,** 785–789. [Gastrointestinal Res. Lab., Dept. Int. Med., Med Sch., Univ. Michigan, Ann Arbor.]

See also Abst. 1389.

Miscellaneous

1473

HECKLY, R. J. **Rapid and precise measurement of moisture in biological materials.** *Science*, 1955, **122**, 760–761. [Dept. Bacteriol., Naval Biol. Lab., Univ. California, Berkeley.]

Water and air are evacuated from the apparatus and the sample is introduced. The water in the sample is vaporised and its weight is calculated from a formula based on the pressure changes shown by a manometer containing oil. The method is rapid and precise.—A. Hepburn.

1474

BAKER, P. R. W. **The micro-determination of residual moisture in freeze-dried biological materials.** *J. Hygiene*, 1955, **53**, 426–435. [Chem. Div., Wellcome Res. Labs., Beckenham, Kent.]

The micro-drying method described gives results comparable with those of the Karl Fischer method and the vapour method of Beckett.—H. G. Bray.

1475

MOSSEL, D. A. A. and VAN KUIJK, H. J. L. **A new and simple technique for the direct determination of the equilibrium relative humidity of foods.** *Food Res.*, 1955, **20**, 415–423. [Central Inst. Nutrit. Res. T.N.O., Utrecht.]

1476

IVÁDY, J. and KOLTAY, M. Saggi semplici d'orientamento per la differenziazione del latte materno dal latte di vacca. [**Simple method of distinguishing between human and cow's milk.**] *Lattante*, 1955, **26**, 65–69. [Paediat. Klin., Univ. Szeged, Hungary.] English summary.

The method depends on the much greater degree of flocculation produced in cow's milk by certain reagents. Most satisfactory was an aqueous solution of 1·25 per cent. alum (*alumen ustum*) and 5 per cent. acetic acid. To 1 ml. human milk in a test tube 0·25 ml. of the reagent is added. If a small deposit appears on the sides of the tube and disappears again on addition of a further 0·5 or 1 ml. of the reagent, the milk is only slightly adulterated with cow's milk. If, however, the deposit increases, the milk contains more than 20 per cent. of cow's milk. Concentrated alcohol and 10 per cent. acetic acid can be used instead of alum.—E. M. Hume.

1477

BRIO, N. Opredelenie obshchego sukhogo ostatka v tzel'nom moloke. [**Estimation of total solids in whole milk.**] *Mol. Prom.*, 1955, **16**, No. 6, 26–27. [All-Union Inst. Milk Prod.]

The formula method of estimating the total solids in whole milk is the only one suitable for commercial work on a large scale, the analytical method being too lengthy. The formula is based on data on the density and fat content of milk. Several formulae are quoted, including Fleischman's, but none is said to be suitable for all districts.—H. Scherbatoff.

1478

HOULBROOKE, A. **Abnormal freezing-point of milk.** *Chem. and Indust.*, 1955, No. 42, 1349–1350. [County Chem. Lab., Martin St., Stafford.]

1479

COLE, E. R. and MEAD, M. **The lactose-chloride contribution to the freezing-point depression of milk.** *J. Dairy Res.*, 1955, **22**, 340–344. [Sch. Appl. Chem., N.S.W. Univ. Technol., Broadway, Sydney.]

1480

GALESLOOT, T. E. Het aantonen van penicilline in melk- en zuivelproducten. [**The detection of penicillin in milk and dairy products.**] *Nederlands Melk Zuiveltijdschr.*, 1955, **9**, 158–164. [Nederlands Inst. Zuivelonderzoek, Ede.]

1481

WETTER, L. R. **The determination of mustard oils in rapeseed meal.** *Canad. J. Biochem. Physiol.*, 1955, **33**, 980–984. [Prairie Reg. Lab., Nat. Res. Counc. Canada, Saskatoon, Sask.]

A suspension of the meal, about 2 g., is treated with myrosinase and steam-distilled, the distillate being collected in ammoniacal $AgNO_3$. The substituted thiourea formed from the mustard oil and ammonia is then decomposed by heating the distillate in a boiling-water bath, to give silver sulphide and a monosubstituted carbodi-imide. The excess silver is then estimated by titration with thiocyanate.—H. G. Bray.

See also Abst. 1599.

MICROBIOLOGICAL

1482

HARRIS, D. A. **Use of microorganisms as analytical tools.** *Anal. Chem.*, 1955, **27**, 1690–1694. [Res. Labs., Chem. Div., Merck and Co., Inc., Rahway, N.J.]

CLINICAL AND EXPERIMENTAL

1483

HUCKABEE, W. E. **Spectrophotometric analysis of uncontaminated blood for oxyhemoglobin.** *J. Lab. Clin. Med.*, 1955, **46,** 486–493. [Evans Mem., Massachusetts Mem. Hosps., Boston.]

1484

MORRISON, M. and COOK, J. L. **Chromatographic fractionation of normal adult oxyhemoglobin.** *Science*, 1955, **122,** 920–921. [Dept. Biochem., Sch. Med. Dent., Univ. Rochester, N.Y.]

1485

HOLLING, H. E., MACDONALD, I., O'HALLORAN, J. A. and VENNER, A. **Reliability of a spectrophotometric method of estimating blood oxygen.** *J. Appl. Physiol.*, 1955, **8,** 249–254. [Clin. Res. Unit, Guy's Hosp., London.]

From experimental values and some values published elsewhere it was shown that the Van Slyke, Haldane and spectrophotometric methods give similar results over the range 0 to 100 per cent. oxygen saturation.—H. G. Bray.

1486

SINGER, R. B., SHOHL, J. and BLUEMLE, D. B. **Simultaneous determination of *p*H, CO_2 content, and cell volume in 0·1 ml. aliquots of cutaneous blood: a modification of the Shock and Hastings technic.** *Clin. Chem.*, 1955, **1,** 287–316. [Dept. Res. Med., Sch. Med., Univ. Pennsylvania, Philadelphia.]

1487

NUMEROF, P. **On the preparation of sodium chromate–Cr^{51} for red cell volume determinations.** *J. Lab. Clin. Med.*, 1955, **46,** 485–486. [Squibb Inst. Med. Res., New Brunswick, N.J.]

1488

EBAUGH, F. G., LEVINE, P. and EMERSON, C. P. **The amount of trapped plasma in the red cell mass of the hematocrit tube.** *J. Lab. Clin. Med.*, 1955, **46,** 409–415. [Robert Dawson Evans Mem. Lab., Massachusetts Mem. Hosps., Boston.]

The red cell concentrations of mixtures of 18 to 75 per cent. cells and plasma were estimated directly from haematocrit readings and indirectly by an isotope dilution technique, using haemoglobin labelled with ^{51}Cr. The difference between the 2 values was taken as the volume of plasma trapped in the red cell column. It was shown that there was a direct correlation between the length of the cell column and the amount of plasma trapped for haematocrit readings from 33 to 73 per cent. Below 33 per cent. no trapping of plasma could be detected.—H. G. Bray.

1489

TALSO, P. J., LAHR, T. N., SPAFFORD, N., FERENZI, G. and JACKSON, H. R. O. **A comparison of the volume of distribution of antipyrine, N-acetyl-4-amino-antipyrine, and I^{131}-labeled 4-iodo-antipyrine in human beings.** *J. Lab. Clin. Med.*, 1955, **46,** 619–623. [Dept. Med., Stritch Sch. Med., Loyola Univ., Chicago, Ill.]

The volume of distribution of 4-iodo-antipyrine labelled with ^{131}I was the same as that of antipyrine or N-acetyl-4-amino-antipyrine: 49·7, 50·6 and 50·6 per cent. of bodyweight, respectively.

H. G. Bray.

1490

KARPELES, L. M. and HUFF, R. L. **Blood volume of representative portions of the musculoskeletal system in man.** *Circulation Res.*, 1955, **3,** 483–489. [Radioisotope Unit, Veterans Admin. Hosp., Seattle, Wash.]

1491

LEEVY, C. M. and DONOVAN, F. J. **Estimation of total circulating sodium.** *J. Amer. Med. Assoc.*, 1955, **159,** 771–773. [Dept. Med., Jersey City Med. Centre, N.J.]

Total circulating Na estimated by measuring the concentration in serum and the plasma volume was on the average 6·0 m. equiv. per kg. bodyweight in 13 normal subjects. Values ranged from 3·0 to 12·4 in 92 patients with abnormalities of body Na. Specific diseases had no characteristic pattern. Low blood Na due principally to either salt depletion or to primary water retention can be distinguished by the estimation of total circulating Na. This estimation also makes it easier to recognise a deficit in plasma Na with a normal serum concentration.—A. Hepburn.

1492

WOLF, F., KINZLMEIER, H. and KIENAST, W. Die photoelektrische Bestimmung der mineralischen Alkalireserven des Serums. **[Photoelectric estimation of the mineral alkali reserve in the serum.]** *Münch. med. Wochenschr.*, 1955, **97,** 1722–1724. [Med. Klin., Univ. Erlangen.]

A satisfactory photo-electric estimation of serum alkali reserve, suitable for clinical use, was obtained after precipitation of protein with methanol. The results agreed well with those obtained by the Van Slyke gas analysis method in healthy subjects and in patients with lipaemia,

ketosis and alkalosis. In 111 normal subjects the alkali reserve ranged from 46·59 to 55·55 vol. per cent. CO_2.—A. M. Copping.

1493

GRÄSBECK, R. **Fractionation of human gastric juice and saliva employing starch electrophoresis.** *Gastroenterologia*, 1955, **84,** 99–102. [Dept. Biochem., Sch. Hyg. Pub. Health, Johns Hopkins Univ., Baltimore, Md.] German and French summaries.

After removal of mucus by centrifuging, the juice was dialysed and lyophilised. The solid obtained was dissolved in a small volume of buffer, *p*H 4·5 to 6·1, and subjected to electrophoresis in a vertical starch block. This was then cut into 35 pieces and each was tested for protein, glucosamine, hexuronic acid and vitamin-B_{12}-binding power. Peptic activity was shown to accompany the major protein peak.—H. G. Bray.

1494

VEALL, N., PEARSON, J. D. and HANLEY, T. **The preparation of ^{132}I and ^{131}I labelled human serum albumin for clinical tracer studies.** *Brit. J. Radiol.*, 1955, **28,** 633–635. [Dept. Physics, Guy's Hosp. Med. Sch., London, S.E.1.]

1495

NEWBERRY, E. and VAN WYK, J. J. **A technique for quantitative urine collection in the metabolic study of infants and young children.** *Pediatrics*, 1955, **16,** 667–672. [Dept. Paediat., Johns Hopkins Univ., Baltimore, Md.]

A metabolism bed and supplementary equipment for a high chair are described in detail with illustrations. Collection periods ranging from several weeks to 522 days have been employed without adverse effect on the child.—D. Harvey.

1496

ABRAHAMSON, E. M. **The glucose homeostasis test.** *Amer. J. Digest. Dis.*, 1955, **22,** 267–271.

The glucose homeostasis test for the diagnosis of functional hyperinsulinism requires a technique different from that used in glucose tolerance tests for diabetes. The differences, notably the use of arterial instead of venous blood in the glucose homeostasis test, are discussed. A modified Folin Wu method of blood sugar estimation for use in this test is described.—F. C. Aitken.

1497

BASAN, L. Novaya metodika dlya izucheniya fiziologicheskikh protzessov vo vremya truda. **[New method for studying physiological processes during work.]** *Fiziol. Zh. SSSR Sechenova*, 1955, **41,** 95–96. [Nauch.-Issled. Voinno Med. Inst., Sofia.]

1498

COTTON, F. S. **Application of a new ergometer to develop a laboratory test for work capacity, with further application to comparisons of ten-year-old children in London and Sydney.** *Brit. J. Prev. Social Med.*, 1955, **9,** 169–178. [Dept. Physiol., Univ. Sydney.]

1499

GARN, S. M. and CLARK, L. C. (Jr.) **Creatinine-weight coefficient as a measurement of obesity.** *J. Appl. Physiol.*, 1955, **8,** 135–138. [Fels Res. Inst., Antioch Coll., Yellow Springs, Ohio.]

The subjects were 76 men aged from 20 to 59 years and weighing from 51·8 to 139·6 kg. Creatinine excretion per 24 hr. was measured and estimates of thickness of subcutaneous trochanteric fat and of percentage of total body fat were made by the authors' methods (see Absts. 1982 and 5132, Vol. 24). Correlations between the creatinine-weight coefficient and trochanteric and percentage fat were moderate, $r = -0{\cdot}43$ and $-0{\cdot}40$, respectively. Further examination of the data revealed that the coefficient failed to identify all obese subjects because some men excrete relatively small amounts of creatinine. The ratio was more effective as a measure of leanness than of obesity.—D. Harvey.

1500

MACMAHON, B. **Statistical methods in medicine.** *New Engl. J. Med.*, 1955, **253,** 646–652; 688–693. [Dept. Environmental Med., Coll. Med., State Univ. New York.]

1501

NICHOLS, P. J. R. and BAILEY, N. T. J. **The accuracy of measuring leg-length differences. An "observer error" experiment.** *Brit. Med. J.*, 1955, ii, 1247–1248.

An experiment was made to examine the accuracy of the standard technique for measuring differences in leg lengths. A group of 50 subjects was selected at random from patients at the Royal Air Force Medical Rehabilitation Unit, and included a number where differences in the lengths of the legs might be expected. The difference for each subject was measured independently by each of 4 doctors, being recorded to the nearest quarter-inch. Analysis of variance of the results showed that there were statistically significant differences between the results obtained by the 4 doctors, but the corresponding estimated component of variance was only 0·006, which is small compared with the residual experimental error of variance of 0·0155. Thus in practice there is scarcely any more variability between measurements by different observers than between repeat measurements by a

single observer. The experimental error is such that differences of ½ in. or more may be taken as diagnostically significant, but smaller differences are not conclusive unless based on a number of measurements.—I. McDonald.

1502

HARPER, R. **Fundamental problems in the subjective appraisal of foodstuffs.** *Appl. Statistics*, 1955, **4**, 145–161. [Dept. Psychol., Univ. Leeds.]

This paper surveys the whole question of the subjective appraisal of foodstuffs, from its techniques to its epistemology. After listing the types of information which may be required, it comments on the main methods of obtaining them: from laboratory panels, from commercial graders or from consumer research. Many trade practices have been established as a result of long experience, but they are usually disturbed by the very process of investigation and it is difficult to estimate their efficiency. It is easier to assess the effect of special training, and a number of investigations have shown that it may greatly increase the sensitivity of some persons. Investigation has also revealed a number of extraneous conditions which may bias the judgement of a single sample. These include the memory of samples tested just before, and even the marking labels used to identify the sample. In the past, subjective judgements have been underrated, owing partly to lack of understanding that because of their complex nature they are seldom highly correlated with any single physical or chemical measurement. It is now recognised that they are extremely useful for some purposes, and can be quite satisfactory when made by a suitably standardised technique. There is finally a philosophic discussion of the problem of drawing conclusions about reality from observations, and it is questioned whether the statistical models in present use are adequate to deal with the complex situations arising when foodstuffs are studied in this way.—I. McDonald.

1503

JONES, L. V., PERYAM, D. R. and THURSTONE, L. L. **Development of a scale for measuring soldiers' food preferences.** *Food Res.*, 1955, **20**, 512–520. [Univ. Chicago, Ill.]

Report of a lecture on attempts to improve the scale of acceptability at present used by the Quartermaster Food and Container Institute for the Armed Forces. It was concluded that: different phrases differ in ambiguity; increasing the length of a scale up to 9 intervals is advantageous without appreciably increasing the time required; and a scale need not include an equal number of positive and negative intervals or a neutral category.—W. M. Deans.

1504

BALFOUR, B. M. **A review of some recent work on rat nutrition.** *J. Animal Tech. Assoc.*, 1955, **6**, 31–36. [Med. Res. Counc., Human Nutrit. Res. Unit, Hampstead, London, N.W.3.]

1505

SMITH, E. **A new apparatus for long term measurement of oxygen consumption in small mammals.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 499–501. [Dept. Anat., Coll. Med., Univ. Cincinnati, Ohio.]

The apparatus, devised for experiments with hibernating bats, is sensitive to consumption of less than 0·01 ml. oxygen per hr. Correction for change in atmospheric pressure is by a compensating chamber which, along with the animal chamber, is connected with the spirometer by separate air bells. Measurements can be recorded continuously for several days.—D. Harvey.

1506

VESELKIN, P. N. Prostaya modifikatziya ustanovki dlya kratkovremennykh opredelenii potreblyaemogo kisloroda u melkikh zhivotnykh. [**Simple modification of the method for short term measurement of oxygen consumption in small animals.**] *Fiziol. Zh. SSSR Sechenova*, 1955, **41**, 108–112. [Akad. Med. Nauk SSSR, Leningrad.]

1507

VENCHIKOV, A. I. Termoelektricheskii kalorimetr. [**Thermoelectric calorimeter.**] *Fiziol. Zh. SSSR Sechenova*, 1955, **41**, 292. [Turkmen. Gosud. Med. Inst.]

Details are given for construction of a calorimeter operated by thermocouple for comparing heat production in 2 aquatic animals of the same species, age and sex, one serving as control, the other available for treatment with pharmacological or other reagents.—D. W. Taylor.

1508

KEHREN, L. Un appareil pour la mesure en continu de l'absorption d'oxygène. [**Apparatus for continuous measurement of oxygen absorption.**] *Rev. Fac. Med. vet., São Paulo*, 1953–54, **5**, 117–126. [Dept. Indúst., Univ. São Paulo.]

The oxygen absorbed is compensated for by the production of an equivalent amount by means of an electrolytic cell.—H. G. Bray.

1509

KOKORINA, E. P. Metodika dvigatel'nykh pishchevykh uslovnykh refleksov u krupnogo rogatogo skota. [**Method for study of food-conditioned reflexes in cattle.**] *Fiziol. Zh. SSSR Sechenova*, 1955, **41**, 96–100. [Inst. Fiziol. I.P.Pavlova, Akad. Nauk SSSR.]

1510

FORBES, G. B. and LEWIS, A. **Determination of specific activity of sodium in bone.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 178–181. [Dept. Paediat., Sch. Med. Dent., Univ. Rochester, N.Y.]

An extension of Abst. 3255, Vol. 25, in which radio-active ^{22}Na was added to a solution of bone salts, showed that ^{22}Na and ^{23}Na behaved similarly on the cation exchange column and that measurements of the specific activity of Na in bone were feasible. The accuracy and limitations of this method are further defined.—A. Hepburn.

1511

CATCHPOLE, A. C. **A perspex cage suitable for metabolic and isotope work.** *J. Animal Tech. Assoc.*, 1955, **6,** 48–49. [Inst. Clin. Res. Exp. Med., Middlesex Hosp., London, W.1.]

The cage is not attacked by urine and can be readily cleaned by removing the front cover lid and food container. Sterilisation by steam is not possible. Faeces and urine are collected separately without disturbing the animal. The cage can be constructed in most laboratories at a favourable cost.—A. Hepburn.

1512

KOLARI, O. E., RUTLEDGE, E. A. and HANSON, L. E. **New equipment for baby pig metabolism studies.** *J. Animal Sci.*, 1955, **14,** 636–641. [Univ. Minnesota.]

An adjustable harness made of elastic, with a collection bag for faeces, suitable for use with pigs too young for confinement in metabolism crates, and also an apparatus for collection of urine from male piglets which allows freedom of movement, are described, with diagrams and photographs.

T. D. Bell.

1513

RAYMOND, W. F. and MINSON, D. J. **The use of chromic oxide for estimating the faecal production of grazing animals.** *J. Brit. Grassland Soc.*, 1955, **10,** 282–296. [Grassland Res. Inst., Hurley, Berks.]

Conditions affecting the accuracy of methods of estimating faecal output on pasture by means of chromic oxide are discussed, and the method of analysis used in the experiments reported is described.

It was shown first that chromic oxide did not impede the digestion of herbage by sheep. Giving the marker in gelatine capsules or as a drench did not alter the diurnal pattern of its concentration in the faeces. This pattern was shown not to be constant, varying with the digestibility of the herbage and the level of intake. From this it was concluded that grab sampling was not suitable. A more satisfactory method, called "ring sampling", is described, in which the faeces dropped within certain marked areas are collected periodically and analysed. When total faecal production was established by this method the results agreed well with those obtained by total collection. The effects of time and method of dosing, and rate of passage of feed through the intestine, on the daily pattern of chromic oxide concentration in the faeces are discussed.—T. D. Bell.

1514

SCHNEIDER, W. Beitrag zur Durchführung von Verdauungsversuchen bei Schweinen mit Hilfe der Indikatormethode. 1. [**Technique of digestion experiments with pigs by the indicator method. 1.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 269–274. [Inst. Tierernährungslehre, Landw. Hochsch. Stuttgart-Hohenheim.] English summary.

Digestion experiments were made with 2 pigs, castrated males of the Swabian-Halle breed weighing about 120 kg., to compare the chromic oxide indicator method with the conventional. Cr was estimated by the method of Schürch *et al.* (Abst. 3204, Vol. 20) with precautions to diminish loss of Cr during mixing of faeces.

In the first experiment, the daily ration was ground barley 2000, protein concentrate 500 and chromic oxide 10 g., given as a thick slop in 2 feeds, for a pre-period of 10 days and an experimental period of 10 days. Daily analyses of faeces showed that their amount was much more variable than their composition. The digestion coefficients found by the indicator method were slightly lower than by the conventional method, probably owing to loss of Cr during preparation of faeces for analysis, but the discrepancy was considered unimportant for most purposes. From combinations of the results in different ways it was concluded that in most experiments collection of faeces over 3 days would suffice.

In the second experiment, lasting 8 days, with the same pigs and a daily ration of tapioca meal 1000, maize 1000, ground extracted soya 500, fishmeal 100 and chromic oxide 10 g., the faeces were sampled at random instead of being collected quantitatively. This proved unsatisfactory; the results agreed neither among themselves nor with those of the conventional method. Further studies are planned.—W. M. Deans.

1515

DEIJS, W. B. and BOSMAN, M. S. M. **Plant pigments in digestion trial studies.** *Rec. Trav. chim. Pays-Bas*, 1955, **74,** 1207–1216. [Central Inst. Agric. Res., Wageningen.]

In digestibility studies with cattle, plant pigments used as markers were extracted from grass and faeces with 85 per cent. aqueous acetone containing oxalic acid, 0·03 *M*. The pigments in the

extract were separated chromatographically on alumina into carotene, xanthophyll, phaeophytin and porphyrin fractions. The porphyrins constituted from 2 to 7 and from 30 to 50 per cent. of total pigments extracted from fresh grass and faeces, respectively. Phylloerythrin was separated from the other porphyrins and identified spectrophotometrically.

Acid acetone extraction, resulting in alteration of chlorophylls to the more stable phaeophytins, was preferred to extraction with aqueous acetone alone, the method of Reid *et al.* (Abst. 1460, Vol. 20). Digestibility coefficients of crude protein by the acid extraction marker method were in good agreement with those calculated by Dijkstra's method (*Landbouw*, 1951, **13,** 23).

Since analyses of base, middle and upper parts of tall grass separately revealed a positive correlation between the content of chromogen and that of crude protein, it was concluded that the error due to the grass sample differing from that eaten by the animals was not important.—J. Davidson.

1516

KAHLMANN, C. Ein Fortschritt in der Bruttechnik: der Luftdruckkompensator. [**An advance in technique of brooding. The compensator for barometric pressure.**] *Arch. Geflügelk.*, 1955, **19,** 464–470. [Berlin-Spandau.] English summary.

See also Abst. 1993.

COOKING, STERILISATION AND PRESERVATION OF FOOD

1517

TOLLENAAR, F. D. and DEN HARTOG, C. Chemicaliën in voedingsmiddelen, een brandend probleem. Indrukken naar aanleiding van een in Wenen gehouden symposium. [**Chemicals in foods, a burning problem. Impressions from a symposium in Wenen.**] *Voeding*, 1955, **16,** 923–932. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.]

The symposium was organised by the *Commission Internationale des Industries Agricoles* (C.I.I.A.) and the *Bureau International Permanent de Chimie Analytique*, which deals with foods and feedingstuffs, as the first of a series of four to deal with the addition of chemicals to food. The meeting, 6 to 11 July, discussed chiefly colouring matter with special reference to carcinogens. A "working paper" prepared for discussion at the next meeting proposed: (1) that foreign substances should not be permitted unless their probable harmlessness had been demonstrated; the addition was defensible on economic and technical grounds; only minimum quantities were used, and the addition should not deceive the buyer about the quality of the food: (2) additions to staple foods should not be allowed, *i.e.*, to milk and milk products, flour and bread, meat and meat products, lard, fresh vegetables and fruit; (3) international agreement is urgently required on a list of permissible additions; (4) addition should be declared on the package; (5) it is desirable that all foods marketed with permitted additions should be procurable also without them.—I. Leitch.

1518

MOSSEL, D. A. A. Die Haltbarmachung von Lebensmitteln auf chemischem Wege mit besonderer Berücksichtigung toxikologischer Fragen. [**Preservation of foods by chemical means with special reference to toxicological questions.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102,** 254–268. [Zentralinst. Ernährungsforsch., Utrecht.]

A review. (See also Abst. 213, Vol. 25).

1519

SOUCI, S. W. Zur Färbung und Konservierung der Lebensmittel. [**Colouring and preservation of foods.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1761–1765. [Deutsch. Forschungsanst. Lebensmittelchem., Munich.]

This report of a lecture to the Consumers' Council of the Ministry of Nutrition, Agriculture and Forestry on colours, preservatives and other extraneous substances added to foods includes some of the findings of 3 Commissions set up in Germany in recent years with a view to new and stricter food laws, and of the international conference held at Bad Godesburg in May 1954, with lists of substances considered permissible. The use of β-carotene to colour butter is commended, and riboflavin is also suggested as a colouring matter.—W. M. Deans.

1520

ALLMARK, M. G., GRICE, H. C. and LU, F. C. **Chronic toxicity studies on food colours. 1. Observations on the toxicity of FD and C Yellow No. 3 (oil yellow AB) and FD and C Yellow No. 4 (oil yellow OB) in rats.** *J. Pharm.*, 1955, **7,** 591–603. [Food and Drug Labs., Dept. Nat. Health and Welfare, Canada.]

1521

MICHELMORE, A. P. G. **Food storage problems in Uganda in relation to insect pests.** *East African Agric. J.*, 1955, **21,** 65–68. [Dept. Agric., Uganda.]

1522

SAGER, C. A. Untersuchungen über Struktur und Haltbarkeit der gefriergetrockneten Frauenmilch. [**Structure and keeping quality of freeze-dried human milk.**] *Monatsschr. Kinderheilk.*, 1955, **103,** 469–471. [Kinderklin., Univ. Kiel.]

The milk was frozen at — 20° C. in feeding bottles, and dried by high-vacuum pump at — 60° C. In the process it lost 89·3 per cent. by weight. The milk powder was stored in the dark at room temperature. After 3 months' storage the lipase, phosphatase and amylase activities were unimpaired, and the power of the milk to inhibit the growth of micro-organisms was at least partly retained. Electrophoresis on paper showed that there was no denaturation of the protein such as occurs in heated milk. The haemagglutination test was still positive. The fat retained its properties well but did not re-emulsify with water very readily; it required slow treatment with water at 30° C. Lactose and Ca were unchanged.

E. M. Hume.

1523

ALBRECHT, J. J., GUNNING, H. E. and PARKER, M. E. **Studies in the cold sterilization of liquid foods using mercury resonance radiation. 1. Milk.** *Food Res.*, 1955, **20,** 424–442. [Illinois Inst. Technol.]

1524

FORSS, D. A., PONT, E. G. and STARK, W. **Further observations on the volatile compounds associated with oxidized flavour in skim milk.** *J. Dairy Res.*, 1955, **22,** 345–348. [Dairy Res. Sect., C.S.I.R.O., Melbourne.]

See Title 3305, Vol. 25.

1525

KRUISHEER, C. I. and KROL, B. M. **The effect of the copper content on the development of flavour defects in cold-stored butter.** *Nederlands Melk Zuiveltijdschr.*, 1955, **9,** 173–181. [Govt. Dairy Stat., Leyden.] Dutch summary.

Studies of flavour defects in representative monthly samples of cold-stored unsalted butter made from ripened cream showed that contamination with copper is even more important than was previously supposed (Abst. 3149, Vol. 19). In summer butter the correlation between Cu content and off-flavour score was $r = + 0{\cdot}67 \pm 0{\cdot}07$. Cu was estimated by the method of den Herder and Krol (Abst. 3138, Vol. 20). Off-flavours began to appear with 50 μg. Cu per kg., which is about the amount naturally occurring in summer butter, and fatty, fishy or fish-oil flavours were present in all but one of the samples with 70 μg. Cu per kg. These findings are similar to those of Piraux *et al.* in Belgium (*Bull. Inst. agronom. Gembloux*, 1954, **22,** 76). In winter butter, which generally contains more Cu, the association with off-flavours was much less clear.

The tocopherol, carotene and vitamin A contents are stated to have no detectable effect on keeping quality (Kruisheer, *Nederlands Melk Zuiveltijdschr.*, 1955, **9,** 275.)—W. M. Deans.

1526

DIMOV, N. and RIZVANOV, K. Poluchavane na kashkaval ot pastorizirano mlyako s chisti kulturi ot mlechnokiseli bakterii. [**Preparation of Kashkaval cheese from pasteurised milk with pure cultures of lactic acid bacteria.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov", Sofia*, 1953–54, 4/5, 231–240. Russian summary.

1527

POL, E. Zhirnyi syr i tvorog bez molochnogo zhira. [**Fat cheese and curds made without milk fat.**] *Mol. Prom.*, 1955, **16,** No. 6, 42–43. [Cheese Factory, Schmiedeberg, East Germany.]

Vegetable oil replaced milk fat in the making of cheese and curds. The vegetable oil was emulsified either by making a mayonnaise-like emulsion with egg yolks, 2 yolks to 1 kg. vegetable oil, which was then diluted in the defatted milk, or by the use of a separator or homogeniser. The amount of vegetable oil needed was calculated by taking 1 kg. vegetable oil to equal 970 g. pure milk fat. Groundnut, sunflower and cotton oils were found to be the most suitable; they were deodorised and refined before use. Only soft cheese could be produced by this method. There was a slight after-taste when the cheese had been swallowed. The relation of this cheese to ordinary cheese is said to be the same as that of good margarine to butter. Vegetable oil being cheaper than milk fat, the resulting cheese costs less. Its final value and that of the curds made with vegetable oil lies in its readily absorbed Ca compounds and protein.

H. Scherbatoff.

1528

LÜCK, H. and JOUBERT, F. J. Der Einfluss verdünnter H_2O_2-Lösungen auf Molkenproteine. [**Effect of dilute hydrogen peroxide solutions on whey proteins.**] *Biochem. Ztschr.*, 1955, **327,** 221–230. [Dairy Indust. Control Board, Windhoek, South Africa.]

Previous work by the same authors (*Milchwissenschaft*, 1955, **10,** 160 and in the press) on the

preservation of milk with dilute hydrogen peroxide showed that casein dissociated. The present paper deals with crystallised β-lactoglobulin and β-lactoglobulin in freeze-dried whey prepared by methods described from centrifuged milk to which 0·25 or 1 per cent. of 40 per cent. H_2O_2 was added.

Examination by the Tiselius apparatus for electrophoresis and the ultracentrifuge showed slight changes in crystalline β-lactoglobulin stored for 7 days at 4° C. with 1 per cent. of H_2O_2. Serum albumin used for comparison was unaffected. On electrophoresis of whey, however, the mobility of β-lactoglobulin was reduced and its peak was broadened by treatment for 6 days with 0·25 per cent. of H_2O_2 and split into 2 by treatment with 1 per cent. of H_2O_2; and ultracentrifuged whey gave a sedimentation diagram indicating dissociation of the β-lactoglobulin. The immune globulins seemed to be unaffected. Why β-lactoglobulin in whey should be so much more sensitive than the pure substance is not clear. Fresh casein-free whey with 1 per cent. of H_2O_2, when examined by Beckman spectrophotometer, showed a flattening of absorption curves in the regions corresponding to tyrosine and tryptophan, more marked in light than in darkness.—W. M. Deans.

1529

RAUCH, W. Qualitätsprüfungen von geölten und ungeölten Hühnereiern. [**Tests of the quality of oiled and unoiled hen eggs.**] *Arch. Geflügelk.*, 1955, **19,** 453–463. [Bundesforschungsanst. Kleintierzucht, Celle.] English summary.

Eggs from the institute were dipped for 3 sec. in oil (Osagit, from Shell A.G., Hamburg) at 30° C. on the day after laying and were stored in a cellar at 17° C. and 74 per cent. relative humidity along with unoiled controls. Another experiment with cold storage at 2° to 3° C. is not yet complete. The results of studies of weight loss, height of air space, yolk height, yolk index, freezing-point of white and refractive index of white and yolk at intervals up to about 80 days are shown graphically. All these, except refractive index of yolk, which was little affected by oiling, as well as organoleptic tests, confirmed the finding of others that stored oiled eggs keep better than unoiled.

W. M. Deans.

1530

PARTMANN, W. Zur Frage der künstlichen Fleischreifung mit papainhaltigen Präparaten. [**Artificial ripening of meat with preparations containing papain.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102,** 321–329. [Bundesforschungsanst. Lebensmittelfrischhaltung, Karlsruhe.]

In continuation of previous work (Partmann, *Naturwissenschaften*, 1955, **42,** 161) studies were made by phase contrast microscopy of homogenates of beef gastrocnemius muscle and of connective tissue which had been ripened by a papain preparation for from 15 min. to 24 hr. at 21° to 22° C. Changes in fine structure of muscle and contraction of fibrils on treatment with adenosine triphosphate are described. Although contractability was not immediately lost, appearance and consistency of the muscle homogenate changed soon after the ripening agent was added. Since the same was true of the connective tissue homogenate, and the percentage of free amino-acids, estimated by the method of Pope and Stevens (Abst. 2631, Vol. 9), rose in both homogenates at about the same rate, it was concluded that papain attacks the proteins of connective tissue as well as those of muscle fibres. The changes in natural ripening of meat may not be the same, and work on this is proposed.

W. M. Deans.

1531

SRIBNEY, M., LEWIS, U. J. and SCHWEIGERT, B. S. **Effect of irradiation on meat fats.** *J. Agric. Food Chem.*, 1955, **3,** 958–960. [Div. Biochem. Nutrit., Amer. Meat Inst. Found., Chicago, Ill.]

Rendered and non-rendered beef and pork fats, packed in casings permeable or non-permeable to oxygen or in cans with air space, were sterilised by γ-rays and stored at 5° C. (casings) or 24° C. (cans) for 4 weeks along with untreated control samples.

Peroxide values were increased by γ-ray treatment as well as by subsequent storage, especially in samples in casings permeable to oxygen. Fat in cans had lower peroxide values and higher free fatty acid values when the radiation dose was increased, which suggests that some cleavage of fatty acid peroxides occurs. No off-odour was noticed, so that it seems that fat is not responsible for the off-odours and off-flavours found when meat is sterilised in this way.—W. M. Deans.

1532

CHANG, S. S. and KUMMEROW, F. A. **A study of the flavor stability and autoxidation of beef fats.** *J. Amer. Oil Chem. Soc.*, 1955, **32,** 547–551. [Dept. Food Technol., Univ. Illinois, Urbana.]

1533

RAO, M. N. and KRISHNAMURTHY, K. **Use of antioxidants in the stabilization of fats and fatty foods.** *Bull. Central Food Technol. Res. Inst., Mysore*, 1955, **4,** 262–265.

1534

DUGAN, L. R. (Jr.), MARX, L., OSTBY, P. and WILDER, O. H. M. **Use of fats in animal feeds. The stabilization of animal fats with**

anti-oxidants during rendering. *J. Amer. Oil Chem. Soc.*, 1954, **31,** 46–49. [Amer. Meat Inst. Found., Univ. Chicago, Ill.]

Animal fats and meat-and-bone scrap for animal feeding can sometimes be stabilised successfully by adding anti-oxidants during dry rendering. More study is needed before the process can be recommended to the industry.—D. Duncan.

1535

CARACCIOLO, S. Ulteriori ricerche sulla resa in carne commestibile (cruda e cotta) di alcune specie di animali acquatici marini. [**Further researches on the amount of edible flesh (raw and cooked) of some species of marine and aquatic animals.**] *Zootec. Vet.*, 1955, **10,** 284–290. [Catt. Approvvig., Univ. Perugia.] French, English and German summaries.

The percentage loss of weight after successive stages of preparation, and the percentage edible flesh after cooking, of some species of fish, cephalopod and lamellibranch molluscs and crustaceans were estimated. The results are presented in tables. It was shown that, contrary to popular belief, the percentage of edible flesh was not inferior to that of domestic animals in most cases, although a wide variation was found between species. Cooking losses varied with the method.

T. D. Bell.

1536

PARIHAR, D. B. **Changes in the saccharides of wheat-flour and rice on their processing into some common Indian foods.** *Naturwissenschaften*, 1955, **42,** 514. [Defence Sci. Lab., Hill Side Rd., New Delhi.]

The saccharides in chapatis, bread, fried flour, rabri (a slurry product made by boiling flour with excess water), puffed rice and cooked rice were examined by circular paper chromatography. During cooking glucose and its polymers were attacked first; carbohydrates containing some other sugars were comparatively resistant. Bread contained glucose, fructose, sucrose, maltose, *iso*maltose, glucofructosan, raffinose, and maltotriose, -tetrose, -pentaose and -hexaose, and fried flour only sucrose, raffinose and glucofructosan. On boiling, rice lost maltose, maltotriose and maltotetraose and glucose decreased. After 22 min. only sucrose and raffinose remained. Puffed rice contained only these 2 and maltose.

A. Hepburn.

1537

BOTHMA, F. De verwerking van retourbrood. [**The processing of unsold bread.**] *Het Bakkersvakblad*, 1955, No. 28, pp. 3. [Centraal Inst. Voedingsonderzoek T.N.O., Wageningen.]

In the United States the proportion of baker's bread unsold is estimated at 5 per cent. and in the Netherlands it is probably similar. In country districts the old bread probably goes to feed pigs and poultry, in the towns it is left in the bakers' hands. Processes in which such old bread is mixed into fresh dough are described. Up to 10 per cent. may be used, but colour and volume are inferior and keeping quality may be less good.

I. Leitch.

1538

BOTHMA, F. Gekookte aardappel in brood. [**Boiled potato in bread.**] *Het Bakkersvakblad*, 1955, **14,** No. 29, pp. 3. [Centraal Inst. Voedingsonderzoek T.N.O., Wageningen.]

A report in *Brot und Gebäk*, 1955, **9,** No. 4, p. 61 stated that the addition of boiled potato to dough improved the keeping quality of bread. To test this, bread was baked with 5, 10 or 15 per cent. potato. Staling was more, not less, rapid with potato than without. Loaf volume and quality were also less.—I. Leitch.

1539

KENNEDY, B. M., FLETCHER, L. R. and SABISTON, A. R. **Studies on the incorporation of nonfat milk solids in whole wheat bread. 2. Mixograms.** *Cereal Chem.*, 1955, **32,** 452–462. [Dept. Home Econ., Univ. California, Berkeley.]

For part 1, see Abst. 1726, Vol. 25.

1540

KIERMEIER, F. and RICKERL, E. Über die Ursachen der Verfärbung gedämpfter Kartoffeln. 2. Der Einfluss des Eisens. [**Causes of discolouration of steamed potatoes. 2. Effect of iron.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102,** 330–337. [Deutsch. Forschungsanstalt. Lebensmittelchem., Munich.]

The dull green colour produced when bivalent iron, from 0·1 to 10 mg. per 100 g. potato, was added to potato meal or dough increased with the amount and was more marked in the dough, showing that moisture also plays a part. Oxygen is already known to do so, and this probably explains why tervalent Fe was found to have less effect than bivalent. At *p*H values above 5·5 the colour was more intense. Addition of Cu or Mn did not blacken potato products.

Possible ways in which Fe may interact with chlorogenic and caffeic acids (see part 1, Abst. 188, Vol. 26) are discussed.—W. M. Deans.

1541

DIETRICH, W. C., LINDQUIST, F. E., BOHART, G. S., MORRIS, H. J. and NUTTING, M. D. **Effect of degree of enzyme inactivation and storage temperature on quality retention in frozen peas.** *Food Res.*, 1955, **20,** 480–491. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 10, Calif.]

1542

MEREGALLI, A. Ulteriori acquisizioni sull'essiccazione artificiale dei foraggi. [**Recent advances in the artificial drying of fodders.**] *Riv. Zootec.*, 1955, **28,** 283–285.

1543

NORDFELDT, S. (with KRUUS, K., HELLBERG, A., HANSSON, L., CAGELL, W. and RUUDVERE, A.) Ensileringsförsök. Prövning av kolhydratrika tillsatsmedel jämte salter av olika slag och AIV-vätska. [**Experiments in making silage. Tests with carbohydrate-rich additions, salts of different kinds and A.I.V. fluid.**] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Medd.* No. 58, 1955, pp. 95. English summary.

The silos used, the laying down of the silage, and the several methods of recording temperatures, sampling for analysis, collection of drainage, analysis, and computation of losses and of the effect of the preservatives added are described. The first series of experiments was with small cylindrical silos, 40 cm. diameter × 80 cm. height and 100 litres capacity. The additions, all per 100 kg. crop, were: A.I.V. fluid 8 kg., molasses 3 kg., Ensilan 250 g., Kofa (see Abst. 4691, Vol. 25) 230 g., Siloferm (said to contain a culture of lactic acid bacteria) 15 g. with 3 kg. barley meal. There were 5 replicates of each and 5 controls without addition. The analyses include dry matter, organic matter, crude protein, ether extract, N-free extract, fibre, ash, Ca, P, sugar and carotene; organic acids and ammonia, *p*H, CO_2. In all, 550 lots of silage were laid down in these and bigger containers and in silos of capacity 8 to 10 tons. The crops, which were sometimes wilted, were from clover and grass pasture usually cut at budding or flowering, or, as typical of material difficult to deal with, alfalfa and clover before budding; the additions, as well as those shown above, were oatmeal, dried beet pulp, and Reymersholm silage phosphate (see Abst. 1168, Vol. 26). The results and computations are set out in detail.

The conclusions are: 5 or 6 per cent. dried beet pulp with molasses gives good quality silage with little loss, as do also cereal meals. Molasses should not be used unless with a wilted crop. Wilted grass gives better results than fresh. Of the chemical preservatives, A.I.V. fluid and Reymersholm phosphate give the best results with small silos. With the big silos, wilted crops and chopped material, the salts gave no improvement over ensiling without addition. The experiments continue.—I. Leitch.

1544

ALLRED, K. R., KENNEDY, W. K., WITTWER, L. S., TRIMBERGER, G. W., REID, J. T. and LOOSLI, J. K. **Effects of preservatives upon red clover and grass forage ensiled without wilting. 1. Storage losses.**

WITTWER, L. S., TRIMBERGER, G. W., KENNEDY, W. K., ALLRED, K. R., REID, J. T., LOOSLI, J. K. and TURK, K. L. **2. Feeding value.** *Cornell Univ. Agric. Exp. Stat. Bull.* No. 912, May 1955, pp. 35; *Bull.* No. 913, July 1955, pp. 30.

1. The use of 70 lb. molasses, 100 lb. brewer's grains or 9 lb. Na metabisulphite per ton forage did not reduce storage losses in clover-grass silage made in towers compared with those in silage made without preservatives sufficiently to warrant their use. Molasses and brewer's grains increased feeding value for cattle a little, but not as much as they would have done if given as fresh supplements to the cattle.

2. Silages similar to those just described were used in trials with 32 dairy cattle. There was no significant difference between the silages in amount consumed, production of 4 per cent. fat-corrected milk or digestibility of dry matter.

Molasses improved palatability, and the unattractive smell could be avoided with Na metabisulphite, but these were the only advantages, and no economic benefit resulted.—T. D. Bell.

1545

KUMANOV, S. and KORDZHIEVA, N. Prouchvaniya vorhu sodorzhanieto na zahar i zaharniya minimum v surovinite za silazhirane. [**Sugar content and sugar minimum in raw materials for silage.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia,* 1953–54, **4/5,** 207–222. Russian summary.

1546

BARNETT, A. J. G. **The effects of the addition of a poly-halogenated acetate of ethyl glycol on the fermentation of minced grass and water mixtures.** *J. Sci. Food Agric.*, 1955, **6,** 716–721. [Div. Agric. Biochem., Dept. Biol. Chem., Univ. Aberdeen.]

The glycol compound, widely used in France, is neutral and bacteriostatic. It was added to slurries of minced grass and water in aspirator jars at levels of 0·006, 0·09 and 0·18 per cent. (w/v). At the lowest level changes in *p*H and production of lactic acid, volatile fatty acids and bases were similar to those of the control (no additive). At the 2 higher levels lactic acid production was partly inhibited and *p*H remained higher than control. Volatile fatty acids and bases were formed in smaller amounts. At all levels the extent of amino-acid breakdown was reduced.—J. L. Corbett.

1547

ZUBKOVA, R. D. Rol' drozhzhei v silosovanii kormov. [**Role of yeasts in the ensilage of fodders.**] *Mikrobiologiya,* 1955, **24,** 353–358.

See also Absts. 1396, 1556, 1559, 1560, 1616, 1663–65, 1698, 1789, 1816–18, 2245.

CULTURE OF MICRO-ORGANISMS FOR FOOD

1548

MORRIS, E. O. **Seaweed as a source of yeast food. 1. 2.** *J. Sci. Food Agric.*, 1955, **6**, 611–618; 618–621. [Brewing Indust. Res. Found., Nutfield, Redhill, Surrey.]

1. A detailed account is given of tests of seaweeds (*Laminaria cloustoni* frond and stipe, *Ascophyllum nodosum*, *Gigartina stellata*, *Polysiphonia fastigiata* and *Rhodymenia palmata*) and seaweed constituents (laminarin, fucoidin, D-mannitol, sodium alginate, and D-fucose), in the form of aqueous extracts without or with ammonium and magnesium sulphate and potassium dihydrogen phosphate, as media for the growth of 46 yeasts, of which 5 grew well enough to merit further investigation. A strain of *Oospora lactis* on the whole gave the best yields and extracts of *L. cloustoni* frond were the best media. Aeration of cultures slightly improved growth; temperature and method of sterilising extracts were without effect. Treatment of seaweed with 0·1 *N* or *N* HCl did not give better results, and chromatography confirmed that hydrolysis of the polysaccharides of the seaweeds had not taken place; it is concluded that other means of hydrolysis must be found before seaweed can be profitably used as a substrate for yeast.

2. Several enzymes were tested on pure laminarin and seaweed extracts; extract of malt and a filtrate of the cellulose-decomposing fungus *Myrothecium verrucaria* were found to hydrolyse up to 56 per cent. of the laminarin or the complex polysaccharides of seaweed. The treated seaweed gave excellent growth and fermentation of yeast, but high concentrations of the enzymes are required.

W. M. Deans.

2. CHEMICAL COMPOSITION OF FOODSTUFFS

(*Except Vitamins, for which see Section* 3)

ENERGY VALUE, PROXIMATE PRINCIPLES AND INORGANIC CONSTITUENTS

GENERAL

1549

INSTITUTO NACIONAL DE LA NUTRICION, QUITO. Tabla de composicion de alimentos ecuatorianos. **[Tables of composition of equatorial foods.]** *Bol. Informaciones Cient. Nac.*, 1955, No. 68, pp. 10.

Tables are presented of the composition of 272 foods, some prepared, in daily use in South America. Data on moisture, energy, protein, ether extract, total carbohydrates and fibre, ash, carotene, ascorbic acid and some of the B vitamins are included.—T. D. Bell.

1550

EDWARDS, C. H., CARTER, L. P. and OUTLAND, C. E. **Cystine, tyrosine, and essential amino acid contents of selected foods.** *J. Agric. Food Chem.*, 1955, **3**, 952–957. [Carver Found., Tuskegee Inst., Ala.]

Twelve amino-acids were estimated microbiologically in 25 foods commonly used in southeastern United States. The types of food were cereals 3, nuts 2, pork muscle and offals 9, egg and chicken offals 4, vegetables 7. The amounts of essential amino-acids in 2 typical southern dinners were calculated and compared with Rose's estimates of minimum daily requirements (Abst. 3891, Vol. 19).—D. Harvey.

1551

REITH, J. F. **Toxic trace elements in food; desirability and possibility of statutory regulations in this field.** *Voeding*, 1955, **16**, 832–838; 867–879; 932–943. [Dept. Food Chem. Toxicol., Univ. Utrecht.]

A review dealing with arsenic, barium, copper, fluorine, mercury, lead, selenium, tin and zinc occurring naturally or as contaminants in foods, with references, details of existing laws in several countries and principles on which further legislation should be based. Provisional limits are suggested for As, Fl, Hg, Se, Pb, Sn and Zn; Ba is considered unlikely to give trouble at present; Cu is kept low in some foods owing to its bad effect on quality, but may require control in vegetables and fruits because of its use in sprays. Up-to-date information on trace elements in Dutch foods is badly needed, but should await the establishment of reliable analytical methods, meanwhile the subject of consultation by the Trace Elements Commission of the International Union of Pure and Applied Chemistry.—W. M. Deans.

FOODSTUFFS OF ANIMAL ORIGIN

Milk and Milk Products

1552

MACY, I. G., KELLY, H. J. and SLOAN, R. E. **The composition of milks. A compilation of**

the comparative composition and properties of human, cow, and goat milk, colostrum, and transitional milk. *Bull. Nat. Res. Counc., Washington*, No. 254, revised 1953, pp. iv + 70.

In this revision of Bulletin 119 of the National Research Council (see Title 183, Vol. 21), data from 268 papers have been assembled in tabular form to give the mean, minimum and maximum recorded values for 10 physical properties, 10 fat characteristics, and 258 chemical components of human, cow and goat milk.—F. E. Hytten.

1553

STRANSKY, E., DAUIS-LAWAS, D. T. and LAWAS, I. L. **On the protein level of milk in Filipino nursing women.** *J. Philippine Med. Assoc.*, 1954, **30,** 647–650. [Dept. Paediat., Coll. Med., Univ. Philippines.]

Protein was estimated in random samples of milk of 127 Filipino nursing mothers in different stages of lactation.

Six women with failing lactation had values of over 3 per cent., but apart from them the average value was 1·34 per cent. More than half had values between 1·0 and 1·5. The percentage with lower values was 18·1 and with higher values 27·5. The values are considered to compare well with those recorded in America and Europe, but babies fed exclusively on breast milk after the age of 6 months do not receive enough protein. The weight curve of Filipino babies tends to flatten at 6 months. No influence on the protein value of age or parity of the mother or of duration of lactation was apparent.—E. M. Hume.

1554

PARADISO, M. and LA CAUZA, C. La gonadotropina corionica quale nuovo mezzo terapeutico per il trattamento dell'eccesso di grasso nel latte umano. [**Chorionic gonadotropin as a new means for treating excess of fat in human milk.**] *Lattante*, 1954, **25,** 687–689. *Proc.* [Clin. Pediat., Florence.]

See Abst. 4697, Vol. 25.

1555

DE LUCA, R. and CUTRONEO, A. Indagini elettroforetiche sulle proteine del latte di donna. [**Electrophoretic investigation of the proteins of human milk.**] Comportamento elettroforetico delle proteine del colostro di donna. [**Electrophoretic behaviour of the proteins of human colostrum.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 203–205; 206–208. [Ist. Clin. Pediat., Univ. Messina.]

Milk was collected 3 hr. after the last feed from 21 women in different stages of lactation. It was centrifuged and the serum, after filtration, treatment with animal charcoal, and dialysis, was subjected to electrophoresis. Three fractions were then distinguished; the proportion of them remained almost unchanged for 10 months, but between the 10th and 12th months there was considerable increase of fraction 3 at the expense of fractions 1 and 2.

Colostrum taken from 5 women 24 hr. after parturition and on the 4 ensuing days was investigated in the same way. The proportions of fractions 1 and 2 were greater, and of fraction 3 less, in colostrum than in milk, but by the 5th day they had progressively adjusted themselves to the values found in milk.—E. M. Hume.

1556

DAVIDOV, P. B. and ANISIMOVA, V. K. Soderzhanie ioda v moloke. [**The iodine content of milk.**] *Izv. Timiryaz Sel'skokhoz. Akad.*, 1954, No. 2, 47–54. [Timiryazev Agric. Acad.]

A study of the variation of iodine content throughout lactation. Tests were made on milk from the academy farm, both on mixed daily samples and on samples from individual cows. Further samples were taken at the Moscow Gor'ki milk combine on arrival of the milk at the combine and from milk sent out to consumers after treatment. The cows on the academy farm were pure-bred Kholmogors, average milk yield 5000 to 5500 kg. milk per cow. During the experiment the average annual amount of fodder per cow was 9 tons green fodder, 5 tons succulents and 2 tons coarse fodder and concentrates. Mineral supplements were provided in the form of salt, bone- and fishmeal and chalk. The lactation was arbitrarily divided into 3 periods: colostrum, 10 days, normal lactation, 290 to 320 days, and the period before drying-off, 5 days.

Colostrum had the highest iodine content; the lowest was before drying-off. If the average iodine content in the colostrum was taken as 100, then during the period of normal lactation the iodine content was only 42 and before drying-off 21 per cent. Although all the animals received the same rations and calved almost simultaneously (January and February) there was considerable variation in the iodine content of the milk of the different cows, one cow having an average of 320 and another only 86 μg. per litre. The maximum amount of iodine in the colostrum occurred in the first 2 days after calving; on the ninth and tenth days there was only about one-third as much as on the second day. It is therefore considered important, in view of the value of iodine for newly born animals, for calves to be given their dam's colostrum. There is 1·5 times as much iodine in the milk when the cows are stall-fed as when they are on pasture. Technological treatment and pasteurisation in particular was found to reduce the amount of iodine in milk by 22 per cent. on the

average. Milk examined on entering the Gor'ki milk combine showed an iodine content of 62 μg. per kg. ; on leaving the combine for delivery to the consumer it was 49, 79 per cent. of the original value.—H. Scherbatoff.

1557

VAN KOETSVELD, E. E. Het anorganisch sulfaat in rundermelk, -biest en -bloed. [**The inorganic sulphate content of the milk, colostrum and blood of cows.**] *Nederlands Melk Zuiveltijdschr.*, 1955, **9**, 165–172. [Inst. Moderne Veevoeding "De Schothorst", Hoogland.] English summary.

The inorganic sulphate of milk has been little studied.

Milk was freed from protein with trichloroacetic acid. The inorganic sulphate was precipitated from the protein-free filtrate with benzidine ; the benzidine sulphate was dissolved and diazotised ; with thymol a red colour was obtained, which could be measured by spectrophotometer at 500 mμ.

Milk samples from 8 cows contained from 7·0 to 14·6 mg. inorganic sulphate per 100 ml., mean 10·9, and the highest yields of milk were associated with the lowest sulphate concentrations, though the daily output of inorganic sulphate varied directly with the milk yield. In 4 cows in full milk production, giving from 15·8 to 27·4 kg. daily with from 9·0 to 9·9 mg. sulphate per 100 ml., and in 4 at the end of lactation with yields of 3·9 to 9·1 kg. and sulphate contents from 11·1 to 17·4 mg. per 100 ml., the mean serum sulphate values were the same, 14·7 mg. per 100 ml. Colostrum of 3 cows was low in sulphate, one cow giving 0 and 3·5 mg. per cent. in the evening and morning milk, respectively, on each of the first 2 days after calving.

Four samples of human milk contained only from under 0·5 to 2·5 mg. inorganic sulphate per 100 ml.—D. Duncan.

1558

RAJ, H. and JOSHI, N. V. **Amino-acid composition of the milk of Indian buffaloes. 1. Essential amino-acid composition of total proteins and protein fractions. 2. α- and β-casein components.** *Indian J. Med. Res.*, 1955, **43**, 591–596 ; 597–602. [Nat. Chem. Lab., Poona.]

1. Two samples of mixed milk and 6 samples from buffaloes of each of the 2 breeds, Surti and Delhi, were collected. Total milk protein, whole casein and total whey protein were analysed by microbiological methods for 8 essential amino-acids and for cystine. The data are tabulated. Little difference from data published for cow's milk was found.

2. Fractionation was by the method of Warner (*J. Amer. Chem. Soc.*, 1944, **66**, 1725). Tryptophan, *iso*leucine and lysine were higher in α- than in β-casein ; leucine, methonine, threonine and valine were higher in β- than in α-casein. In comparison with the data of Gordon *et al.* (Abst. 4581, Vol. 19) these fractions of buffalo's milk differed little from those of cow's milk.

D. Harvey.

1559

BERGE, S. Fettprosenten i geitemjølk. [**Percentage fat in goat's milk.**] *Sau og Geit*, 1955, No. 4, 85–86.

The composition of goat's milk as sampled at the Tretten cheese factory in 1932–33 and as recorded for the whole country in 1949 is given as, per cent. : total solids 12·20, 11·82 ; fat 3·75, 3·48 ; protein 3·10, 3·17 ; lactose 4·01, 4·33 ; ash 0·81, 0·83. English milk has more protein (3·34) and more fat (4·5) than Norwegian milk as reported by M. D. Gordon (1950) for the British Goat Association [no reference]. Lactose (4·08) is about the same. There is a low inverse correlation between lactose and fat.

The special value of goat's milk for cheese-making resides in the taste, and it is not known what substances cause the taste, whether strength of taste is a heritable characteristic of the goat, or whether, as some think, milk from goats fed indoors in clean stalls and giving a high yield has less taste than ordinary milk. In some countries breeders select against taste : in Norway selection should be for taste with yield and for lactose, since goat's milk protein and fat have no special value and fat may be present in excess of what cheese-makers prefer. Also, goat's milk costs more to produce than cow's milk.—I. Leitch.

1560

LINDSET, J. Fettprosenten i geitmjølk. [**Percentage fat in goat's milk.**] *Sau og Geit*, 1955, No. 5, 95–96.

The manager of a dairy replies to Professor Berge (see preceding Abst.). Real goat cheese requires 3·2 per cent. fat in milk and neither the fat nor the protein can be replaced by cow's milk fat or protein. It is true that goat's milk costs more to produce ; it is still most profitable when both yield and fat percentage are high. In northern Norway the milk is often of poor quality, low in fat and total solids.

Taste is associated with both the fat and the sugar, not with the protein, but the characteristics of goat's milk protein are different from those of cow's milk protein and the cheese produced is much finer. It does not depend on type of housing but does, to some extent, depend on the feed ; individual differences are certain.

In a postscript Berge replies briefly, on the assumption that goat's milk cheese should have a fixed proportion of lactose, protein and fat. More information is needed.—I. Leitch.

1561

KASANEN, A., EKMAN, E. M. and PELTONEN, T. Über den Eisengehalt in der Milchnahrung der Säuglinge. [**Iron content of milk feeds for infants.**] *Ann. Paediat. Fenn.*, 1955, **1**, 277–282. [Kinderklin., Univ. Turku.]

The Fe content, as estimated by Wong's method, of the milk of 101 donors to milk banks in 4 towns of Finland ranged from 0·051 to 0·144 mg. per cent., mean 0·085. Other results are quoted from the literature. The mean value on the first day for 40 women delivered in the university hospital was only 0·053 mg. per cent. It rose rapidly in the next few days and then more slowly to a maximum in the 4th month, and after 6 months declined a little. Age of mother and delivery by caesarean section made no difference.

Although cow's milk naturally contains less Fe than this, in practice it takes up enough from containers to approach human milk ; milk on sale in Turku had a mean Fe content of 0·079 mg. per cent. Infant feeds used in the *Kinderklinik* had more : two-thirds milk, with 3 per cent. wheat flour, 0·097, half-milk, diluted with oatmeal gruel, 0·103 and full milk with egg, 0·104 mg. per cent.

W. M. Deans.

1562

STADHOUDERS, J. and MULDER, H. **The composition of Dutch butter fat. 1. Seasonal variations in the unsaturated fatty acid composition of butter fat.** *Nederlands Melk Zuiveltijdschr.*, 1955, **9**, 182–193. [Lab. Dairying, Agric. Univ., Wageningen.] Dutch summary.

At fortnightly intervals during 1953–54, 27 butter samples were obtained from a co-operative dairy and the butterfat was examined for poly-unsaturated fatty acids, iodine value and refractive index ; residual unsaturation, after allowing for the contribution of the polyunsaturated fatty acids to the iodine value, was calculated as oleic acid.

The following ranges of values, expressed as weight per cent., were found : dienoic acids, conjugated, 0·58 to 2·81 ; dienoic acids, non-conjugated, 0·73 to 1·90 ; trienoic acids, conjugated, 0·015 to 0·026 ; trienoic acids, non-conjugated, 0·35 to 0·96 ; tetraenoic acids, conjugated, 0·0 to 0·008 ; tetraenoic acids, non-conjugated, 0·27 to 0·60 ; oleic acid, 28·1 to 40·1 ; iodine value, 32·1 to 46·6.

With the change-over from winter stall-feeding to pasture in May the content of oleic acid, conjugated dienoic acids and non-conjugated trienoic acids in butterfat rose appreciably ; that of non-conjugated dienoic acids fell. The content of oleic acid, the iodine value of the fat and its refractive index were closely correlated throughout the year.—G. A. Garton.

1563

MULDER, H. and SCHOUTEN, G. Het "Zoutgehalte" van enige soorten dieetkaas uit de handel. [**"Salt" content of some kinds of "dietetic" cheese on the market.**] *Voeding*, 1955, **16**, 976. [Lab. Zuivelbereiding, Landbouwhogesch., Wageningen.]

"Dietetic" cheese is designed for use in unsalted therapeutic diets. Data are given for the percentage of Na, K, Ca and Cl in 6 samples of cheese bought in the open market. Unsalted cheese had 0·03 per cent. Na, ordinary Edam cheese 0·78. Of "dietetic" cheeses one hard cheese had 0·06 and one cream cheese 0·05 per cent. Na. The other two, which had presumably been treated in the usual way with sodium citrate and sodium phosphate to soften them, had 0·67 and 0·66 per cent. Na.—I. Leitch.

See also Absts. 2244, 2491, 2501.

Meat (All Kinds)

1564

WENIGER, J. H., FUNK, K. and KÖNIG, K. H. Untersuchungen über den Calcium-, Phosphor- und Nährstoffgehalt von Schafen und Ziegen. [**Calcium, phosphorus and organic nutrients in sheep and goats.**] *Arch. Tierernährung*, 1955, **5**, 216–224. [Inst. Tierzucht, Martin Luther Univ., Halle.]

The carcases analysed were those of 10 sheep, some of the Merino and some of the Karakul breed, ranging from newborn lambs to 10 years of age, and of 7 goats of the Improved White breed, ranging from newborn kids to 3 years of age. The carcases except those of newborn lambs and kids were subdivided into (1) blood and organs, (2) flesh and fat, (3) bones, (4) pelt. Dry matter, crude protein, crude fat, Ca and P were estimated as for pigs (Abst. 4272, Vol. 24). The results are given in tables in g. per kg. (liveweight less digestive tract contents) or as percentages ; some results by Lawes and Gilbert and by Jantzon (quoted from Radeff, *Arch. Tierernährung*, 1930, **3**, 639) for sheep are also reproduced.

Newborn lambs contained little fat, only about 1/6 of the protein content. The Ca : P ratio (mean of 4) was 1·75 : 1, close to the values for kids (1·78 : 1) and piglets (1·73 : 1). Animals of 9 months had much more fat but were similar in protein content and Ca : P ratio. At 21 months the Ca : P ratio was slightly greater. In all parts other than bones and pelt P was more abundant than Ca. The ash of the bones contained from 35·7 to 37·4 per cent. Ca and from 17·40 to 17·81 per cent. P. The ash content of the bones increased

with age. The results for kids and goats were similar to those for lambs and sheep.

W. M. Deans.

1565

MARSHALL, C. R. **The nitrogen content of lean pork.** *Analyst*, 1955, **80,** 776–778. [Excel Co., Ltd., Carpenters Rd., Stratford, London, E.15.]

From data which are tabulated for the composition of each of 5 cuts from 1 side of home-killed and 1 of Irish pork, N on a fat-free basis was calculated to be 3·39 and 3·43 g. per 100 g., respectively. For further analyses of only shoulders and loins from 5 sides the arithmetical means were 3·35 and 3·65 on the same basis. These are lower than the data reported by Jackson and Jones (*Analyst*, 1932, **57,** 562) on which are based the factors recommended by the Society of Public Analysts, Analytical Methods Committee (Abst. 1195, Vol. 23) for converting meat N into defatted meat. It is thought possible that either breed or changes in methods of feeding may have produced these differences between new and older values.

D. Harvey.

1566

TARANOVA, A. I., AL'BOVA, E. S. and GROMIKHINA, L. S. Soderzhanie arginina, gistidina, lizina, tirozina, triptofana i tzistina v belkakh razlichnykh vidov myasa i ryby. [**Arginine, histidine, lysine, tyrosine, tryptophan and cystine in the protein of different kinds of meat and fish.**] *Vop. Pitan.*, 1955, **14,** No. 5, 27–35. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

The composition in terms of 6 amino-acids is tabulated for 24 kinds of meat from domestic animals and birds or game, 20 kinds of fish and fish products and also dolphin, seal, lobster and crab.—D. Duncan.

1567

EASTOE, J. E. **The amino acid composition of mammalian collagen and gelatin. Notes on the determination of amino acids by ion-exchange chromatography.** *Biochem. J.*, 1955, **61,** 589–600; 601–602. [Brit. Gelatine Glue Res. Assoc., 2a Dalmeny Ave., London, N.7.]

The amino-acid composition of collagen or gelatine from man, ox, pig, whale and wallaby was estimated by a slightly modified form of the method of Moore and Stein (Abst. 4469, Vol. 21) which is described in the appendix (pp. 601–602).

The values for ox-hide gelatine agreed well with those previously published, except for alanine and serine. Two gelatines serially extracted from ox hide, which differed in rigidity properties but had the same molecular weight, were not significantly different in amino-acid composition. Gelatine had a composition similar to that of collagen. Collagens from man, ox and pig did not differ much, but collagen from wallaby contained slightly more serine and threonine, and these were present in greater amounts in whale gelatine. Gelatine contained less tyrosine than collagen precursors. Fractionation with ethanol further reduced the tyrosine content.—A. Hepburn.

1568

HANSEN, R. P., SHORLAND, F. B. and COOKE, N. J. **Occurrence of *n*-nonadecanoic acid in ox perinephric fat.** *Nature*, 1955, **176,** 882. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

An acid was isolated in trace amounts from hydrogenated ox perinephric fat which corresponded in its saponification equivalent, melting-point and X-ray long spacing to *n*-nonadecanoic acid.—G. A. Garton.

1569

SHORLAND, F. B. and JESSOP, A. S. **Isolation of Δ^9 heptadecenoic acid from lamb caul fat.** *Nature*, 1955, **176,** 737. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

By the use of methods which included low-temperature crystallisation, ester-fractionation and chromatography on silica gel, 1·846 g. C_{17} unsaturated fatty acid methyl esters, m.p. — 32° to — 30·5° C., was obtained from 2·5 kg. lamb caul fat. Hydrogenation of a portion of these esters, followed by saponification, yielded an acid, m.p. 59·5° to 60·5°, which gave mixed m.p. 60·0° to 60·6° on admixture with authentic margaric acid, m.p. 60·8° to 61·0° C. Oxidation of the unsaturated fatty acid with $KMnO_4$ yielded azelaic acid. It was therefore concluded that Δ^9-heptadecenoic acid was present in the lamb caul fat.—G. A. Garton.

1570

MERKER, P. C., EDWARDS, L. D., ANDREWS, F. N. and CHRISTIAN, J. E. **The estrogenic activity of residues obtained from chickens treated with pellets of diethylstilbestrol.** *Poultry Sci.*, 1955, **34,** 1118–1125. [Sch. Pharm., Purdue Univ., Lafayette, Ind.]

See also Abst. 1573.

Fish

1571

LEE, C. F. **Composition of cooked fish dishes. Proximate analysis of dishes containing fish and shellfish.** *Fish and Wildlife Serv., U.S. Dept. Interior Circular* No. 29, pp. 31.

In this mimeographed circular proximate composition and energy value per 100 g. and per serving are tabulated for 161 cooked sea fish or shellfish dishes. The ingredients of composite dishes are given in household measures [but not the method of preparation].—W. M. Deans.

1572

GOROZHANKINA, L. A. Soderzhanie metionina v belkakh ryb i rybnykh produktov. [**Methionine content of protein of fish and fish products.**] *Vop. Pitan.*, 1955, **14,** No. 5, 35–37. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

The methionine content of 21 kinds of fish and fish products was estimated. The percentage of total protein N provided by methionine ranged from 1·6 in sprats preserved in oil to 2·32 in pilchards. Other fish rich in methionine were sandre, cod, salmon, sturgeon and catfish.

D. Duncan.

1573

GUTTMANN, A. **Extracts and enzymic hydrolysates from fish liver and mammalian liver.** *J. Fish. Res. Board Canada*, 1955, **12,** 637–645. [Atlantic Fish. Exp. Stat., Halifax, N.S.]

Besides supplying other nutrients, beef liver was formerly a cheap source of good protein, but the price is steadily rising. Meanwhile large quantities of fish liver are discarded after the oil has been secured. Studies were accordingly made of extracts from fresh whole liver, liver residue after treatment of fresh minced liver with sodium bisulphite, autoclaving and centrifuging to remove the oil, or liver residue dried and defatted by extraction with 1 : 2-dichloroethane, and of enzymic hydrolysates produced from fresh minced liver by digestion with papain and removal of oil, or from dried defatted liver or liver residue by digestion first with papain and then with pancreatin. Details of the procedures are given. Ca, total and inorganic P, Cu, Fe, total N, amino-N, choline, vitamin B_1, riboflavin, folic acid, nicotinic acid, pantothenic acid and vitamin B_{12} contents of 7 extracts and 9 enzymic hydrolysates on a dry basis are tabulated; for most of the later Co and F contents are also given. The species represented were cod, salmon, haddock, whale and seal, with beef liver and pork liver for comparison.

The mineral, total N, amino-N, choline, folic acid and vitamin B_{12} contents of fish liver extracts and enzymic hydrolysates were comparable with those of beef and pork liver extracts and enzymic hydrolysates. In other B complex vitamins they were lower, especially the extracts. Enzymic digestion gave better yields than extraction, and the dried hydrolysates, unlike the dried extracts, were not hygroscopic. Salmon liver products were particularly good, and the low oil content of salmon liver permits removal of oil and enzymic digestion in one operation instead of two.

It is concluded that satisfactory extracts and hydrolysates can be prepared from fish liver, suitable for use in nutrition or medicine. Pilot plant experiments have begun, but a study of market possibilities is required before it can be decided whether the processes are economic.

W. M. Deans.

See also Abst. 1566.

FOODSTUFFS OF VEGETABLE ORIGIN

General

1574

INTENGAN, C. L., CONCEPCION, I., SALUD, R. D., MANALO, J., DEL ROSARIO, I., GOMEZ, R., ARZAGA, V. and ALEJO, L. G. **Composition of Philippine foods. 2.** *Philippine J. Sci.*, 1954, **83,** 187–216. [Foods and Nutrit. Biochem. Lab., Inst. Nutrit., Manila.]

In continuation of the first report (Abst. 1794, Vol. 25) results of analysis are presented for 167 samples of indigenous food plants and food products of vegetable origin. A brief description of each item is given.—E. M. Hume.

1575

CHAMBERLAIN, G. T. **The major and trace element composition of some East African feedingstuffs.** *East African Agric. J.*, 1955, **21,** 103–107. [E. African Agric. Forest. Res. Organiz., Kikuyu, Kenya.]

Seventeen samples of feedingstuffs and one of rumen contents were analysed for ash, Ca, Mg, Na, K and P and for 15 trace elements. The findings are tabulated. The low Na content of East African soils is reflected in the small amounts of Na found in some of the feedingstuffs.

D. Harvey.

1576

BERTRAND, G. and SILBERSTEIN, L. Teneur en manganèse d'environ cinq cents échantillons de phanérogames. [**Manganese content of about five hundred samples of phanerogams.**] *Ann. agronom.*, 1955, **6,** 523–535.

Over 500 samples of dicotyledons and monocotyledons were analysed for Mn. Average values in mg. per kg. dry matter, grouped by family, were: Ranunculaceae 99·9, Cruciferae 44·6, Caryophyllaceae 104·9, Leguminosae 72·1, Rosaceae 130·6, Umbelliferae 60·4, Compositae 56·8, Boraginaceae 62·4, Solanaceae 59·7, Scrophulariaceae 32·6, Labiatae 62·2, Salsolaceae 30·8, Polygonaceae 64·9, and Gramineae 78·0.—J. S. Thomson.

Cereals

1577

RAMACHANDRAN, L. K. and MCCONNELL, W. B. **The terminal amino acids of wheat gliadin.** *Canad. J. Chem.*, 1955, **33,** 1463–1466. [Nat. Res. Counc. Canada, Prairie Reg. Lab., Saskatoon, Sask.]

Wheat gliadin was found to contain 3 N-terminal histidine residues per molecular weight of 27,000, and trace amounts of other amino-acids. Carboxypeptidase did not liberate free amino-acids, although C-terminal leucine and glutamic acid were tentatively identified by a chemical method.—A. Hepburn.

1578

MUNTONI, F. and POCCHIARI, F. La identificazione del principio attivo dell'aleurone di frumento.—Nota preliminare. Individuazione dello spettro caratteristico nell'ultravioletto. [**Identification of the active principle of wheat aleurone. Preliminary note: the characteristic ultraviolet spectrum.**] *Rend. Ist. Super. Sanità, Rome*, 1955, **18**, 805–809. French, English and German summaries.

An " active substance " [not further described] was separated from the aleurone layer of wheat by a fermentation process. It had a characteristic absorption spectrum in the ultraviolet with maxima at 216 and 277 mμ., from which it can be estimated quantitatively.—T. D. Bell.

1579

VAN DER LEE, J. Het brood en enkele andere producten van de bakkerij en de bloemverwerkende industrie. [**Bread and some other products of the baking and milling industries.**] *Voeding*, 1955, **16**, 894–900. [Stat. Maalderij, Bakkerij, Wageningen.]

A chapter for Jansen's textbook on nutrition (see Abst. 3588, Vol. 24).

1580

ANDERSON, D. M. W. and GREENWOOD, C. T. **An investigation of the polysaccharide content of oats, *Avena sativa* L.** *J. Sci. Food Agric.*, 1955, **6**, 587–592. [Dept. Chem., Univ. Edinburgh.]

Oat kernels were defatted and successively extracted with cold and hot water followed by cold and hot alkali. The resulting extracts were further fractionated by centrifuging and analysed for sugars, ash, protein and unhydrolysable material. Fructose was found entirely in the cold-water extract; glucose, galactose, arabinose and xylose were present in nearly all the fractions. Potentiometric iodine titrations showed that the unfractionated starch contained 26·0 per cent. amylose. From this and the results of oxidation of the starch with periodate it was calculated that the amylopectin contained on the average 20·3 glucose units per unit chain. Protein impurities interfered with the periodate oxidation.

A. Hepburn.

1581

ACKER, L., DIEMAIR, W. and SAMHAMMER, E. Über das Lichenin des Hafers. 2. Molekulargewichts-bestimmung und weitere Untersuchungen zur Konstitution. [**The lichenin of oats. 2. Estimation of molecular weight and further studies of constitution.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102**, 225–231. [Inst. Lebensmittelchem., Univ. Frankfurt a.M.]

For part 1, see Title 3369, Vol. 25.

See also Absts. 1536, 2206, 2415.

Roots

1582

CASTLE, M. E. **The effect of winter weather on the composition of fodder-beet left in the ground.** *J. Sci. Food Agric.*, 1955, **6**, 579–581. [Dept. Animal Husb., Vet. Fac., Univ. Liverpool.]

Sample plants from a fodder beet crop left in the ground all winter were chemically analysed at intervals of about 14 days. The dry matter content of the roots stayed within the range 18·8 to 21·0 per cent. from October to the end of March and there was no evidence of deterioration of quality. At the end of April, the dry matter content had fallen to 17·8 per cent. and the small portions of roots above the ground were brown and soft. The proportion of tops to the total weight of roots and tops fell from 49·4 per cent. in October to 18·4 per cent. in March, later increasing. It is suggested that fodder beet may be left in the ground until required in order to reduce storage costs.—J. L. Corbett.

1583

CHENG, R. C. and HANNING, F. **Phenolic compounds in potato tissue.** *Food Res.*, 1955, **20**, 506–511. [Dept. Food Nutrit., Sch. Home Econ., Univ. Wisconsin, Madison.]

The content of tannins (tannin plus tyrosine) in the skin of 5 varieties of potato ranged from 1·13 to 2·27 mg. per g. and was higher than in the centre flesh, 0·54 to 0·79 mg. per g. There was no correlation between colour score and tannin content. From paper chromatograms chlorogenic acid was the only tannin-like compound present in detectable amounts in all 3 types of tissue, skin, discoloured areas and centre flesh; *l*-tyrosine was identified in discoloured areas and centre flesh and caffeic acid in skin extracts.—J. S. Thomson.

Legumes

1584

SINGH, H. D. and BANERJEE, S. **Studies on the effect of germination on the availability of iron in some common Indian pulses.** *Indian J. Med. Res.*, 1955, **43**, 497–500. [Dept. Physiol., Presidency Coll., Calcutta.]

Total, available, protein-free and protein-bound Fe were estimated in 8 different pulses before germination and after germination for 2 and 3 days. Available Fe before germination ranged from 0·86 to 4·40 mg. per 100 g. and after 3 days' germination from 1·19 to 6·18 mg. Total Fe ranged from 6·10 to 9·20 mg. Protein-free Fe before germination ranged from 0·94 to 2·31 mg. with a slight increase after germination.

J. S. Thomson.

1585

EHEART, J. F., YOUNG, R. W. and ALLISON, A. H. **Variety, type, year, and location effects on the chemical composition of peanuts.** *Food Res.*, 1955, **20,** 497–505. [Dept. Biochem., Virginia Agric. Exp. Stat., Blacksburg.]

To ascertain the effect of variety, type, year and location on the composition of groundnuts, 7 varieties of Virginia- and 5 of Spanish-type groundnuts were grown in an experiment over 5 years, in one year at 3 different locations. Estimations were made of protein, ether extract, vitamin B_1, riboflavin and nicotinic acid in the kernels and of protein in the hay. Variety had a greater influence on all constituents in the kernels than had year, but year had a marked effect on vitamin B_1 and riboflavin. Location had a greater effect on vitamin B_1, riboflavin and hay protein than variety, and neither had much effect on kernel protein or ether extract. Spanish-type groundnuts were higher in protein, but Virginia were higher in nicotinic acid and in the protein of the hay. Average values found for protein, riboflavin and nicotinic acid were higher than those quoted by FAO (see Vol. 24, p. 727).—J. S. Thomson.

1586

PICKETT, T. A. **Note on oils from seed of two wild species of Arachis.** *J. Amer. Oil Chem. Soc.*, 1955, **32,** 521. [Georgia Exp. Stat., Experiment.]

1587

NAISMITH, W. E. F. **Ultracentrifuge studies of the ammonium sulphate fractions of the protein from yellow lupin seed (*Lupinus luteus*).** *J. Sci. Food Agric.*, 1955, **6,** 721–724. [Imperial Chemical Industries, Ltd., Nobel Div., "Ardil" Fibre Factory, Dumfries.]

The protein extracted by 10 per cent. NaCl from yellow lupin seed meal was fractionated with $(NH_4)_2SO_4$. Examination in the ultracentrifuge at ionic strength 0·5 and *p*H 7·6 revealed 4 sedimentary components. Three of these with sedimentation constants of 11·7, 7·6 and 1·8 Svedburg units were obtained reasonably pure. The first dissociated reversibly and slowly when the ionic strength was reduced; the second associated reversibly and rapidly.

For results with blue lupin seed see Joubert, *Biochim. biophys. Acta*, 1955, **16,** 370.

A. Hepburn.

Fruits

1588

ANET, E. F. L. J. and REYNOLDS, T. M. **Water-soluble constituents of fruit. 2. The separation of acids on anion-exchange resins: the isolation of *l*-quinic acid from apricots.**

ASH, A. S. F. and REYNOLDS, T. M. **3. An examination of the sugars and polyols of apricots, peaches, pears, and apples by paper chromatography.**

ANET, E. F. L. J. and REYNOLDS, T. M. **4. The organic acids in peaches.** *Austral. J. Chem.*, 1955, **8,** 267–275; 276–279; 280–284. [Div. Food Preservation, C.S.I.R.O., Homebush, N.S.W.]

For part 1 see Title 3377, Vol. 25.

2. The resins used were Amberlite IRA-400, Dowex 1-X4 and Dowex 2-X4, the acids being displaced by 0·1 *N* HCl. The order of emergence of 27 acids is given. The isolation of *l*-quinic, succinic, *l*-malic and citric acids from apricots is described. R_F values are recorded for 30 acids in the solvent systems methyl ethyl ketone-cineole-aqueous formic acid (53 per cent.) (50 : 50 : 36) and ethanol (95 per cent.) - ammonia - water (80 : 5 : 15).

3. Xylose, fructose, glucose, sucrose, sorbitol, a cyclitol (probably *meso*-inositol) and one or more ketose oligosaccharides were detected in 80 per cent. ethanolic extracts of apricots, peaches, pears and apples. Pears were shown to contain galactose, which may be present also in some other fruits. The solvent mixtures used were ethyl acetate-pyridine-water (8 : 2 : 1), *n*-butanol-acetic acid-water (4 : 1 : 1) and phenol-water (4 : 1).

4. *l*-Quinic, *l*-malic and citric acids are the chief acids of the peach: a small amount of mucic acid was also detected. Galacturonic acid was present under certain ripening conditions.

H. G. Bray.

1589

JACQUIN, P. and TAVERNIER, J. Sur la teneur des jus de fruits en méthanol. [**Methanol content of fruit juices.**] *Bull. Soc. sci. Hyg. aliment*, 1955, **43,** 214–217. [Stat. Recherches Pomol., Rennes.]

Methanol, estimated by the method of Denigès in samples of apple, black-currant, gooseberry and tomato juice and fruit cocktail of French origin and orange, grapefruit, and pineapple juice from the United States was found to range from 45 mg. per litre for apple juice (mean of 3 samples) to 680 in a sample of sweetened black-currant juice; the American juices had less than the apple juice.

The methanol is thought to arise from demethylation of pectins by an enzyme, and it is suggested that fruit juice should be obtained from fruit not quite fully ripe and pasteurised as soon as possible.
W. M. Deans.

1590
TAVERNIER, J., CAUSERET, J. and HUGOT, D. Le cidre dans l'alimentation. [**Cider in nutrition.**] *Bull. Soc. sci. Hyg. aliment.*, 1955, **43,** 163–193. [Stat. Recherches Pomol., Rennes.]
A review.

1591
JACQUIN, P. Le poiré. [**Perry.**] *Bull. Soc. sci. Hyg. aliment.*, 1955, **43,** 194–213. [Stat. Recherches Pomol., Rennes.]
A review.

Other Types

1592
KREHL, W. A. and COWGILL, G. R. **Nutrient content of cane and beet sugar products.** *Food Res.*, 1955, **20,** 449–468. [Yale Nutrit. Lab., New Haven, Conn.]
Some 240 samples of cane and sugar beet products were analysed for their vitamin content and in some cases for inorganic constituents estimated spectroscopically. The products included blackstrap and high cane molasses, raw sugars, brown and soft sugars and cane juice. All contained small amounts of vitamins, insufficient to constitute them sources of these substances. The heating and lime treatment of cane or beet juice destroyed much of the vitamin B_1, riboflavin and pantothenic acid present.—J. S. Thomson.

1593
BUDZYŃSKA, J. Skład chemiczny polskiego oleju rzepakowego. [**Chemical composition of rapeseed oil.**] *Rocz. Państwowego Zakł. Hig.*, 1955, **6,** 229–233. Russian and English summaries.
Samples of Polish rapeseed oils showed the following ranges of percentage composition : lower fatty acids 0, higher saturated fatty acids 7·0 to 9·2, erucic acid 44·1 to 49·2, oleic acid 15·3 to 23·1, linoleic acid 13·3 to 18·0, linolenic acid 4·4 to 9·8. (From summary.)—J. S. Thomson.

1594
BISHOP, C. T. **Carbohydrates of sunflower heads.** *Canad. J. Chem.*, 1955, **33,** 1521–1529. [Nat. Res. Labs., Div. Appl. Biol., Ottawa.]
Stoikoff (*Mitt. Geb. Lebensmittel. Hyg.*, 1948, **39,** 292) suggested that sunflower heads, after removal of the seeds for oil, might serve as a source of pectin. At present in southern Manitoba they are ploughed in.
Shewfelt's method (*Thesis*, Oregon State Coll., 1952) of separating the pectin from polysaccharides by extraction of the heads, after removal of ash and extraction with ethanol-benzene, with a mixture of 0·25 per cent. ammonium oxalate and 0·25 per cent. oxalic acid solutions at 75° C., filtration and precipitation of the pectin with acidified ethanol was found to be effective, and it is suggested that it may prove useful in the study of other plant carbohydrates. Full details of the procedures and of subsequent work on the pectin and polysaccharide fractions are given.
Sunflower seed heads contained ash 11·95 and pigments and waxes extracted with 1 : 2 ethanol-benzene 12·7 per cent. After removal of these the percentage composition was lignin 12·3, pectin 27·5, alkali-soluble polysaccharides 8·2, α-cellulose 52. The pectin was 97 per cent. soluble in water. It was 37 per cent. esterified. In chemical properties it closely resembled pectin from other sources. Acid hydrolysis of the polysaccharides yielded D-xylose 59·3, D-glucose 23·5, D-galactose 16·2 per cent., traces of arabinose and rhamnose identified by chromatography, and 1·53 per cent. of an aldobiuronic acid, identified as 3-*O*-α-(D-glucopyruronosyl)-D-xylopyranose. There was evidence that the 3 main sugars were in 3 different polysaccharides, but attempts to separate these were unsuccessful.—W. M. Deans.

1595
COULSON, C. B. **Plant proteins. 5. Proteins and amino-acids of marine algae.** *J. Sci. Food Agric.*, 1955, **6,** 674–682. [Inst. Seaweed Res., Inveresk, Midlothian.]
For earlier parts see Abst. 270, Vol. 26.
Estimations were made of protein in extracts prepared in different ways and in the corresponding residues. There was interference with protein extraction, thought to be due to formation of a protein-alginate complex.
The amino-acid composition is tabulated for proteins prepared in bulk from *Rhodymenia palmata, Enteromorpha intestinalis, Laminaria cloustoni* and *Ascophyllum nodosum*. It is concluded that in general the proteins from these marine algae resemble, in amino-acid composition, those from fresh-water algae and higher plants, but differ from those of land plants in having more aspartic acid than glutamic acid.—D. Harvey.

1596
BLACK, W. A. P. **Seaweeds and their constituents in foods for man and animal.** *Chem. and Indust.*, 1955, No. 51, 1640–1645. [Inst. Seaweed Res., Inveresk, Midlothian.]

1597

HOCK, A. Eignung von Hefe als Eiweissquelle für die Ernährung von Mensch und Tier. [**Suitability of yeast as a source of protein in the diet of man and animals.**] *Arch. Tierernährung*, 1955, **5**, 225–246.

A lecture review.

1598

CERBULIS, J. **Carbohydrates in cacao beans. 2. Sugars in Caracas cacao beans.** *Arch. Biochem. Biophys.*, 1955, **58**, 406–413. [Stephen F. Whitman and Son, Inc., Philadelphia, Pa.]

In addition to D-fructose, D-glucose, sucrose, melibiose, raffinose, manninotriose and stachyose, previously found in roasted Caracas cacao beans (Title 4292, Vol. 24), planteose, verbascotetraose, verbascose and several unidentified sugars, as well as free glycerol, *meso*-inositol and an unidentified sugar alcohol were detected by paper chromatography after extraction with methanol.

W. M. Deans.

1599

ANSELMI, S., CESARI, A. and MONACELLI, R. La presenza di piccole quantità di nichel nel cacao. [**The presence of small quantities of nickel in cocoa.**] *Rend. Ist. Super. Sanità, Rome*, 1955, **18**, 597–614. French, English and German summaries.

Samples of whole, ground, shelled, unshelled, toasted, raw and completely processed cocoa from 11 regions were analysed for nickel. There was wide variation in the values found, but it was shown that Ni was present in all. It is therefore suggested that estimation of Ni is of no use in testing cocoa products for the addition of hydrogenated fats.—T. D. Bell.

1600

MARTINEK, R. G. and WOLMAN, W. **Xanthines, tannins, and sodium in coffee, tea, and cocoa.** *J. Amer. Med. Assoc.*, 1955, **158**, 1030–1031.

The sodium contents per cup prepared with distilled water according to directions on the label, estimated by flame photometer, were, in m. equiv.: ordinary coffee 0·30, instant coffee 0·35, decaffeinated coffee 0·33, tea bags 0·16, green tea 0·15, unsweetened bulk cocoa 0·34, Dutch process cocoa 1·13.

Values are also given for percentages of tannin and caffeine or theobromine, and the amounts per cup in mg.—W. M. Deans.

See also Abst. 1382.

Pasture, Hay and Silage

1601

NEHRING, K. and LAUBE, W. Untersuchungen über die Zusammensetzung der pflanzlichen Gerüstsubstanz in Grün- und Rauhfutterstoffen und ihren Einfluss auf die Verdaulichkeit dieser Futterstoffe. [**Composition of the components of supporting structures in green feeds and roughages and its effect on the digestibility of these feeds.**] *Arch. Tierernährung*, 1955, **5**, 177–215. [Inst. Landw. Versuchswesen, Rostock.]

The main supporting substances in plant tissues can be grouped as cellulose, pentosans and lignins. They were estimated separately, since it has been shown that losses occur when they are estimated together as crude fibre by the Weende method. Their digestibility was studied in 42 trials with 2 wethers; the green feeds and roughages were usually given alone, but those of poorest feeding value were given with some soya meal or meat-meal.

The crude fibre content of green feeds increased with advancing stage of growth, and the increase was most rapid in the early stages. The digestibility of the crude fibre decreased with advancing growth. The cellulose content also increased with growth and was usually close to the crude fibre content, though in straw, hay and green rye it was somewhat lower. All the crucifers, namely, marrowstem kale, mustard, winter rape and rape chaff, contained more cellulose than crude fibre. Digestibility of cellulose was usually higher than that of crude fibre, except when the digestibility of lignin was high. It fell with advancing growth.

The pentosan content of feeds increased with growth less than crude fibre or cellulose content, and more irregularly. Green rye, Italian ryegrass and straws had relatively high pentosan contents. There was no important difference in digestibility between cellulose and pentosans. In alfalfa and green rye, pentosans were more digestible than cellulose, which may be ascribed to the presence of a higher proportion of readily decomposable xylans. The lignin content rose regularly with advancing growth, and its digestibility was usually less than 10 per cent., though in a few green feeds such as rye the digestibility went up to 32 per cent., and in straws it lay between 10 and 20 per cent.

Correlation coefficients are given for the relations between crude fibre and supporting substances separately and together.

The N-free extract content was usually between 30 and 50 per cent. The content of residual carbohydrates, i.e. 100 — (ash + crude protein + crude fat + cellulose + pentosan + lignin), was much more variable and was related to species and stage of growth. It was the most easily digestible of all fractions, with a coefficient of digestibility usually exceeding 90. It is suggested that the conventional analysis of N- and fat-free substances and N-free extract is not sufficiently accurate for

modern needs, and that residual carbohydrate is a more meaningful fraction than N-free extract.

The effects of the supporting substances on the digestibility of crude fibre, cellulose, crude protein and organic matter are discussed and regression equations are given.

It is concluded that although study of crude fibre by the Weende method is still useful, more information can be obtained by study of the separate supporting substances.—D. Duncan.

1602

HOLMES, W. and MACLUSKY, D. S. **The intensive production of herbage for crop-drying. 6. A study of the effect of intensive nitrogen fertilizer treatment on species and strains of grass, grown alone and with white clover.** *J. Agric. Sci.*, 1955, **46,** 267–286. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

For previous parts see Abst. 3383, Vol. 25.

Results from a small-plot experiment lasting 5 years are presented. Increasing applications of fertiliser N to pure grass swards raised dry matter yields and crude protein yields and contents progressively. In grass and clover plots crude protein content and proportion of clover in the herbage decreased. Species varied in their response to N and in their compatability with clover. In absence of clover, cocksfoot gave the highest yields when N was applied, but it was surpassed by ryegrass and timothy when clover was present. The relative merits of fertiliser and clover N are discussed. Shading by grasses appeared to be the most important cause of suppression of clover when N was applied, and this interaction, and the grass-clover relationship, are considered.—J. L. Corbett.

1603

DENT, J. W. **Seasonal yield and composition of lucerne in relation to time of spring cutting.** *J. Brit. Grassland Soc.*, 1955, **10,** 330–340. [Nat. Inst. Agric. Botany, Cambridge.]

Cutting alfalfa in spring at the early-bud stage instead of at the early-flowering stage increased the number of cuts possible during the season from 3 to 4. Total dry matter yield was unaltered, but the quality of the first cut was very much improved, crude fibre being lower and crude protein higher.

J. L. Corbett.

1604

WEHRMANN, J. Mangan, Kupfer und Kobalt in Pflanzen and Böden schleswig-holsteinischer Weidegebiete. [**Manganese, copper and cobalt in plants and soils of pasture in Schleswig-Holstein.**] *Plant and Soil*, 1955, **6,** 61–83. [Inst. Pflanzenernähr. Bodenk., Univ. Kiel.]

Samples were collected from 56 permanent pastures in Schleswig-Holstein. The lowest mean contents of Mn, Cu and Co were in plants grown on brown earths, low moor, and low moor or podsols, respectively, but there were wide ranges of variation with botanical composition and stage of growth even on the same soil. There was little relation between soil total Mn and the Mn content of pasture plants but on the more acid soils plants often took up more Mn. Plants containing less than 5 p.p.m. Cu were found only on podsols and low moor, which soils also contained least Cu; there was no effect of *p*H. All pasture samples from podsol and low moor contained less than 0·04 p.p.m. Co on a dry matter basis, and no sample on brown earth or alluvial marsh from the west coast contained less than 0·044 p.p.m. More acid soils tended to have more available Co, but the relation was less clear than with Mn.—D. Duncan.

1605

GARCIA-RIVERA, J. and MORRIS, M. P. **Oxalate content of tropical forage grasses.** *Science*, 1955, **122,** 1089–1090. [Federal Exp. Stat., U.S. Dept. Agric., Mayaguez, Puerto Rico.]

The oxalic acid content of 24 tropical grasses ranged from 0·02 to 2·57 per cent. of the dry weight, average 0·8. Three species of *Panicum* and 2 of *Pennisetum* had more than 1·6 per cent.

A. Hepburn.

1606

DE WITT, J. B. and DERBY, J. V. (Jr.) **Changes in nutritive value of browse plants following forest fires.** *J. Wildlife Management*, 1955, **19,** 65–70. [U.S. Fish and Wildlife Serv., Laurel, Md.]

The effect of controlled burning and forest fires on the proximate composition of the leaves and young twigs of 4 plants commonly browsed by deer were examined. The experimental area was subjected to controlled burning in 1947, and was swept by fire in 1950. Periodical samples taken monthly from May to October from 1947 to 1952 and control samples from untouched areas and similar plants were analysed. Controlled burning resulted in increased protein in red maple (*Acer rubrum*), flowering dogwood (*Cornus florida*) and roundleaf greenbrier (*Surilax rotundifolia*), but white oak (*Quercus alba*) was not significantly affected. The effects were not carried over to the second year. The more severe fire caused significant increases of protein in all species, and the effect was still apparent after 2 years.—T. D. Bell.

1607

PEIVE, YA. V. Rol mikroelementov v pitanii rastenii i zhivotnykh. [**The role of trace elements in the nutrition of plants and animals.**] *Biokhimiya*, 1955, **20,** 265.

1608

TIVER, N. S. **Deficiencies in South Australian soils.** *J. Dept. Agric. S. Austral.*, 1955, **59,** 100–113.

1609

NEWMAN, R. J. **Molybdenum deficiency in Central Highlands and Upper Goulburn Regions, and adjoining districts.** *J. Dept. Agric., Victoria*, 1955, **53**, 451–463.

On acid soils of granite or basalt origin or Ordovician or Silurian sediments over more than 2 million acres in Central Highlands, Upper Goulburn and neighbouring districts the natural pasture is of low value. Vigorous swards of subterranean clover can be established after dressing with superphosphate and 2 oz. of a Mo salt per acre, with some lime on the more acid soils, *p*H 5·0 to 5·5. Field trials are described.—D. Duncan.

1610

STRANG, J. **A pasture response to applications of sodium molybdate.** *J. Austral. Inst. Agric. Sci.*, 1955, **21**, 179–180. [Dept. Agric., Berry, N.S.W.]

The site was on iron podsolised soil, a sandy clay loam developed *in situ* from argillaceous sandstone. It had received since clearing of forest a single application of superphosphate and was growing summer grass (*Digitaria*) and Japanese millet. Replicate plots were dressed with all combinations of, per acre, sodium molybdate 2 oz., borax 5 lb., copper sulphate 7 lb. and magnesium sulphate 56 lb., with 5 cwt. superphosphate per acre. All were sown with pasture seeds mixture and lime.

The best green herbage yields were from plots given Mo. Each of the other substances increased the response to Mo, but not significantly.

D. Duncan.

1611

WALKER, T. W., ADAMS, A. F. R. and ORCHISTON, H. D. **The effects and interactions of molybdenum, lime and phosphate treatments on the yield and composition of white clover, grown on acid, molybdenum responsive soils.** *Plant and Soil*, 1955, **6**, 201–220. [Canterbury Agric. Coll., New Zealand.]

1612

BOWEN, H. J. M. and DYMOND, J. A. **Strontium and barium in plants and soils.** *Proc. Roy. Soc.* [*B*], 1955, **144**, 355–368. [Biol. Res. Unit, Atomic Energy Res. Estab., Harwell.]

1613

CHESHMEDZHIEV, B. Sostav, smilaemost i hranitelna stoinost na seno ot s. Tulovo, Kazanloshko. [**Composition, digestibility and feeding value of hay from the village of Tulovo, Kazanlik.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia*, 1953–54, **4/5**, 143–150. Russian summary.

The animals were sheep.

1614

CHESHMEDZHIEV, B. Sostav, smilaemost i hranitelnost na livadno seno ot Lulin pri opiti s razlichni zhivotni. [**Composition, digestibility and feeding value of meadow hay from Lulin in trials with different animals.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia*, 1953–54, **4/5**, 151–163. Russian summary.

The animals were wethers, buffaloes, oxen and horses.

1615

CHESHMEDZHIEV, B. Sostav, smilaemost i hranitelnost na seno ot mohar i proso. [**Composition, digestibility and feeding value of Italian millet and millet hay.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia*, 1953–54, **4/5**, 165–173. Russian summary.

1616

AXELSSON, J. and KIVIMÄE, A. Försök med ensiliering av grönmajs under 1953–1954. [**Experiments in ensiling green maize in 1953–1954.**] *Kgl. Lantbruksakad. Tidskr.*, 1955, **94**, 119–124. English summary.

Three varieties of maize from the United States, Eagle Hill, KF and Wisconsin 335, were ensiled at 2 different stages of maturity in each of 2 successive years. Eagle Hill, the earliest variety, was in the milk stage and the others were more immature. Silage dry matter contained more crude fat, crude fibre and ash and less N-free extract and carotene than the corresponding dry matter of the crop. Protein and total dry matter were about the same.

Eagle Hill had more dry matter, more N-free extract and less crude fibre in the dry matter than the other varieties, both in the green crop and in the silage. It gave the best silage but was too immature to give a first-class silage and there was about 23 per cent. crude fibre in the silage dry matter. The loss of nutrients during ensiling of all varieties was moderate; only silage from the first cuts contained a small amount of butyric acid.—A. Hepburn.

1617

CHESHMEDZHIEV, B. Sostav, smilaemost i hranitelnost na silazh ot slonchogled i sudanka. [**Composition, digestibility and feeding value of silage from sunflowers and from Sudan grass.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia*, 1953–54, **4/5**, 51–59. Russian summary.

MISCELLANEOUS

1618

REITH, J. F. Drinkwater. [**Drinking water.**] *Voeding*, 1955, **16**, 945–955.

A chapter for Jansen's textbook on nutrition (see Abst. 3588, Vol. 24).

3. VITAMINS

GENERAL

1619

MARKEES, S. Neuere Forschungsergebnisse über den Wirkungsmechanismus einiger Vitamine. **[Recent results of research on the mode of action of certain vitamins.]** *Schweiz. med. Wochenschr.*, 1955, **85,** 1234–1238. [Med. Lab., F. Hoffmann-La Roche Co. A.G., Basle.] English summary.

The vitamins whose mode of action is discussed in a lecture are vitamin B_1, pantothenic acid, vitamin B_6 as pyridoxal-5-phosphate, and vitamin E.

E. M. Hume.

1620

AXELROD, A. E. and PRUZANSKY, J. **The role of the vitamins in antibody production.** *Vitamins and Hormones*, 1955, **13,** 1–27. [Inst. Pathol., W. Reserve Univ., Cleveland, Ohio.]

1621

SQUIBB, R. L., BRAHAM, J. E., GUZMAN, M. and SCRIMSHAW, N. S. **Blood serum total proteins, riboflavin, ascorbic acid, carotenoids and vitamin A of New Hampshire chickens infected with coryza, cholera or Newcastle disease.** *Poultry Sci.*, 1955, **34,** 1054–1058.

Blood samples were collected from 5 flocks of birds of both sexes and of different ages, which were affected with coryza. At each sampling, blood was collected also from comparable healthy birds. The pooled results showed that the infection caused a statistically significant rise of the total protein, and a decrease of ascorbic acid, total carotenoids and vitamin A, in the serum. There was no appreciable change in the serum riboflavin.

The effect of cholera on the serum constituents was similarly studied in 3 flocks, moderately or severely infected. In the serum of infected birds the total protein and ascorbic acid contents were significantly less than in the serum of normal birds. Serum amylase also was reduced.

The effect of Newcastle disease was studied in 6-week-old birds which were not infected, or were showing high mortality from the disease, or were survivors of an attack. The survivors showed typical signs of " crazy chick " disease. The total protein, vitamin A and total carotenoid contents of the serum were significantly decreased as the result of the infection. The ascorbic acid content was significantly increased, but riboflavin remained unaffected. In the birds showing signs of " crazy chick " disease, the total serum protein was higher than in normal birds.

It is suggested that the value of nutritional measures for controlling coryza and cholera in poultry should be investigated.

E. M. Cruickshank.

1622

GUPTA, D. P. **Vitamins and their role in various pathological processes.** *Antiseptic*, 1955, **52,** 689–696. [Dept. Pathol., S.M.S. Med. Coll., Jaipur.]

1623

WEITZEL, G., SCHÖN, H. and GEY, F. Antiatherosklerotische Wirkung fettlöslicher Vitamine. **[Anti-atherosclerotic action of fat-soluble vitamins.]** *Klin. Wochenschr.*, 1955, **33,** 772–773. [Biochem. Abt., Med. Forschungsanst., Max-Planck-Gesellsch., Göttingen.]

Spontaneous atherosclerosis in 4-year-old hens and cholesterol-induced atherosclerosis in younger hens was not affected by giving vitamin K. Vitamin E in large doses had some effect in combating the condition, and vitamin A alone or with vitamin E had a strongly beneficial effect. (To appear in full in *Hoppe-Seyler's Ztschr.*)

E. M. Hume.

1624

DUMM, M. E., LAKEN, B. and RALLI, E. P. **Factors influencing adrenal weight and adrenal cholesterol in rats following stress.** *J. Nutrition*, 1955, **56,** 517–531. [Dept. Med., Coll. Med., New York Univ.-Bellevue Med. Centre.]

Studies were made on 391 male and female rats given 7 diets containing 22 or 16 per cent. vitamin-free casein, sucrose, hydrogenated cottonseed oil, cod liver oil, salt mixture and vitamins E and K and those of the B group. The effect of greatly increasing the amount of calcium pantothenate and of adding 1000 mg. ascorbic acid per 102 g. diet was studied. After 4 weeks the animals were subjected to unilateral adrenalectomy alone or accompanied by denudation of the skin. The left adrenal gland which had been removed was weighed and analysed for cholesterol, and after an interval the right adrenal gland was removed and analysed ; results were compared and the responses of male and female rats were compared.

In rats given a high intake of pantothenate the increase in weight of the adrenal glands during the second week after both types of operation was greater than in rats given a normal intake of pantothenate. A high intake of ascorbic acid also was associated with a greater increase of

adrenal weight in the second week after unilateral adrenalectomy. The restoration of adrenal cholesterol, depleted after the operation, was slower in rats given a large amount of ascorbic acid than in rats not given an addition, but was not affected by a high intake of pantothenate. In rats having 16 per cent. of protein in the diet, adrenal cholesterol was lower 24 hr. after unilateral adrenalectomy than in rats having 22 per cent. Adrenal cholesterol recovered more slowly in female than in male rats having a normal intake of pantothenate and 22 per cent. protein. A greater increase of adrenal weight and a more prolonged depression of adrenal cholesterol occurred when skin denudation accompanied unilateral adrenalectomy than when it did not.—G. F. Garton.

1625

EAGLE, H. **The minimum vitamin requirements of the L and HeLa cells in tissue culture, the production of specific vitamin deficiencies, and their cure.** *J. Exp. Med.*, 1955, **102,** 595–600. [Lab. Infect. Dis., Nat. Microbiol. Inst., Nat. Insts. Health, Bethesda, Md.]

Requirements of a mouse fibroblast (strain L) and a human carcinoma cell (strain HeLa) for choline, folic acid, nicotinamide, pantothenate, pyridoxal, riboflavin and vitamin B_1 were estimated with a vitamin-deficient culture medium. Vitamin deficiencies did not become apparent until cells had been grown for from 5 to 15 days, when multiplication ceased and cell changes occurred. All 7 vitamins were found to be essential for the tissues in concentrations of 10^{-7} to 10^{-8} g. per ml. culture. No requirement for biotin, inositol, tocopherol, vitamin A, D, or K or lipoic acid was demonstrated in the conditions of the experiments, but the possibility of requirements for further vitamins is considered to exist.

A. M. Copping.

1626

PALLADIN, A. V. and VERTAĬMER, N. Obnovlenie belkov v tzentralnoi nervoi sisteme pri razlichnom funktionalnom sostovanii. [**Replacement of proteins in the central nervous system in different functional states.**] *Dokl. Akad. Nauk SSSR*, 1955, **102,** 319.

The absence of vitamins C and E from the diet of animals, like starvation, reduces the rate of replacement of protein in the central nervous system, the rate varying according to the functional condition of the system.—E. S. Fountain.

1627

DANILEVSKI, V. M. Profilaktika i terapiya vitaminnoi nedostatochnosti ptitz. [**Prophylaxis and treatment of vitamin deficiency in fowls.**] *Veterinariya*, 1955, **32,** No. 5, 77–81.

1628

BARTH, K. and ZUCKER, H. Zur Verwendung von Holzkohle in der Geflügelfütterung unter besonderer Berücksichtigung einer möglichen Vitamin-Adsorption. [**Use of wood charcoal in poultry feeding with special reference to possible adsorption of vitamins.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 300–307. [Inst. Physiol. Ernährung Tiere, Univ. Munich.] English summary.

According to Almquist and Zander (Abst. 3387, Vol. 10) signs of vitamin deficiency may appear in chicks on a diet including wood charcoal. The present experiment with 8 groups of 20 male and 8 groups of 20 female day-old New Hampshire chicks, reared in batteries from eggs from a single hatchery, did not confirm that result. The pullet chicks had a basal diet of, per cent., wheat 37, barley 15, oats 10, bran 5, pollards 4, soya grits 20 and fishmeal 6, with minerals, and mixtures supplying, per kg. diet, vitamin A 4000 I.U., vitamin D_3 400 I.U., vitamin B_1 2 mg., riboflavin 2 mg., and procaine penicillin 5 mg. From the 7th day of life half the groups had the same diet except that 1 per cent. wheat was replaced by the same weight of wood charcoal. Feed and water were available all the time. The plan was the same for the cockerels, but their basal diet was a fattening diet of, per cent., wheat 7, maize 20, barley 20, oats 5, bran 5, pollards 4, soya grits 26, fishmeal 6 and dried skimmed milk 4, with minerals, and mixtures supplying, per kg. diet, vitamin A 7000 I.U., vitamin D_3 1000 I.U., vitamin B_1 2 mg., riboflavin 2 mg. and procaine penicillin 5 mg.

Groups with and without wood charcoal did not differ significantly in mean bodyweight after 4 or 8 weeks, or in mean intake of feed or total nutrients after 4 or 8 weeks, or in mean efficiency of feed utilisation, or in blood clotting time, or in the vitamin A content of the liver ascertained at the close of the experiment for 2 chicks from each group. It was concluded that if the feeding and rearing conditions are good the adsorbent properties of 1 per cent. wood charcoal are too slight to affect the growth of chicks.—W. M. Deans.

1629

FANGAUF, R., KLEIN, F. W. and BARLÖWEN, G. v. Der Einfluss des Pressens und des Lagerns von Mischfutter auf die Wirksamkeit verschiedener Vitamin-Zusätze. [**Effect of pelleting and of storage of mixed feeds on the activity of vitamin additions.**] *Arch. Geflügelk.*, 1955, **19,** 239–246. [Lehr- u. Versuchsanst. Kleintierzucht, Kiel-Steenbek.] English summary.

A standard poultry mixture containing green alfalfa meal, dried yeast and a vitamin A and D supplement was used as a standard and 5 other

diets with additions of natural and synthetic vitamins were tested. All diets were tested as fresh or stored meal and as fresh or stored pellets, and the criterion of quality was the growth of chicks for 8 weeks. More was eaten when the feed was pelleted and birds given pellets had better weight gains than those given meal. There was no evidence that storage for 8 weeks decreased the value of any of the diets. Diets containing full supplements of synthetic vitamins gave growth and efficiency of use of feed comparable with those given by the standard diet. In comparison with a group without vitamin supplement all groups given vitamins A, D and B complex had a better growth rate and a lower mortality rate.

A. M. Copping.

VITAMIN A

1630

DE, N. K. **A fluorometric method for vitamin A assay.** *Indian J. Med. Res.*, 1955, **43,** 391–395. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

Biological material was first saponified to ensure that any vitamin A present was in the alcohol form. The unsaponifiable fraction was extracted with light petroleum and the extract was washed and dried. Vitamin A was estimated in samples of the same extract fluorimetrically, spectrophotometrically and colorimetrically with the $SbCl_3$ test. In the fluorimetric method a 10-ml. portion was placed in a cuvette and illuminated with light at 365 mμ. The resulting fluorescence was measured in a Photovolt Multiple Photometer, Model 520 M, an extremely sensitive apparatus capable of reading light values down to 10^{-4} microlumen. The instrument was calibrated with pure vitamin A, and the linear relationship between fluorescence and concentration of vitamin A was good for the range from 1 to 18 I.U. Good agreement was obtained with the 3 methods; for instance, an extract of shark liver oil was found to contain 6200 I.U. per g. by the fluorimetric, 5700 by the spectrophotometric and 6000 by the colorimetric method. Estimation of vitamin A by the fluorimetric method in portions of from 1 to 2·5 ml. plasma and milk did not yield consistent results. The effect of vitamin D, carotene, cholesterol and vitamin E on the fluorimetric estimation of vitamin A was studied also. Ultraviolet irradiation of carotene produced a fluorescent material, but the product did not possess the property of vitamin A as judged colorimetrically and it did not cure eye lesions in rats deficient in vitamin A. It was destroyed by further irradiation.—I. M. Sharman.

1631

CASTER, W. O. and MICKELSEN, O. **Serum vitamin A level: a critique of methods and significance.** *Amer. J. Clin. Nutrit.*, 1955, **3,** 409–417. [Nutrit. Chem. Lab., Nutrit. Branch, U.S. Pub. Health Serv., Washington, D.C.]

When vitamin A is estimated spectrophotometrically the total absorption at 328 mμ. is due not only to the vitamin A present but also to other substances. Two methods are available for estimating the true absorption due to the vitamin. In the chemical method of Bessey the total absorption is first measured and the extract is then irradiated with ultraviolet light to destroy vitamin A. The residual absorption is then estimated directly. The validity of this method depends on the assumptions that ultraviolet light converts vitamin A to products having no absorption at 328 mμ., that interfering substances originally present do not undergo appreciable change in their absorption at 328 mμ., and that ultraviolet light causes quantitative destruction of vitamin A. The second method, that of Morton and Stubbs, depends on a mathematical procedure in which the irrelevant absorption is assumed to be linear over a small range near 328 mμ. The total absorption is measured at 3 points near 328 mμ., and from the results obtained the absorption at 328 mμ. due to material other than vitamin A is estimated and subtracted from the total. Five specimens of serum were analysed by both methods, and the estimations were repeated with 4 or 5 samples of the same serum to increase precision. The agreement between the two methods was found to be poor, especially in samples containing little of the vitamin.

From a survey of the literature for studies of the vitamin A status of human subjects, it is concluded that the concentration of vitamin A in the serum is a characteristic of the individual rather than a reflection of the intake of vitamin A. From this conclusion and from the difficulties of estimating vitamin A, estimation of serum carotene is recommended as a measure of vitamin A status.

I. M. Sharman.

1632

ROGERS, A. R. **Tables for the rapid application of the Morton-Stubbs correction in vitamin-A assay.** *Analyst*, 1955, **80,** 903–906. [Anal. Dept., Allen and Hanburys, Ltd., Ware, Herts.]

Estimation of vitamin A according to the International Pharmacopoeia, the British Pharmacopoeia, and the United States Pharmacopeia is by spectrophotometric measurement with employment of the Morton Stubbs correction for irrelevant

absorption. The procedure requires measurement of extinction at the wavelength of maximum absorption of the pure vitamin and at two other wavelengths at which the extinction for the pure vitamin is exactly six-sevenths of the maximum. The British Pharmacopoeia, which specifies *cyclo*hexane as solvent, has rounded off the wavelengths for vitamin A acetate and alcohol, but has not made the corresponding adjustments in the coefficients that appear in the correction formula. On the assumption that the six-sevenths relationship holds, the formulae should read for vitamin A acetate

$$E_{corr.} = 7(E_{327\cdot5} - 0\cdot4\ E_{312\cdot5} - 0\cdot6\ E_{337\cdot5}),$$

and for vitamin A alcohol

$$E_{corr.} = 7(E_{326\cdot5} - 0\cdot417\ E_{312\cdot5} - 0\cdot583\ E_{336\cdot5}).$$

Such corrections are tedious and time-consuming. Simplifications are considered, and tables for accelerating the calculation of vitamin A potency by use of the figures given in the British and United States Pharmacopoeias are given. Values are recorded for the difference range 0·04 to 0·09, since differences outside those limits are seldom encountered with E values between 0·4 and 0·6, which is the optimum working range of most spectrophotometers. An example is given to clarify the arithmetical procedure.—I. M. Sharman.

1633

FELDHEIM, W. Zur Bestimmung des Vitamins A im Blut nach Bisaz. [**Estimation of vitamin A in blood by the method of Bisaz.**] *Schweiz. med. Wochenschr.*, 1955, **85,** 1242. [Anst. Vitaminforsch., Potsdam-Rehbrücke.]

The conclusion was reached that in the method of Bisaz (Abst. 234, Vol. 23) the precipitation of the proteins with alcohol carried down some of the vitamin A with it. It is, therefore, recommended that saponification with alcoholic potash should first take place, and that extraction should be with benzene instead of light petroleum. Estimations on 40 samples of serum gave results which were on the average 14 per cent. higher after saponification than before it.—E. M. Hume.

1634

BERGER, S. and DIETL, B. Metoda oznaczania β-karotenu w czekoladzie witaminizowanej. [**A method for estimating β-carotene in vitaminised chocolate.**] *Rocz. Państwowego Zakł. Hig.*, 1955, **6,** 181–184. Russian and English summaries.

The chocolate was mixed with water at 40° C. and the β-carotene was extracted in the cold with light petroleum. The recovery of β-carotene added to vitaminised chocolate was about 97·3 per cent. and that of total carotenoids about 94·1 per cent. The estimation with 2 concurrent samples took from 90 to 120 min. (From English summary.)

A. Hepburn.

1635

SWAIN, L. A. and IDLER, D. R. **Vitamin A instability.** *Fish. Res. Board Canada, Progr. Rep. Pacific Coast Stat.*, 1955, No. 103, 11–13. [Pacific Fish. Exp. Stat.]

Samples of oil obtained from 2 commercially produced halibut liver oil emulsions designated A and B, a mixture of 2 parts of A and 1 part of B designated C, and D, which was a refined preparation of C, were tested for the stability of vitamin A in them during 3 days' exposure to air at room temperature. The respective percentage loss was 6·6, 92·4, 93·0 and 96·7 when the spectrophotometric estimation was based on the whole oil, and 10·0, 93·2, 100 and 100 when estimation was by the Morton Stubbs method on the unsaponifiable fraction.

The iron content of oil A emulsion was 0·06 per cent. and was reduced to 0·007 per cent. by centrifuging; oil B contained 0·13 per cent., reduced to 0·012 by centrifuging. When 10 g. water was added to 1 g. oil A together with an emulsifying agent, 21·4 per cent. of the vitamin A was lost on standing at room temperature overnight. The loss was reduced to 4·9 per cent. by the addition of Versene, an iron-binding agent. The addition of 0·07 per cent. Fe as ferrous sulphate increased the loss to 73·6 per cent. and of 0·35 per cent. Fe to 82·9 per cent. The addition of Versene reduced the loss of vitamin A in the last instance to 5·9 per cent.

The addition of 0·04 per cent. butylated hydroxyanisole to oil A reduced the loss in a 3-day test from 9·5 per cent. to zero. The loss from oil B was reduced from 65·6 per cent. to 26·3 per cent. by 0·04 per cent. butylated hydroxyanisole, to 8·4 per cent. by 0·08 per cent. and to 5·3 per cent. by 0·20 per cent. Butylated hydroxytoluene was not quite as effective as the anisole derivative.

R. J. Ward.

1636

HOLYER, N. F. and WEEDON, B. C. L. **Oxidative degradation of carotenoids.** *Chem. and Indust.*, 1955, No. 39, 1219. [Dept. Chem., Imp. Coll. Sci. Technol., London, S.W.7.]

On oxidation with permanganate, α- or β-ionone ring systems form αα-dimethylglutaric, αα-dimethylsuccinic and dimethylmalonic acids according to the position of oxygen functions in the end group attached to the polyene chain. When amounts of from 10 to 100 mg. carotenoid were oxidised the resulting di-acids were separated by paper chromatography and the individual acids were identified by comparison with mixed chromatograms of authentic samples. The best separation was obtained with ascending chromatograms on No. 1 Whatman paper with 20 μl. of alcoholic solutions of about 0·1 *M* of the di-acids. The irrigation solvent was xylene, phenol and 85 per

cent. formic acid. The papers were air-dried after from 12 to 18 hours' development and were sprayed with 0·05 per cent. alcoholic solution of bromocresol green and then with 3 per cent. aqueous solution of lead acetate. Yellow-green spots appeared on a blue background and were marked immediately because of rapid fading. Unsubstituted oxalic, malonic and succinic acids were separated satisfactorily by the chromatographic procedure and did not interfere with the dimethyl compounds. Geronic and *iso*geronic acids were readily separated from the other diacids but not from one another.—I. M. Sharman.

1637

ENGEL, C. Chemie en physiologie van vitamine A en carotenoiden met vitamine A-werking. 2. **[Chemistry and physiology of vitamin A and carotenoids with vitamin A activity. 2.]** *Voeding*, 1955, **16,** 850–866. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.]

A chapter for a new textbook of nutrition (Absts. 3588, Vol. 24; 296, 342, 395, Vol. 26.)

1638

DIKSHIT, P. K. and RANGANATHAN, S. **Studies in carotene metabolism in mammals. 1. Experiments with goats. 2. Experiments with albino rats.** *Indian J. Med. Res.*, 1955, **43,** 481–487; 489–496. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

1. Goats fed on a diet of green grass, outer leaves of cabbage and Bengal gram excreted daily from 200 to 300 mg. carotene in the faeces without a trace being found in either milk or blood. After administration of massive doses of from 5000 to 14,000 μg. carotene by oral, subcutaneous or intravenous route, no trace of carotene could be found in the milk or blood. The vitamin A content of the milk was raised after carotene was given. When 10,000 μg. carotene was injected subcutaneously the vitamin A content of the milk after 24 hr. had risen to 88 from 60 I.U. per 100 ml. The same quantity of carotene injected intravenously raised the carotene content of the milk after 10 hr. to 102 I.U. from 68. The intravenous injection of 25,000 I.U. of a water-miscible preparation of vitamin A raised the vitamin A content of the blood from a trace to 167 I.U. per 100 ml. in 10 min. and that of the milk to 316 I.U. per 100 ml. from 54 after 10 hr. Studies *in vitro* in which carotene was incubated with goat's blood suggested that carotene was destroyed by oxidation and not by enzymic action. Investigation into the fate of carotene injected intravenously into goats showed that about 60 per cent. could be accounted for in the lungs within 10 min. of the injection, and none was found in the blood. Colostrum contained no carotene but was considerably richer in vitamin A than milk; 6 hr. after parturition it contained 816 I.U. per 100 ml.

2. When an intramuscular injection of 16,000 μg. carotene was given to a normal rat about 2 μg. only was found in the lungs 24 hr. later. When smaller quantities of carotene were injected into the heart considerable amounts of carotene were found in the lungs; for instance, when 925 μg. was given, 615 μg. was found in the lungs 5 min. later, and when 3040 μg. was given, 1989 μg. was found in the lungs after 10 min. When vitamin A was given in the same way, considerable quantities were found in the lungs whether the vitamin was given in oil solution or in a water-miscible form. In studies designed to examine the fate of carotene without its having to pass through the lungs before reaching the liver, injections of carotene were made into the spleen. There were discernible amounts of carotene in the lungs, 46 μg. being found after an injection of 300 μg. In experiments with rats deficient in vitamin A injections of carotene, ranging from 200 to 7000 μg., were given into the muscle, heart and spleen. Increase of bodyweight showed that carotene was physiologically active when given by any of those routes.—I. M. Sharman.

1639

GREUEL, E. and KNAPPEN, F. Zusammenhänge zwischen Serumfärbung und Dottersackinvolution der Küken während der ersten Lebenswochen. **[Relations between serum pigments and involution of the yolk-sac in chicks during the early weeks of life.]** *Arch. Geflügelk.*, 1955, **19,** 268–275. [Tierphysiol. Inst., Univ. Bonn.] English summary.

In chick blood, carotenoids fall as the yolk-sac disappears. The fall was less in chicks given lucerne meal than in those without dietary carotene, bnt the loss of yolk-sac carotene was just as rapid. The liver store of carotene sufficed to maintain some serum carotene in circulation after the yolk-sac was gone.—D. Duncan.

1640

MITOLO, M. and TERLIZZI, L. Avitaminosi "A" sperimentale e dieta proteica esclusiva. **[Vitamin A deficiency and protein diet.]** *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 87–90. [Inst. Fisiol., Univ. Bari.]

Groups of 3 rats weighing from 45 to 50 g. were given a diet lacking vitamin A, containing, per cent., olive oil 14, dried yeast 10, salts 4, agar 2, with vitamins D and E, and casein 60, fibrin 6 and egg albumin 4, or wheat gluten 65 and egg albumin 5, or wheat gluten 33, casein 33 and egg albumin 4. Three other rats had a mixed diet without vitamin A. All the rats having the high-protein diets

grew less well and died sooner than the rats having the mixed diet, those having the diet with much vegetable protein being the worst affected. The eye signs of vitamin A deficiency did not appear.
E. M. Hume.

1641

LEUTSKIĬ, K. M. and LEUTSKAYA, Z. K. Zavisimost soderzhaniya vitamina A i karotina v organizme ot malichiya belka v pishche. **[Dependence of the vitamin A and carotene content of the organism on the presence of protein in the food.]** *Dokl. Akad. Nauk SSSR*, 1955, **100,** 519–520.

1642

DANOWSKI, T. S., WIRTH, P., BLACK, M. H., BARTON, E. and BASTIANI, R. M. **Effect of vitamin A supplements on serum PBI level, and disposal of exogenous thyroxine.** *J. Clin. Endocrinol.*, 1955, **15,** 1262–1269. [Dept. Res. Med., Univ. Pittsburgh, Pa.]

Adolescent rats were fed for from 8 to 12 weeks on pellets which supplied them with 0, 2000, 10,000, 20,000 or 30,000 I.U. vitamin A acetate daily. Intakes of 10,000 I.U. or more of the vitamin, but not 2000 I.U., caused a significant decrease in the protein-bound iodine of the blood serum. This effect was not found in 2 healthy men and 2 healthy women who were given 500,000 I.U. vitamin A daily for 3 weeks, presumably because the dose was too small. In further studies rats were given 0·1 or 0·2 mg. thyroxine daily with or without 10,000 I.U. vitamin A. In 3 out of 4 experiments less protein-bound iodine was found in the groups which received 10,000 I.U. vitamin A than in the groups not given vitamin A. The difference was not statistically significant. In 4 human subjects the effect of thyroxine was not altered by vitamin A, 500,000 I.U. daily given by mouth, a dose per kg. bodyweight only one-fifth of that given to the rats. It is concluded that vitamin A affects the production and mobilisation of thyroxine, but not the rate of its disposal in the body.—T. Moore.

1643

MATTERSON, L. D., BUNNELL, R. H., STINSON, L. D., SINGSEN, E. P. and POTTER, L. M. **The effect of incorporating diphenyl-p-phenylenediamine (DPPD) into a ration containing various levels of vitamin A from fish oils.** *Poultry Sci.*, 1955, **34,** 1080–1084. [Dept. Poultry Sci., Storrs Agric. Exp. Stat., Univ. Connecticut.]

Groups of crossbred chicks were given for 8 weeks a semi-purified diet without vitamin A, supplemented per lb. with vitamin A from fish oil in amounts from 75 to 4800 I.U., and with or without diphenyl-*p*-phenylenediamine (DPPD). All the feed for the experiment was mixed beforehand and stored at 75° F. After 2, 4, and 8 weeks, 5 birds from each group were killed and the vitamin A content of the blood and liver was estimated. The maximum growth response in chicks given DPPD was obtained with 1635 I.U. vitamin A per lb. feed, and in those not given DPPD, with 2445 I.U. With supplements of vitamin A up to 1200 I.U. per lb., in the presence or absence of DPPD, the vitamin A content per g. liver was less at 8 weeks than at 4 weeks. It appeared, therefore, that more than 1200 I.U. per lb. feed, the National Research Council's recommended allowance, was required to obtain maximum growth and maintain liver reserves. With the amounts of vitamin A studied as supplement, the vitamin A content per g. liver at 8 weeks of age was from 2 to 5 times greater with DPPD than without. The vitamin A content of the plasma was higher also, though the increase was less than in the liver.—E. M. Cruickshank.

1644

MURRAY, T. K. and CAMPBELL, J. A. **The effect of aureomycin on the apparent utilization of vitamin A by the ovariectomized rat.** *J. Nutrition*, 1955, **57,** 89–99. [Food and Drug Labs., Dept. Nat. Health Welfare, Ottawa.]

Young ovariectomised rats were given a diet deficient in vitamin A until their reserves were depleted as judged by the appearance of large numbers of cornified epithelial cells in the vagina. They received by mouth over a period of 2 days 25, 50 or 100 I.U. vitamin A. Aureomycin was given 2 days before dosage to half the animals and was supplied throughout the experiment. Vaginal smears were examined daily, and the number of days elapsing between the beginning of dosing with vitamin A when no cornified epithelial cells were present and their reappearance was recorded. The response results were calculated as days in relation to the logarithm of the dose. Aureomycin at the rate of 33 mg. per kg. diet had no effect, but with 66 mg. the apparent increase in utilisation of vitamin A ranged from 18·5 to 50·5 per cent. When the aureomycin was included in the diet from 2 days before dosing to only one day after it, it had no effect on the potency of vitamin A. When it was given from one day after dosing until the end of the test, its effect in increasing potency was of the same order as when given throughout the test, but given from 2 days after dosing it had no effect. The addition of 4 mg. α-tocopherol to the vitamin A did not affect the utilisation of vitamin A whether aureomycin was present or not. Vitamin B_{12} at the rate of 2·5 mg. per kg. diet did not behave like aureomycin, and it did not eliminate the effect of aureomycin.
R. J. Ward.

1645

MURRAY, T. K. and CAMPBELL, J. A. **Effect of aureomycin on liver storage of vitamin A, and on growth, depletion and survival time of rats.** *J. Nutrition*, 1955, **57**, 101–110. [Food and Drug Labs., Dept. Nat. Health Welfare, Ottawa.]

Male and female rats were given a diet of starter mash which contained vitamin A. Aureomycin was given to half the animals at the rate of 66 mg. per kg. diet. After 28 days they were all killed and vitamin A was estimated in the liver. There was little difference between females given and not given aureomycin; the mean weight of the liver was, respectively, 7·2 and 6·9 g., and the mean content of vitamin A was 1590 and 1514 I.U. For males the corresponding values were 9·9 and 9·1 g., and 1412 and 1643 I.U. Both differences were significant absolutely but not in terms of vitamin A stored per g. food eaten.

In a second experiment rats of both sexes in 2 groups were given a diet without vitamin A and with or without aureomycin at the rate of 66 mg. per kg. diet. All the rats were given 50 I.U. vitamin A acetate 3 times a week. After 4 weeks vitamin A was estimated in the liver. For males there was no difference in the mean weight or vitamin A content of the liver. The livers of females given aureomycin were significantly smaller than those of females not given aureomycin, and weighed 4·24 compared with 4·76 g., but there was no significant difference in vitamin A content. Aureomycin had no influence on the rate of depletion measured by the vitamin A content of the kidney, liver or plasma, but age and weight at depletion were significantly increased by aureomycin in 2 out of 3 experiments. With a daily maintenance dose of 2 I.U. vitamin A, aureomycin significantly increased the mean weekly weight gain, but not with a daily dose of 1 I.U.

R. J. Ward.

1646

CAMP, A. A., CARTRITE, H. T., QUISENBERRY, J. H. and COUCH, J. R. **Supplementary vitamin A and choline in the diet of the growing chick.** *Poultry Sci.*, 1955, **34**, 1134–1138. [Texas Agric. Exp. Stat., Gonzales.]

Eight groups each of 112 chicks were given for 10 weeks a ration of yellow maize, milo, soya bean meal, fish solubles, dried whey, minerals and the necessary vitamins other than vitamin A, supplemented with 5 per cent. dehydrated alfalfa leaf meal, or 2·5 per cent. alfalfa and 2000 I.U. vitamin A per lb., and with or without choline. The vitamin A was in dry, stabilised form; the 2·5 per cent. alfalfa supplied 2300 I.U. vitamin A activity per lb. feed. The substitution of vitamin A for part of the alfalfa increased liveweight at 10 weeks of age to a highly significant extent and improved efficiency of feed conversion. The addition of choline to the ration containing 5 per cent. alfalfa also increased liveweight significantly, but there was no significant growth response when choline was added to the ration containing the vitamin A supplement. It is suggested that choline aids in the utilisation of carotene in alfalfa.

E. M. Cruickshank.

1647

HARMS, R. H., REID, B. L. and COUCH, J. R. **Storage of vitamin A in chick livers as a criterion of stability, availability, and dietary level.** *Poultry Sci.*, 1955, **34**, 1125–1133. [Dept. Poultry Husb., Texas Agric. and Mech. Coll. System, College Station.]

Day-old chicks received for 4 or 10 weeks a basal diet without vitamin A or with, per lb., 4000 I.U. vitamin A from a fish oil or a stabilised vitamin A concentrate. The diets were freshly mixed every 5 weeks. Experiments were made at different seasons of the year.

Birds given stabilised vitamin A grew better and stored significantly more of the vitamin in the liver than birds given the vitamin in fish oil. The vitamin A content of the liver, particularly in the birds given fish oil, increased as the weather became cooler, probably because of increased feed consumption. The increase in liver storage in the birds given fish oil was much greater than in the birds given stabilised vitamin A, which was taken as evidence that in the hot weather appreciable destruction of the vitamin occurred in diets supplemented with fish oil and relatively little in diets containing stabilised vitamin A. In hot weather, chicks given diets which contained fish oil and which had been stored at 55° F. deposited more vitamin A in the liver than chicks given the same diets stored at the prevailing room temperature. In chicks given for 4 weeks amounts of vitamin A from 500 to 240,000 I.U. per lb. feed, the increase in vitamin A stored in the liver bore a linear relationship to the increase in dietary vitamin A. The percentage of the vitamin A ingested which was stored in the liver varied from 7 to 43; in general, increased intake resulted in increase in the percentage stored. In chicks which for 4 weeks were given graded amounts of vitamin A and then were deprived of the vitamin, survival time was directly related to the amount stored in the liver.

It is concluded that the amount of vitamin A deposited in the liver of chicks during a 4-week test may be used to evaluate the stability and availability of vitamin A supplements added to mixed feeds.—E. M. Cruickshank.

1648

DEADRICK, R. E., BIERI, J. G. and CARDENAS, R. R. (Jr.) **Effects of octachloronaphthalene**

on vitamin A metabolism in the rat. *J. Nutrition*, 1955, **57**, 287–295. [Dept. Biochem. Nutrit., Univ. Texas Med. Branch, Galveston.]

Rats whose stores of vitamin A had been partly depleted were given a diet deficient in vitamin A containing yeast and a daily supplement of 994 μg. vitamin A for 10 days, followed by the diet alone or with 0·05, 0·20 or 0·50 per cent. octachloronaphthalene incorporated in it. After 22 days for the 4 groups, respectively, the average vitamin A content of the liver and kidneys together was 37·6, 13·9, 8·4 and 4·6 μg. per g., and of the serum 59·6, 80·4, 73·0 and 97·2 μg. per 100 ml.

In a second experiment weanling rats were given a deficient diet containing yeast, alone or with 0·05 or 0·30 per cent. octachloronaphthalene. A single dose of 121·5 μg. carotene in oil was given by mouth 4 days before the rats were killed. The average respective vitamin A content of the liver and kidneys together was 5·6, 3·6 and 2·6 μg. per g. and of the serum 36·3, 36·9 and 30·4 μg. per 100 ml. The vitamin E content of the liver was 59·1, 50·1 and 40·6 μg. per g. for the respective groups, but the differences were not statistically significant. When the purified diet contained no yeast and was given with or without 0·03 per cent. octachloronaphthalene there was no significant change in the vitamin A or vitamin E content of the serum.

In a third experiment deficient rats were given the deficient diet containing yeast with or without supplements of 0·10 or 0·30 per cent. octachloronaphthalene. After 3 days half of each group was given orally 131 μg. carotene in oil and the other half an intravenous injection of 131 μg. carotene dispersed in water. In the groups receiving carotene intravenously there was no difference between those given and not given octachloronaphthalene in the amount of vitamin A formed or carotene recovered from the tissues. When the carotene was given orally the vitamin A content of the liver and kidneys together of the rats not given octachloronaphthalene was 9·7 μg.; with 0·01 per cent. octachloronaphthalene it was 6·4 μg., and with 0·03 per cent. octachloronaphthalene 6·2 μg. Faecal excretion of carotene could not be estimated because large quantities were present of a yellow pigment which could not be separated from carotene. The addition of 8 per cent. yeast to the purified diet prevented accumulation of fat in the liver of rats given octachloronaphthalene, but did not prevent enlargement of the liver.—R. J. Ward.

1649

KAGAN, B. M. and KAISER, E. **Vitamin A metabolism in infection. Effect of sterile abscesses in the rat on serum and tissue vitamin A.** *J. Nutrition*, 1955, **57**, 277–286. [Dept. Paediat. Res., Kunstadter Labs. Paediat. Res., Michael Reese Hosp., Chicago, Ill.]

In rats receiving a diet containing 8 I.U. vitamin A per g., a subcutaneous or intramuscular injection of turpentine once a week produced sterile abscesses, and caused a pronounced reduction of vitamin A in the blood serum. There was also a slight decrease in the reserves of vitamin A in the liver, and an increase is claimed in the amount of vitamin excreted in the urine. The injections did not affect the ability of the rats to absorb vitamin A alcohol given by mouth. Injections of sweet almond oil also reduced vitamin A in the blood serum.—T. Moore.

1650

GREEN, B., LOW, J. S. and MORTON, R. A. **The effect of vitamin A deficiency on the cholesterol levels of the plasma and liver of the rat.** *Biochem. J.*, 1955, **61**, 447–453. [Dept. Biochem., Univ. Liverpool.]

Two groups of 20 weanling rats were given a stock diet for 40 days and then a synthetic vitamin-A-free diet. One group received a supplement of 12 I.U. vitamin A daily for 113 days and then 20 I.U.; the other group received 0·1 ml. arachis oil daily. Plasma cholesterol was estimated on 8 rats each day so that the 40 animals were examined every 5 days. Blood was withdrawn by cardiac puncture. Cholesterol was estimated by a modification of the method of Kenny (Abst. 1271, Vol. 23). At the end of the experiment vitamin A was estimated in the kidneys and cholesterol in the liver.

There was no significant difference between the 2 groups at the 1 per cent. level in the mean values for plasma cholesterol which over the period of the experiment ranged from 99·4 to 118·5 mg. per 100 ml. for the rats given vitamin A and from 94·4 to 119·5 for the deprived animals. There was also no significant difference between the 2 groups in the cholesterol content of the liver, the mean values for which were 18·57 mg. per liver for the non-deprived animals and 19·56 for the deprived, or 2·556 mg. per g. tissue for the non-deprived and 2·876 for the deprived.—R. J. Ward.

1651

BERN, H. A., ELIAS, J. J., PICKETT, P. B., POWERS, T. R. and HARKNESS, M. N. **The influence of vitamin A on the epidermis.** *Amer. J. Anat.*, 1955, **96**, 419–447. [Dept. Zool., Univ. California, Berkeley.]

Rats were fitted with pads to cover a shaved dorsal area, and were left untreated or given daily applications or injections of sesame oil or of a solution of vitamin A alcohol in sesame oil. The animals were killed after intervals of up to 60

days, and the area of skin from under the pad was examined histologically after staining by several different methods, and sometimes by electron microscopy. When applied to the skin vitamin A caused acanthosis, with doubling of the thickness of the skin. There was no evidence of differentiation into mucus-secreting cells, or of interference with the process of keratinisation. Sesame oil by itself caused only a slight thickening of the skin. Subcutaneous injections of the vitamin A solution or of the solvent oil did not cause thickening. Vitamin A resembled oestradiol in causing acanthosis when applied to the epidermis of the nipples of male guineapigs, and the thickening was about the same whether the vitamin and hormone were applied together or separately.—T. Moore.

1652

RAMALINGASWAMI, V., LEACH, E. H. and SRIRAMACHARI, S. **Ocular structure in vitamin A deficiency in the monkey.** *Quart. J. Exp. Physiol.*, 1955, **40,** 337–347. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

Young growing monkeys, *Macacus sinicus*, were given a diet deficient in vitamin A, of polished rice, casein, arachis oil, minerals, and vitamins C, D and the B complex. Others were given adequate vitamin A. After from 3 to 4 months xerophthalmia appeared in 2 of the 3 monkeys not given vitamin A. Bitôt's spots were seen, and the eyelids were swollen. The concentration of vitamin A was much reduced in the plasma of these 2 deprived animals, but not in that of the third. When the monkeys were tested for their capacity for dark adaptation by threatening them silently with a white stick in a dark room, the 2 with a low value for plasma vitamin A responded only after from 35 to 45 min. in the dark. The third, and 2 given vitamin A, responded after from 4 to 6 min. By the end of the 4th month both the animals with a low plasma value for vitamin A had developed keratomalacia in one eye. Histological studies of the affected eyes revealed degeneration of the pigment epithelium of the retina and atrophy of the rods and cones. Descemet's endothelium was degenerated. In one animal damage to the retina was present without involvement of the cornea, which suggests that in man the incidence of damage to the retina through chronic deficiency of vitamin A may be much greater than would be assumed from the incidence of keratomalacia.—T. Moore.

1653

GRANT, A. B. **Vitamin A and ovine rickets.** *Vet. Rev.*, 1955, **1,** 115–116. [Wallaceville Animal Res. Stat., Wellington, N.Z.]

1654

GIROUD, A. and MARTINET, M. Malformations diverses du foetus de rat suivant les stades d'administration de vitamine A en excès. [**Foetal malformations in the rat after administration of excess of vitamin A.**] *C.R. Soc. Biol.*, 1955, **149,** 1088–1090.

Pregnant rats were given 60,000 I.U. daily of vitamin A for 3 days at different stages of gestation, and the effect on the foetuses was studied; the mothers were killed on the 21st day of pregnancy. When the vitamin was given from the 5th to the 7th day of pregnancy the usual effect was resorption of the foetuses. Of the few which survived, about 8 per cent. were anencephalic and some had cleft palate. Overdosage during days 8 to 10 caused anencephaly in 53 per cent. of the foetuses, and spina bifida, anophthalmia, microphthalmia and occasionally cleft palate. After treatment during days 11 to 13 cleft palate was found in 92 per cent. of the foetuses, and there were a few cataracts and "open eyes". Cleft palate was again the main lesion after treatment during days 14 to 16, but it occurred in only 49 per cent. of the foetuses, a few of which had cataracts. Finally, after treatment on days 18 to 20, cataract was the only abnormality found. The findings show clearly that the teratogenic action of the excess of vitamin A depends on the stage in development of the foetus at which the excess is given; the ill effects sometimes appeared to extend beyond the actual period of treatment.—T. Moore.

1655

WOLBACH, S. B., MADDOCK, C. L. and COHEN, J. **The hypervitaminosis-A syndrome in adrenalectomized rats; skeletal changes in weanling rats with and without cortisone.** *Arch. Pathol.*, 1955, **60,** 130–135. [Labs. Nutrit. Res., Child. Med. Centre, Boston, Mass.]

In rats which were given 1000 I.U. vitamin A palmitate per g. bodyweight daily, adrenalectomy accelerated the action of excess vitamin A on the skeleton. The essential nature of the lesions was, however, much the same with and without adrenalectomy. Survival time was prolonged by 50 mg. cortisone daily, but not by 1 mg.—T. Moore.

1656

MAINARDI, B. Ricerche sperimentali su gli effetti delle dosi urto di vitamina A nei suini neonati. [**The effects of massive doses of vitamin A on newborn pigs.**] *Riv. Zootec.*, 1955, **28,** 326–330.

Baby pigs were given by mouth on the third day of life single massive doses of vitamin A ranging from 50,000 to 500,000 I.U. Growth was stimulated during the 8 weeks of the trial progressively more by doses up to 400,000 I.U. When

a dose of 1,000,000 I.U. was given growth was depressed, and signs of toxicity were produced by 10,000,000 I.U. Post-mortem examination of pigs dying within 4 days after getting the largest dose revealed kidney lesions, which are described.

T. D. Bell.

1657

GLEDHILL, R. H. and SMITH, S. B. **The effectiveness of different vitamin A sources for poultry.** *Poultry Sci.*, 1955, **34**, 942–948. [Rhode Island Agric. Exp. Stat., Kingston.]

Day-old chicks which received for 10 weeks a practical ration, supplemented with a commercial preparation of vitamin A in a dry form, gained more weight, used their feed more efficiently, and had a lower mortality rate, than when the vitamin was supplied as freshly processed fish liver oil or as provitamin A in alfalfa leaf meal. The storage of vitamin A in the whole liver of chicks receiving per lb. feed 1000 I.U. vitamin A in the dry form was 1396 I.U., compared with 985 and 680 I.U., respectively, for chicks receiving the same amount of supplementary vitamin A as fish oil or alfalfa. Egg production of pullets was higher with the dry preparation of vitamin A than with fish oil. Chicks hatched from the eggs of those pullets and maintained on a diet lacking vitamin A survived longer when the pullet's diet contained the dry forms of vitamin A than when it contained fish oil.

E. M. Cruickshank.

1658

SAMPATH, S. R., ANANTAKRISHNAN, C. P. and SEN, K. C. **Studies on vitamin A in milk. 8. Vitamin A in market milk.** *Indian J. Dairy Sci.*, 1955, **8**, 129–134. [Indian Dairy Res. Inst., Bangalore.]

For Part 7 see Abst. 4349, Vol. 24.

Four hundred samples of milk, cow's, buffalo's and a mixture of the two, obtained commercially in Bangalore, were analysed for fat and vitamin A during the year 1953–54. The value for vitamin A, in I.U. per lb., ranged from 336 to 1025, 492 to 1536, and 449 to 1200 for cow's, buffalo's and mixed milk, respectively. The average monthly values for cow's milk varied from 582 in January to 806 in June, and for buffalo's milk from 745 in January to 1151 in September. Milk from centres in the municipal area had more vitamin A than others, which would be expected because such centres are known to take special care to provide adequate amounts of green fodder. The percentage of fat in the samples of cow's, buffalo's and mixed milk ranged, respectively, from 3·0 to 6·0, 4·4 to 8·6, and 3·2 to 6·2, with average values 4·2, 6·2 and 4·8.—I. M. Sharman.

1659

HIGASHI, H., HIRAO, S., YAMADA, J. and KIKUCHI, R. **The vitamin A content of *Heteroscymnus longus* Tanaka, a kind of deep sea shark.** *J. Vitaminol., Japan*, 1955, **1**, 200–207. [Sect. Marine Product Utilisation, Tokai Reg. Fish. Res. Lab., Tsukishima, Chuo-ku, Tokyo.]

The percentage of oil in the liver of 4 specimens of the shark *Heterocymnus longus* ranged from 62·5 to 80·5, and the vitamin A content of the liver oil from 2990 to 16,700 I.U. per g. The vitamin A content in I.U. per g. of other oils was for kidney from 516 to 25,500, pancreas 20,200, spleen 11,200 and egg 810. The oil content of the kidney, pancreas and spleen was about 2 per cent. and of the egg 35 per cent. The eyes contained from 114 to 118 I.U. vitamin A. The oil content of the flesh was from 15·8 to 23·1 per cent.; the oil of the common flesh contained from 505 to 1550 and that of the dark flesh from 318 to 856 I.U. per g. The vitamin A content of the flesh thus ranged from 9120 to 26,800 I.U. per 100 g., the highest vitamin A value for fish flesh ever known. The amount of vitamin A in the flesh was from 5 to 7 per cent. of that in the liver. The flesh oil contained about 10 per cent. of unsaponifiable matter. No squalene was detected in the flesh of any of the specimens.—R. J. Ward.

1660

FISHER, L. R., KON, S. K. and THOMPSON, S. Y. **Vitamin A and carotenoids in certain invertebrates. 2. Studies of seasonal variations in some marine crustacea. 3. Euphausiacea.** *J. Marine Biol. Assoc. U.K.*, 1954, **33**, 589–612; 1955, **34**, 81–100. [Nat. Inst. Res. Dairying, Univ. Reading.]

For Part 1 see Abst. 308, Vol. 24.

2, Fat, vitamin A and carotenoids were estimated in specimens of *Meganyctiphanes norvegica* and *Thysanoessa raschii* collected at about monthly intervals from Loch Fyne. Each monthly haul was separated into groups by length with 2-mm. intervals. Vitamin A was found in the eyes of both species, 66 to 100 per cent. of the total in *Meganyctiphanes norvegica*, and 65 to 98 per cent. in *Thysanoessa raschii*. In no group of either was β-carotene found in more than a minute trace. Astaxanthin or its esters was the only carotenoid found. In *M. norvegica* the eyes contained about 50 per cent. of the total in the animal, and in *Thysanoessa* the average was about 65 per cent. Chromatographic estimation showed a higher ratio of vitamin A ester to vitamin A alcohol in the eyes than in the bodies of both Euphausiacea. The concentration of vitamin A and astaxanthin was higher in the spring and autumn. Higher concentrations were found in larvae and in adults over 30 mm. long of *Meganyctiphanes*, and in larvae and in adults over 15 mm. of *Thysanoessa*, than in adults of 20 to 30 mm. and of 13 to 15 mm., respectively.

Similar estimations were made on specimens of the shrimps *Crangon allmani* and *C. vulgaris*, *Nephrops norvegicus* and the eyes of the lobster (*Homarus vulgaris*) which were collected at regular intervals for a year. No seasonal variation in the reserves of vitamin A and astaxanthin was found in the shrimps. The vitamin A content of the lobster eyes rose from 15 I.U. per g. in January to 20 in April and then fell to about 4 towards the end of the year. Carotenoids also reached their highest value, 85 μg. per g., in the spring and fell during the remainder of the year. The origin of the large reserves of vitamin A in the eyes of Crustacea is discussed and the possible role of astaxanthin as a precursor is considered.

3. Fat, carotenoids and vitamin A were estimated in 11 species of Euphausiacea. Groups of *Meganyctiphanes norvegica* from Loch Fyne and the Mediterranean had higher reserves of vitamin A, 11 to 29 I.U. per g., than those from open Atlantic waters, 7·4 to 11. From a total of 258 groups of this species a weighted average of 15 I.U. vitamin A per g. was deduced. Very high concentrations, over 100 I.U. per g., occurred in larvae. In *Thysanoessa raschii* concentrations of vitamin A were much more widely distributed, though half the groups examined had values between 10 and 45 I.U. per g. The weighted average for the whole series of 190 groups was 33 I.U. per g. In *Euphausia pacifica*, *Meganyctiphanes norvegica* and *Thysanoessa raschii* it was found that the vitamin A content of animals separated into eyes and bodies before preservation was higher than in animals left whole. The suggestion that a substance might be present in the bodies causing destruction of vitamin A is being further investigated. Vitamin A was found also in *Thysanoessa inermis*, *T. gregaria*, *T. spinifera*, *Euphausia superba*, *Nematoscelis difficilis*, *Stylocheiron maximum* and *S. elongatum*. In *E. superba* the concentration of vitamin A was less than in the other species containing vitamin A but was still higher than in other decapod Crustacea. No vitamin A was found in *Thysanopoda acutifrons*. In all the species examined astaxanthin or its esters was the only carotenoid detected. The role of euphausiids as the link conveying nutrient substances from detritus, phytoplankton and zooplankton to marine vertebrates is considered with particular reference to the conversion of carotenoids to vitamin A by them.

I. M. Sharman.

1661

KORDZHIEVA, N. Prouchvaniya vorhu sodorzhanieto na karotin v nyakoi furazhi v zavisimost ot vegetaciyata na rasteniyata. **[Carotene content of some fodders in relation to vegetative growth.]** *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia*, 1953–54, **4/5**, 101–125. Russian summary.

1662

DODI, B. Variazioni di ordine genetico ed ambientale nel tenore in caroteni dei vegetali. **[Genetic and environmental variations in the carotene content of plants.]** *Riv. Zootec.*, 1955, **28**, 320–324. [Ist. Zootec. Gen., Fac. Agrar., Univ. Piacenza.]

Carotene was estimated by chromatography in 8 varieties of carrot (*Daucus carota*) each grown in 8 different centres with different types of soil. The method of estimation is described.

The average carotene content was 64·15 mg. per kg., but there was great variation between varieties and between centres. Important causes of difference between centres were time of sowing and degree of insect infestation. Information on the carotene content of feeds should include the minimum likely to be encountered, as well as the average.—T. D. Bell.

1663

SCHARRER, K. and RÄKER, K. Der Einfluss der Einsäuerung der Futtermittel auf deren Carotingehalt. **[Effect of ensiling feedingstuffs on their carotene content.]** *Ztschr. Tierernährung Futtermittelk.*, 1955, **10**, 275–300. [Agrikulturchem. Inst., Justus Liebig Hochsch. (Univ.), Giessen.] English summary.

Lucerne, mustard, radish, sugar-beet leaves and other forage materials were ensiled in wooden or concrete silos each holding from 200 to 300 kg. A.I.V. solution, HCl, molasses, sugar, Amasil, Kofa salt, Glykosil salt and Glykosil solution were tested as preservatives. Silages were made also without addition. After 4 months the silages were examined for α- and β-carotenes, volatile acids, *p*H and protein degradation. Subjective observations were made on taste, smell, colour and structure. Quality was assessed on Flieg's scale.

The loss of carotene ranged from 3 to 88 per cent. There appeared to be no regular relationship between the type of preservative and the retention of carotene, or between silage quality and carotene content. Poor silage sometimes had a high carotene value. The α-carotene content sometimes appeared to increase, which may have been due to inclusion of isomers of β-carotene in the α-fraction.

The best silages were obtained with A.I.V. solution, molasses, sugar and Kofa salt, which were, on the average, about equally good for silage production. A.I.V. solution gave the most consistently good results. With sugar-beet leaves all the mixtures produced good silage.—V. H. Booth.

1664

WIERZCHOWSKI, Z. Wpływ temperatury, tlenu i światła na zawartość karotenow w zielonkach roślin pastewnych w czasie suszenia. [**The influence of temperature, oxygen and light on the carotene content of green forages during drying.**] *Rocz. Nauk rol.* [*B*], 1955, **69**, 163–194. Russian and English summaries.

The green forages used were yellow lupins, alfalfa and bushy rye. The crops were dried in the field, in the shade under a roof, artificially in an air oven at from 50° to 60° C. with ventilation, in a vacuum oven at 50°, or in an air oven at from 105° to 200° C.

The percentage loss of carotene from alfalfa dried in the field was from 95 to 100, and in the shade 90. Artificial drying at high temperature showed a loss of from 6 to 69 per cent. according to the temperature and duration; loss was lowest at from 50° to 60° C. with ventilation, and highest at 105° C. Loss was high with very juicy material, and rapid drying helped to preserve the carotene. Vacuum drying gave a loss of only from 0·2 to 3 per cent. Lupin leaf meal, dried with ventilation, and stored in hermetically sealed glass containers for from 2½ to 4½ years, still contained from 16 to 77 mg. carotene per kg. Meals kept in dark glass containers at a low temperature for 16 months had a high proportion of the original carotene. (From summary.)—J. S. Thomson.

1665

BOOTH, V. H. **Preservation of carotene in dried green crops. An appraisal of the present standing of the problem of preventing loss during storage.** Association of Green Crop Driers, Cereal House, Mark Lane, London, E.C.3, 1955, pp. iii + 60. Price 8s. 6d.

The present state of knowledge about the problem of reducing loss of carotene during storage in dried grass and in lucerne and alfalfa meals is described in a monograph. There is an extensive review of published work, and new data based on original experiments are reported.

Loss of carotene can be prevented by exclusion of oxygen, but in practice exclusion is both difficult and costly. Storage in large tanks under an inert gas, as practised in the United States, gives excellent protection, but involves large capital costs. Grinding into meal causes heating, and loss of carotene during subsequent storage could be substantially reduced by cooling. Partial refrigeration, with the stacks of meal used as insulating material, might pay. Compression of meal into blocks gives a small amount of protection. When meal has to be stored in sacks or other packs permeable to oxygen, moisture content becomes important. A moisture content between 6 and 8 per cent. should be carefully maintained; managers of drying plants may not be aware that the product of their driers sometimes has less. Use of anti-oxidants can appreciably reduce loss of carotene, one of the most effective being 1 : 2-dihydro-6-ethoxy-2 : 2 : 4-trimethylquinoline. Oil as a vehicle for the anti-oxidant reduces dustiness of the meal, so that the total improvement may well warrant the cost of application. It is suggested that 150 g. anti-oxidant in 10 kg. vegetable oil should be applied per long ton (1000 kg.) meal. Such an amount corresponds with a final content of 150 p.p.m. of anti-oxidant and 1 per cent. of oil. Whether such anti-oxidants can be physiologically tolerated is still uncertain. The relative cost of the different protective schemes suggested is discussed. Control of moisture would be cheapest to operate, cooling would come second, particularly if combined with acceptance of coarser grinding, and when oil is applied to reduce dustiness the addition of anti-oxidant to it would come next. Partial refrigeration would be slightly more expensive. Barrier packing would be costliest of all.

The report recommends that dried green crop should be separated earlier than is usual at present into one of two categories according to its intended use as source of carotene or of protein. Only the former warrants protective treatment. Consideration should be given to the scheme "chop, compress, barrier-pack, store, grind at compounding plant and convey direct to mixer". Changes of machinery would be required, including replacement of mill by press, but the removal of dust and the reduction in transport costs and storage space of the denser material would contribute to justify the scheme.—I. M. Sharman.

See also Absts. 1549, 2462.

VITAMIN D

1666

STROSS, P. S. and BREALEY, L. **The chemical estimation of calciferol in pharmacopoeial preparations.** *J. Pharm.*, 1955, **7**, 739–750. [British Drug Houses, Ltd., London, N.1.]

Estimation of vitamin D in Tablets of Calciferol B.P. and Solution of Calciferol B.P. were based on the antimony trichloride-acetyl chloride reaction of Nield *et al.* (Absts. 3363, Vol. 10 and 1028, Vol. 13), and included a chromatographic procedure of purification from decomposed calciferol. Results obtained by chemical tests were found to be in agreement with those of biological tests.

K. H. Coward.

1667

LYNESS, W. L. and QUACKENBUSH, F. W. **New color reaction for vitamins D.** *Anal. Chem.*, 1955, **27**, 1978–1980. [Dept. Biochem., Purdue Univ., Lafayette, Ind.]

The iodine and ethylene dichloride reagent was prepared in presence of mercuric *p*-chlorobenzoate, which enhanced the yellow colour given by vitamin D_2 and D_3 with the reagent. The yellow colour reached its greatest intensity in about 7 min. and then faded slowly; it had a very sharp maximum of spectral absorption at 450 mμ. The absorption of a number of samples of crystalline vitamin D_2 and vitamin D_3 was identical. Ergosterol, cholesterol, lumisterol, 7-dehydrocholesterol, stigmasterol and sitosterol gave no yellow colour, and the first 3 when tested did not interfere with the absorption of vitamin D. Vitamin A produced a weak violet colour with maximum absorption at 555 mμ. and with weak absorption at 450 mμ. Its presence caused some interference with the spectral absorption of vitamin D, and it is considered desirable to remove vitamin A from mixtures of it with vitamin D, which could be done by chromatography. The ethylene dichloride used sometimes needed purification with H_2SO_4 and silica gel. Other mercuric salts enhanced colour production, but none as much as the *p*-chlorobenzoate.—E. M. Hume.

1668

ROGERS, A. R. **The spectrophotometric determination of vitamin D in pharmaceutical preparations. 2. Tablets of calciferol B.P.** *J. Pharm.*, 1955, **7**, 731–738. [Anal. Dept., Allen and Hanburys, Ltd., London.]

A method is described for estimating vitamin D in tablets by extraction and direct spectrophotometric estimation at 265 mμ. in *cyclo*hexane, ethanol or light petroleum ($E\ ^{1\ per\ cent.}_{1\ cm.} = 470$) or at 267 m$\mu$. in ethylene dichloride ($E\ ^{1\ per\ cent.}_{1\ cm.} = 420$) and by spectrophotometric estimation at 500 mμ. of the colour developed in about 1 min. in the $SbCl_3$ reaction ($E\ ^{1\ per\ cent.}_{1\ cm.} = 2000$). A mixture of reagent and solvent in the blank cell instead of solvent alone was found to correct the rather high values previously found for the reagent blank. Ethylene dichloride was preferred as solvent since it is used in the preparation of the $SbCl_3$ reagent.—K. H. Coward.

1669

HAVINGA, E., KOEVOET, A. L. and VERLOOP, A. **Studies on vitamin D and related compounds. 4. The pattern of the photochemical conversion of the provitamins D.** *Rec. Trav. chim. Pays-Bas*, 1955, **74**, 1230–1242. [Lab. Org. Chem., Univ. Leyden.]

For previous parts see Titles 363, Vol. 25; 329, Vol. 26.

Intermediate products of irradiation with ultraviolet light (265 to 280 mμ.) were obtained by exposing for a short time solutions of about equal amounts of radio-active 7-dehydrocholesterol-3-^{14}C and inactive lumisterol, or of radio-active ergosterol, obtained by growing yeast in a medium containing acetate-1-^{14}C, with inactive lumisterol and tachysterol. The unchanged provitamin D was removed by precipitation with digitonin. The irradiation products were separated by their different rates of reaction with maleic anhydride. From the specific radio-activities of the products it was concluded that lumisterol was not an intermediate product in the formation of vitamin D and that tachysterol probably was not either. The formation of another substance, previtamin D, was recognised, with the same spectral absorption at 265 to 280 mμ. as ergosterol, but with a relatively low extinction coefficient.—E. M. Hume.

1670

PATRICK, H. and SCHWEITZER, G. K. **Usage of Ca^{45} in determination of vitamin D depletion and response time in chicks.** *Poultry Sci.*, 1955, **34**, 832–833. [Univ. Tennessee, Knoxville.]

Groups of day-old cockerels were given a basal rachitogenic diet alone or supplemented, per 100 g., with 200 I.U. vitamin D_3. Others were given 300 I.U. vitamin D_3 at one day of age and were maintained on the basal diet alone or supplemented, per 100 g., with 300 I.U. vitamin D_3. At the start of the experiment 8 chicks were given, by pipette, 20 μC. ^{45}Ca and 24 hr. later they were killed. The ^{45}Ca content of the right and left tibia together was estimated and expressed as a percentage of the 20 μC. administered. This percentage is termed degree of bone mineralisation. Eight chicks from each group were similarly given ^{45}Ca after 4, 7, 10, 14 and 18 days, and bone mineralisation was estimated 24 hr. later. In chicks on the basal ration alone the initial value for bone mineralisation was 13·4 per cent.; when they were depleted of vitamin D after 14 days, bone mineralisation was at its minimum, 7·2 per cent. In the birds given a single dose of 300 I.U. vitamin D_3 and maintained on the unsupplemented basal ration, some depletion was evident after 10 days and it was complete after about 18 days. In a second experiment depleted chicks were given 200 μC. ^{45}Ca at intervals up to 48 hr. after administration of 300 I.U. vitamin D_3; they were killed 24 hr. after administration of the isotope. An increase in bone mineralisation took place when the isotope was given 4 hr. after administration of vitamin D_3, and the maximum response was obtained when it was given after 24 hr. [It should

be noted that the degree of bone mineralisation was not estimated until 24 hr. after the administration of the isotope so that the first increase in bone mineralisation occurred 28 hr. after receiving vitamin D, and not 4 hr. as is shown in Table 2.]—E. M. Cruickshank.

1671

PATRICK, H. and SCHWEITZER, G. K. **A chick vitamin D assay method using radioactive calcium (Ca^{45}).** *Poultry Sci.*, 1955, **34,** 834–835. [Univ. Tennessee, Knoxville.]

Day-old cockerels were given a basal rachitogenic ration. After 6 days groups of 8 were given for 7 days supplements, per 100 g. diet, of from 5 to 200 I.U. vitamin D_3. Each chick then received, by pipette, 20 μC. ^{45}Ca. Twenty-four hours later the chicks were killed and bone mineralisation was estimated (see above Abst.). The results were compared with those obtained by the A.O.A.C. bone-ash method. The percentage of the amount of isotope given found in the tibias was no higher with 40 I.U. vitamin D_3 per 100 g. diet than with 20, showing that 20 I.U. sufficed to produce normal bone mineralisation. About 30 I.U. was required to produce a normal percentage of bone ash. A commercial sample of vitamin D concentrate was tested by the isotope method and the potency thus found was close to that guaranteed by the manufacturers.—E. M. Cruickshank.

1672

MURRAY, T. K. and CAMPBELL, J. A. **A note on the effect of aureomycin on the response of the rat to vitamin D.** *Canad. J. Biochem. Physiol.*, 1955, **33,** 797–799. [Food and Drug Labs., Dept. Nat. Health Welfare, Ottawa.]

Young rats were given the U.S. Pharmacopeia diet for the line test with addition of 5 per cent. brewer's yeast. In a number of tests, pairs of groups of from 8 to 10 rats were given a total dose of 0·75, 1·5 or 3 I.U. vitamin D over a period of 6 days. One of each pair of groups received in addition 66 mg. aureomycin per kg. diet 2 days before dosing began and until the end of the experiment. All the rats were killed 3 days after the last dose of vitamin D. The extent of calcification was measured by "usual bio-assay proceedures" (Bliss and György, *Vitamin Methods*, Vol. 2, Academy Press, Inc., 1951, New York), including the line test. The mean superiority in calcification for all the rats given aureomycin was 18 per cent., which was significant at $P = 0{\cdot}05$. The mean weight increase with aureomycin also was greater. The weight increase was not affected by the amount of vitamin D given, so that aureomycin presumably did not act by increasing the absorption of vitamin D.—E. M. Hume.

1673

HORN, V. and EDER, H. Beeinflussung der Vit.-D_3-Wirkung durch Antibiotika beim Küken. **[Modification of the activity of vitamin D_3 for chicks by antibiotics.]** *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 249–252. [Vet. Physiol. Inst., Justus Liebig Hochsch., Giessen.]

Six groups of day-old White Leghorn cockerels were given the rachitogenic diet of Olsson and, by mouth, 0·025, 0·05 or 0·75 μg. vitamin D_3 daily. Three groups received in addition 25 mg. procaine penicillin per kg. diet. After 3 weeks the presence or absence of rickets was determined by measurement of the tarso-metatarsal distance. On the deficient diet alone, 0·025 μg. vitamin D_3 was not sufficient to protect any of the birds against rickets; 0·05 prevented rickets in 80 per cent., but when the diet contained penicillin, 0·075 μg. was required to give the same degree of protection.

E. M. Cruickshank.

1674

DIKSHIT, P. K. **Effect of vitamin D on parathyroidectomized rats.** *Indian J. Med. Res.*, 1955, **43,** 679–684. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor.]

Of 36 rats aged from 26 to 28 days, half had the parathyroid glands removed. The completeness of the operation was checked at autopsy. Five days later all the rats received a rachitogenic diet low in P, and were kept in a dark room. Each series was divided into 3 groups given 0·53 or 1·06 I.U. vitamin D daily or none. After 3 weeks all were killed. Bone ash was estimated in the femur, and the width of the epiphyseal cartilage in the tibia was measured. There was no significant difference referable to the removal of the parathyroid glands.

Of 2 series of rats, one had the parathyroid glands removed. They were all fed on a stock diet, and each series included 3 groups of 3 or 4 animals injected subcutaneously every other day for 50 days with 0·1 ml. groundnut oil containing 10,000 or 20,000 I.U. vitamin D or none. Percentage bone ash and adverse effect on weight gain were not significantly different in the 2 series.

It is concluded that the action of vitamin D is not mediated through the parathyroid glands.

E. M. Hume.

1675

PILEGGI, V. J., DE LUCA, H. F. and STEENBOCK, H. **The role of vitamin D and intestinal phytase in the prevention of rickets in rats on cereal diets.** *Arch. Biochem. Biophys.*, 1955, **58,** 194–204. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Male rats weighing from 60 to 75 g. were fed on a cereal diet of, per cent., yellow maize 76, wheat gluten 23, and NaCl 1 to which $CaCO_3$ was added, or on a semi-synthetic diet low in P to which Ca

was added as $CaCO_3$, inorganic P as an equimolar mixture of KH_2PO_4 and K_2HPO_4, and phytate P as sodium phytate. The rats were maintained on the diets for 21 days, and half of any group was given 75 I.U. vitamin D_2 every 3 days. Analyses were made of blood, bone and faeces.

With the cereal diet almost all the phytate was hydrolysed whether vitamin D was given or not. When 1 or 3 per cent. $CaCO_3$ was added the hydrolysis of phytate was much less, and addition of vitamin D only partly restored the amount hydrolysed.

With the cereal diet with or without 3 per cent. $CaCO_3$, and with the semi-synthetic diet, addition of vitamin D increased the phytase and alkaline phosphatase activity of the faeces and intestine. The hydrolysis of dietary phytate and absorption of P were correspondingly increased only when $CaCO_3$ was present. The relation between extent of enzyme activity and of phosphate hydrolysis was rough and not quantitative. Administration of vitamin D increased phytase and alkaline phosphatase in the faeces even though the diet contained no phytate.

By adjusting the amount of available P in the different diets it was shown that the increase of available P, brought about by vitamin D when rendering a phytate-containing diet high in Ca non-rachitogenic, was not sufficient by itself to account for the prevention of rickets. In rats having a rachitogenic cereal diet and not given vitamin D, compared with rats given vitamin D, the amount of inorganic P in the faeces was greater because of non-absorption, though the amount derived from hydrolysis of phytate was less.

It is concluded that " the antirachitic action of vitamin D with cereal diets is due primarily to an improved utilization of inorganic P ".

E. M. Hume.

1676

BAILIE, J. M. and IRVING, J. T. **Development and healing of rickets in intramembranous bone.** *Acta med. scand.*, 1955, **152**, *Suppl.* 306, 1–14. [Dept. Physiol., Med. Sch., Univ. Cape Town.]

The intramembranous bone studied was the maxillary incisal fundic alveolar bone adjacent to the formative end of the incisor tooth, where apposition and resorption are rapid during growth. Rats weighing from 50 to 80 g. were given the rachitogenic diet of Steenbock and Black, Ca : P ratio 5·6, with or without 1 per cent. lysine. They were killed at intervals of 3 or 4 days up to 28 days. Other material from rachitic rats, previously obtained, was studied also. To study the healing process, rats received one of the same two rachitogenic diets for 28 days, followed by a diet of stock biscuits for 4 days, or a single oral dose of 30 I.U. vitamin D with the same diet as before, or a modification of one of the same diets to make the ratio of Ca to P 1·86. After any of the changes rats were killed at intervals of from 6 hr. to 12 days. A portion of fundic bone was removed from the jaw and stained with haematoxylin and eosin or by the $AgNO_3$ method of Gomori (*Amer. J. Pathol.*, 1933, **9**, 253).

During the development of rickets the bone grew steadily wider. An osteoid margin appeared on the appositional side of the bone about the 10th day. It grew gradually wider while the calcified part of the bone remained fairly constant until the 21st day when it rapidly disappeared, and by the 28th day the bone was entirely osteoid. A primitive type of bone, with more matrix than cells, developed slowly from the appositional side for a time after the 10th day. Osteoclasts on the resorptive side of the bone became fewer but did not entirely disappear. It is considered that the osteoblasts could at first promote calcification of bone but progressively lost the power till by the 21st day they could form only osteoid.

The three means of healing tried all produced the same result but at different rates. Osteoid on the resorptive side of the bone began to show calcification within 2 days after vitamin D was given, and within from 12 to 24 hr. after the dietary changes. The first change was the calcification of osteoid. A layer of round cells on the resorptive surface, next the periodontal membrane, became re-established. They lined the calcifying bone between and around the osteoclasts, and gave the appearance of osteoblasts calcifying the osteoid tissue prior to its removal by osteoclasts, which decreased in number. As healing progressed the bone became narrower. After 3 or 4 days of healing calcification began on the appositional side, and continued till it met that from the resorptive side. The effect of a single dose of vitamin D began to lessen after 10 days, and by 12 days rachitic changes had begun again.

Rachitic changes and the healing process in the other bones ran parallel with the processes in the fundic bone.

The presence of lysine in the diet made no difference.

It is concluded that, in healing, calcification begins in the oldest osteoid on the resorptive side, and that osteoid is not resorbed until it has been calcified. In the soft tissues on the resorptive side there is a reserve of undifferentiated cells which can fuse to form osteoclasts or act as osteoblasts according to need. In rickets they lose their functions and differentiation, which revive when healing begins.—E. M. Hume.

1677

SCHETTLER, G. and JOBST, H. Experimenteller Beitrag zur subakuten vitamin D-Intoxikation. [**Experiments on sub-acute vitamin D**

intoxication.] *Ztschr. ges. exp. Med.*, 1955, **126,** 338–352. [Med. Klin., Univ. Marburg a.d. Lahn.]

Seventy-eight mongrel dogs were given by mouth or injection from 3 to 20 mg. vitamin D_2 per kg. bodyweight in oil solution or in combination with milk protein. The latter form was more quickly absorbed from intramuscular injection than the oil solution, but in the lower doses was less toxic. The dogs died with acute dehydration in a state of circulatory collapse. The blood chemistry and kidney function were studied with the lower toxic doses.—E. M. Hume.

1678

ENGEL, C. **Vitamin D in milk.** *Nederlands Melk Zuiveltijdschr.*, 1955, **9,** 139–145. [Central Inst. Nutrit. Res. T.N.O., Utrecht.] Dutch summary.

Data from the literature are assembled and conclusions are drawn that the average vitamin D content per litre is 10 I.U. for human milk and 20 I.U. for cow's milk. Values are given for the requirement at different ages. Methods of augmenting the vitamin D content of milk are reviewed and discussed. The controversy about the vitamin D content of cow's milk irradiated with ultraviolet light by the process of Scholl, Scheer and Steinheil, as used at Frankfort am Main and Bremen, is briefly summarised, and it is concluded that the results giving the milk a negligible antirachitic potency, published by Wagner (*Milchwissenschaft*, 1953, **8,** 379), are not correct. The vitamin D content is considered to be between 160 and 200 I.U. per litre (Scheer, *Hessisches Ärzteblatt*, 1954, no. 7; Coates *et al.*, Abst. 1883, Vol. 25; Engel, Abst. 4813, Vol. 25), and the milk is accepted as effective in preventing and curing rickets.

E. M. Hume.

VITAMIN E

1679

EGGITT, P. W. R. and NORRIS, F. W. **The chemical estimation of vitamin-E activity in cereal products. 3. The application of partition chromatography to the isolation of ε-tocopherol from bran and to the determination of the individual tocopherols of cereals.** *J. Sci. Food Agric.*, 1955, **6,** 689–696. [Dept. Appl. Biochem., Univ. Birmingham.]

For earlier parts see Absts. 2965, Vol. 24; 341, Vol. 26.

A partition column 1·4 cm. in diameter and 20 cm. long was prepared by loading Hyflo Super-cel, previously made hydrophobic by exposure to vapours of dimethyldichlorosilane, with 70 per cent. of liquid paraffin. The mobile phase was 75 per cent. ethanol equilibrated with paraffin. About 0·25 mg. of α-, γ- and δ-tocopherol was applied to the column and fractions of 3 ml. were collected mechanically. Estimations by the method of Emmerie and Engel were made directly on the 3-ml. fractions in the tubes in which they were collected. The peak for δ-tocopherol occurred with 51 ml. of eluate, and that for γ-tocopherol with 96 ml., but α-tocopherol was spread over 100 ml. When the solvent was changed to 80 per cent. ethanol after the 36th fraction, the α-homologue was eluted as a sharp band with 210 ml. Improved separation of δ- and γ-tocopherol was obtained by eluting first with 70 per cent. ethanol and then with 80 per cent. ethanol after the 70th fraction. The respective peaks were then with 81 ml. for δ-, 180 ml. for γ-, and 315 ml. for α-tocopherol. Chromatograms of the tocopherols from wheat germ, middlings and bran showed that the peak for ε-tocopherol coincided with that of δ-tocopherol, and that for β-tocopherol with that for γ-tocopherol. From the shape of the dimethyl curve of both bran and middlings it appeared that the recently discovered ζ-tocopherol, or 5 : 7-dimethyltocol, has an R_F value greater than that of β- or γ-tocopherol, which, it is suggested, may be due to the presence of a methyl group on each side of the hydroxyl group.

The percentage tocopherol pattern for wheat germ measured by this method was α 59, β 28 and ε 1·5, with 12 per cent. of reducing material retained on the column. For fine wheatfeed the percentages were α 28, β 24, ε 37 and 11 per cent. retained, for coarse bran α 11, β 20, ε 63 and 6 per cent. retained. The ultraviolet absorption spectrum of ε-tocopherol, isolated from bran in this way, had maxima and minima almost identical with those of β-tocopherol, and the absorption of nitroso-ε-tocopherol was almost identical with that of nitroso-β-tocopherol in both spectral position and amplitude.—R. J. Ward.

1680

BLAXTER, K. L. and MCGILL, R. F. **Muscular dystrophy.** *Vet. Rev.*, 1955, **1,** 91 – 114. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

1681

AZZONE, G. F. and ALOISI, M. **Early changes of myosin in vitamin E-deficient rabbits.** *Biochim. biophys. Acta*, 1955, **18,** 451. [Inst. Gen. Pathol., Univ. Modena, Italy.]

Myosin prepared from the muscles of rabbits which had been without vitamin E for only 2

weeks was abnormal in failing to dissolve completely in 0·1 *M* KCl. In solution it was less viscous than normal.—T. Moore.

1682

TALLAN, H. H. **Free amino acids of muscle of normal and of vitamin E-deficient rabbits.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 553–555. [Labs. Rockefeller Inst. Med. Res., New York.]

Ion-exchange chromatography was used to estimate the concentration of free amino-acids in muscle extracts of normal rabbits and dystrophic rabbits deprived of vitamin E. In the severely dystrophic animals the concentration of aspartic acid, glutamic acid, alanine, threonine, leucine, proline, urea, phosphoethanolamine and glycerophosphoethanolamine was much increased and that of glycine, 1-methylhistidine, carnosine and anserine was decreased. The concentration of glycine was low even in the earliest stage of dystrophy.—R. J. Ward.

1683

DINNING, J. S., SIME, J. T. and DAY, P. L. **The influence of vitamin E deficiency on the metabolism of sodium formate-C^{14} and glycine-1-C^{14} by the rabbit.** *J. Biol. Chem.*, 1955, **217,** 205–211. [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

White New Zealand rabbits of about 600 g. weight were given a purified diet without vitamin E. Some received 4 mg. α-tocopheryl acetate per kg. bodyweight twice weekly. The deprived rabbits were selected for experiment when the ratio of creatine to creatinine in the urine had reached about 3 to 1 and when the rabbit had difficulty in righting itself when it was placed on its side. Deprived and non-deprived rabbits were injected intraperitoneally with 10 μC. of glycine-1-^{14}C or of sodium formate-^{14}C. The animals were killed 4 hr. later and certain organs and tissues were immediately frozen in a mixture of dry iec and acetone. The tissues were fractionated by the Schneider procedure (Title 2915, Vol. 15). One sample of the nucleic acid fraction was evaporated for counting and another was wet-ashed for estimation of phosphorus.

When glycine was injected, rats deprived of vitamin E incorporated less glycine into nucleic acids than non-deprived rats, and there was no increase in the amount of radio-activity incorporated. When sodium formate was injected the specific activities, in counts per min. per micromole P, of the nucleic acids of the skeletal muscle, bone marrow, small intestine, spleen and liver were for the deprived rabbits 41·9, 271·3, 82·7, 35·5 and 20·4, and for the non-deprived 5·3, 39·5, 18·0, 8·6 and 29·1.

In the protein the specific activity in counts per min. per mg. of the same tissues for rabbits injected with formate was for deprived rabbits 11·8, 103·2, 41·4, 42·9 and 38·5, and for non-deprived 1·9, 31·7, 19·0, 17·5 and 29·1. When the rabbits were injected with glycine the values for the deprived animals were 5·6, 44·1, 15·5, 27·5 and 19·9 and for the non-deprived 2·1, 89·3, 53·3, 57·7 and 44·4. When the nucleic acids of bone marrow and skeletal muscle were fractionated into ribonucleic acid and deoxyribonucleic acid, more radio-active formate was found to be incorporated into the deoxyribonucleic acid fraction. The specific activity of both acid-soluble and nucleic-acid purines after injection of formate was much higher in the deprived animals. Vitamin E deficiency reduced the incorporation of glycine into purines, slightly decreased the conversion of formate to CO_2 and increased the oxidation of glycine to CO_2.—R. J. Ward.

1684

LOEWI, G. **A lesion in the aorta of vitamin-E-deficient animals.** *J. Pathol. Bacteriol.*, 1955, **70,** 246–249. [Dunn Nutrit. Lab., Univ. Cambridge.]

In guineapigs and rabbits which had been deprived of vitamin E for from 7 to 10 months, areas of necrosis, calcification and fibrosis were found in the aorta. The abnormalities were mainly confined to the media; sub-endothelial fibrosis and nuclear palisading were also prominent. Histologically the lesions did not resemble atheroma even though necrosis was involved. No aortic lesion could be found in rats deprived of vitamin E for similar periods.—T. Moore.

1685

SLINGER, S. J., PEPPER, W. F. and ARTHUR, D. **Effect of phosphorus, vitamin E and environment on growth and the incidence of perosis in turkeys.** *Poultry Sci.*, 1955, **34,** 935–941. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

Groups of Broad Breasted Bronze turkeys received, from hatching, diets containing different amounts of inorganic P with or without supplement of vitamin E. At 8 weeks of age each group was divided into two of which one was reared in a slatted sun-porch, the other on deep litter. For the next 16 weeks, all birds received a diet containing 0·5 per cent. inorganic P. The vitamin E supplement was continued to birds which previously received it. During the first 8 weeks diets containing 0·7 per cent. inorganic P gave better growth than those containing 0·5 per cent., but after 24 weeks the difference disappeared, and it is concluded that 0·5 per cent. inorganic P was sufficient in both starting and rearing diets for optimum growth and efficiency of feed utilisation. About

0·7 per cent. was required to prevent perosis. Supplements of vitamin E had no beneficial effect on growth up to 8 weeks of age, but increased the bodyweight of 24-week-old birds which had received 0·3 and 0·5 per cent. inorganic P during the starting period. The vitamin E supplement decreased the incidence and severity of perosis in all groups except those receiving 0·3 per cent. inorganic P in the starting ration. The birds reared on deep litter were in all respects superior to those reared in sun-porches.

E. M. Cruickshank.

1686

ZUR HORST-MEYER, H. and POTEL, J. Der Einfluss von Vitamin E, Methionin und Corhormon auf die experimentelle Meerschweinchentuberkulose. [**Effect of vitamin E, methionine and corhormon on experimental tuberculosis in guineapigs.**] *Arch. exp. Pathol. Pharmakol.*, 1955, **227**, 62–70. [2. Med. Klin., Martin Luther Univ., Halle-Wittenberg.]

α-Tocopheryl phosphate added to the culture medium had no effect on the growth of a human type of tubercle bacillus. In guineapigs 15 mg. α-tocopheryl acetate given twice a week by intramuscular injection increased resistance to infection by tubercle bacilli. Methionine and corhormon, a standardised extract of embryo heart, gave no protection.—T. Moore.

1687

BUNNELL, R. H., MATTERSON, L. D., SINGSEN, E. P., POTTER, L. M., KOZEFF, A. and JUNGHERR, E. L. **Studies on encephalomalacia in the chick. 3. The influence of feeding or injecting various tocopherols and other anti-oxidants on the incidence of encephalomalacia.**

SINGSEN, E. P., POTTER, L. M., MATTERSON, L. D., BUNNELL, R. H., KOZEFF, A. and JUNGHERR, E. L. **4. The influence of oil in fish meal, oils from various species of fish, and animal fats on the incidence of encephalomalacia.** *Poultry Sci.*, 1955, **34**, 1068–1075; 1075–1079. [Dept. Poultry Sci., Storrs Agric. Exp. Stat., Univ. Connecticut.]

3. Anti-oxidants were given to chicks deprived of vitamin E by intramuscular injection or in a basal diet supplemented with 2 per cent. of an oil containing vitamins A and D. The brains of chicks dying of encephalomalacia were examined histologically within an hour after death. Anti-oxidants found to be as effective in preventing encephalomalacia as N, N-diphenyl-*p*-phenylenediamine (DPPD) were 2 : 6-di-*tert*-butyl-4-methylphenol, dibutyl- and diamylhydroquinone, di-*sec*.-butyl-*p*-phenylenediamine and 1 : 2-dihydro-2 : 2 : 4-trimethyl-6-ethoxyquinoline. DPPD when injected gave complete protection, though no vitamin E could be detected in the blood. It was not as effective as vitamin E on an equimolar basis, but was nearly equivalent on a weight basis. When injected, α-tocopherol and γ-tocopherol gave almost complete protection, but δ-tocopherol was ineffective. The mode of action of anti-oxidants which prevent encephalomalacia is discussed, and it is suggested that they not only preserve vitamin E but also function as anti-oxidants *in vivo*.

4. Chicks hatched from the eggs of hens depleted of vitamin E for 2 months were given a basal diet containing, per lb., about 3 I.U. vitamin E from α-tocopherol. The diet was supplemented with 2 per cent. herring, red fish, cod liver or menhaden oil, or a feeding oil containing vitamins A and D, or a hydrogenated animal fat. Percentage mortality and incidence of encephalomalacia were directly related to the degree of unsaturation, and hence to the iodine number, of the oil. The hydrogenated fat, fat from meat scrap, or unstabilised yellow grease did not increase mortality from encephalomalacia. The addition of 2 per cent. lecithin to the diet containing the feeding oil considerably reduced the incidence, possibly because of the tocopherol content of the lecithin or its anti-oxidant properties. Oil added to the ration as fishmeal had the same effect as an equal amount of extracted oil. As little as from 0·5 to 1 per cent. of a highly unsaturated oil was sufficient to cause encephalomalacia in chicks deprived of vitamin E.—E. M. Cruickshank.

See also Abst. 2060.

VITAMIN K

1688

MARCH, B. E., BIELY, J. and TOUCHBURN, S. P. **The composition of the breeder diet and blood clotting in dams and chicks.** *Poultry Sci.*, 1955, **34**, 1097–1100. [Poultry Nutrit. Lab., Univ. British Columbia, Vancouver.]

The amount of vitamin K from dehydrated green feed given to hens kept in pens on litter did not influence the prothrombin time in the blood of the hens, but was reflected in the prothrombin time in the blood of the newly hatched chicks. When the breeding diet contained only 2·5 per cent. dehydrated green feed, the transfer of vitamin K to the chick appeared to be below the optimum but, since it varied somewhat from hatch to hatch, it is suggested that the vitamin K intake of the hens varied because of seasonal changes in temperature, which influenced synthesis of the vitamin by bacteria in the litter.

E. M. Cruickshank.

VITAMIN B COMPLEX: GENERAL

1689

KEVEI, E., KISZEL, M. and SIMEK, M. **Polarographic determination of the riboflavin and thiamin contents of foods. 1. Determination of riboflavin. 2. Determination of thiamin.** *Acta chim. hung.*, 1955, **6,** 345–363. [Inst. Res. Canning, Budapest.] Russian and German summaries.

1. Riboflavin was extracted by heating with 0·1 *N* HCl on a water-bath. The amount of acid required and the heating time varied for different foods according to the amount of riboflavin present. After acid extraction, incubation with takadiastase gave complete liberation of riboflavin. The extracts were centrifuged and cleared by precipitation of interfering substances with basic lead acetate. The riboflavin content of the solution could then be measured by polarography.

2. Free vitamin B_1 was extracted with HCl and alcohol. The vitamin was adsorbed on suitable charcoal, eluted successively with dilute HCl and 25 per cent. ethanol and measured directly in the polarograph. Bound vitamin B_1 was freed by incubation with takadiastase and subsequently extracted to give a value for total vitamin B_1.

For both riboflavin and vitamin B_1 it is claimed that more satisfactory results are given by polarographic than by fluorimetric methods.

A. M. Copping.

1690

DALGLIESH, C. E. **The relation between thiamine, biotin and tryptophan metabolism, studied in the rat.** *Biochem. J.*, 1955, **61,** 328–334. [Postgrad. Med. Sch., Ducane Rd., London, W.12.]

The effect was studied on metabolites in the urine of giving 1 mg. DL-tryptophan per g. bodyweight for 1 or 2 days to young rats having purified diets lacking vitamin B_1, or vitamin B_1 and pyridoxine, or biotin, or biotin and pyridoxine. After tryptophan non-deprived rats excreted small amounts of kynurenine, xanthurenic acid and anthranilic acid and its conjugates. Simple vitamin B_1 deficiency in severe stages prevented the excretion of any of these. Excretion after tryptophan of kynurenine, hydroxykynurenine, their conjugates and xanthurenic acid, characteristic of pyridoxine deficiency, was reduced in amount or ceased when vitamin B_1 was withdrawn as well as pyridoxine; if kynurenine was given instead of tryptophan at this stage the pattern of excretion typical of pyridoxine deficiency was restored. It is concluded that vitamin B_1 is concerned in the conversion of tryptophan to formylkynurenine. Lack of biotin alone or combined with lack of pyridoxine had no apparent effect on the pathways of tryptophan metabolism.—A. M. Copping.

1691

BERNARDINI, A. Le modificazioni del contenuto in vitamine del complesso B da parte di tessuti di animali irradiati. 2. Le modificazioni della tiamina. [**Changes in the content of B complex vitamins in the tissues of animals treated with X-rays. 2. Changes in vitamin B_1.**] 3. Le modificazioni della niacina. [**3. Changes in nicotinic acid.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 295–297; 297–299. [Ist. Patol., Univ. Catania.]

With the same technique as was used for riboflavin (Abst. 390, Vol. 26), 4 groups of 7 rats were exposed once to X-rays, on the head only, on the thorax and abdomen, on the whole body, or not at all. Fifteen days later they were killed and vitamin B_1 and cocarboxylase were estimated in the liver, brain and muscle. In the muscle free vitamin B_1 increased after exposure, the increase being greatest when the whole body was exposed; the concentration of cocarboxylase was little affected. In the liver free vitamin B_1 and cocarboxylase decreased; the decrease was greatest when the thorax and abdomen were exposed. In the brain the free vitamin and cocarboxylase decreased, with the decrease greatest when the head was exposed.

3. With the same technique, in groups of 6 rats, the same parts of the body were exposed to X-rays. Fifteen days later nicotinic acid was estimated in the liver and muscle. In both tissues there was decrease in the content of nicotinic acid, which was greatest when the head was exposed, less with the whole body, and least with the thorax and abdomen.—E. M. Hume.

1692

DELORE, P. and BERRY, H. Carence alimentaire et recours à l'alcool. Recherches expérimentales. [**Dietary deficiency and recourse to alcohol. Experimental studies.**] *Presse méd.*, 1955, **63,** 1591–1592. [Lyons.]

When alcohol was available, rats on a diet deficient in the B vitamins took more of it than rats on a normal diet. Consumption of alcohol increased before signs of vitamin deficiency appeared.—L. Wills.

1693

LUCKEY, T. D., PLEASANTS, J. R., WAGNER, M., GORDON, H. A. and REYNIERS, J. A. **Some observations on vitamin metabolism in**

germ-free rats. *J. Nutrition*, 1955, **57**, 169–182. [Lobund Inst. Res. Life Sci., Univ. Notre Dame, Ind.]

With germ-free rats reared according to the method described by Orland *et al.* (Abst. 5037, Vol. 24) the requirement for biotin, folic acid, citrovorum factor, vitamin B_{12}, vitamin K and inositol was found to be like that of normally reared rats except that the presence of biotin in the diet seemed to be essential, and synthesis of folic acid and citrovorum factor did not take place without it. The amount of food eaten was measured and the shed hair, urine, faeces and wasted food were analysed for all vitamins of the B complex. Less riboflavin, nicotinic acid and biotin were found in body tissues and excreta than in the food consumed. The balance of pantothenic acid and vitamin B_{12} was even and the folic acid and citrovorum factor in the body exceeded the amount taken in. Severe biotin deficiency occurred in rats given no biotin, with loss of weight, loss of hair, dermatitis and skin ulcers. Germ-free male rats did not grow as rapidly as normal rats. Those born naturally and suckled by their dams grew better than rats taken by caesarean section and hand-fed to weaning.

A. M. Copping.

1694

BEZNÁK, A. B. L. and VAN ALPHEN, G. W. H. M. **Cardiac automatism and choline acetylation in rats on thiamine- and pantothenic-acid-deficient diets.** *Canad. J. Biochem. Physiol.*, 1955, **33**, 867–883. [Dept. Physiol., Univ. Ottawa.]

Young male albino rats were given purified diets with a complete vitamin supplement, or without vitamin B_1 or pantothenic acid or both. Simultaneous deprivation of vitamin B_1 and pantothenic acid diminished the growth retardation and lessened the severity of the signs seen in rats deprived of vitamin B_1 only. When only pantothenic acid was lacking growth was similar to that of fully supplemented rats. Severe changes occurred in the electrocardiogram of all rats deprived of vitamin B_1 but no electrocardiographic abnormality occurred in those deprived of pantothenic acid only. No change was detected in the power to acetylate choline by extracts of heart muscle from rats deprived of vitamin B_1 or pantothenic acid or both. The results are discussed with reference to the literature, and further studies of a possible relationship between acetylcholine, cocarboxylase and disturbances of cardiac automatism are suggested.—A. M. Copping.

1695

JONES, J. D. and BAUMANN, C. A. **Relative effectiveness of antibiotics in rats given limiting B vitamins by mouth or by injection.** *J. Nutrition*, 1955, **57**, 61–71. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

The effect on growth of penicillin, aureomycin or streptomycin added in amounts of 25 mg. per kg. to a purified basal diet was studied in rats given a suboptimum dose, by mouth or injection, of vitamin B_1, riboflavin or pantothenic acid. The diet was adequate in all vitamins except that under investigation. Penicillin or aureomycin enhanced the effect of a limited amount of any of the 3 vitamins whether the vitamin was given by mouth or by injection, but the effect was in most experiments greater when the vitamin was given by mouth. Penicillamine and penicilloic acid had no effect on growth. Streptomycin did not increase the effect of a limited amount of vitamin given by mouth but did increase the effect when the vitamin was injected. The results are discussed with reference to many other observations, and it is considered that penicillin and aureomycin probably stimulate intestinal synthesis of vitamin B_1, riboflavin and pantothenic acid. The mode of action of streptomycin is discussed but is still unexplained.—A. M. Copping.

1696

HÜBNER, O. and LIEBSCHER, W. Der Vitamin-B-Komplex bei der Fütterung der Hühner. Versuche mit Fortafeed 2-49C. [**Vitamin B complex in poultry feeding. Experiments with Fortafeed 2-49C.**] *Arch. Geflügelk.*, 1955, **19**, 247–254. [Mitterndorf.] English summary.

The needs of poultry for vitamins of the B complex are reviewed and a table of the B vitamins in feedingstuffs is given. Studies were made with diets containing 3 per cent. food yeast or 0·03 per cent. of a supplement of riboflavin, pantothenic acid, nicotinic acid, choline chloride and folic acid (Fortafeed 2-49C) with 2·97 per cent. groundnut meal to give protein equivalent to that in yeast. During 10 weeks young birds grew equally well and used feed equally efficiently on both diets. In laying and hatching tests the synthetic supplement was as effective as the yeast and was cheaper.

A. M. Copping.

1697

MAYFIELD, H. L., ROEHM, R. R. and BEECKLER, A. F. **Riboflavin and thiamine content of eggs from New Hampshire and White Leghorn hens fed diets containing condensed fish or dried whale solubles.** *Poultry Sci.*, 1955, **34**, 1106–1111. [Dept. Home Econom. Res., Montana State Coll., Bozeman.]

Eggs were collected from New Hampshire and White Leghorn Hens on a basal diet with or without inclusion of condensed fish solubles or dried whale solubles. The diets contained, per g., 6·3 to 8·1 μg. riboflavin and 4·3 to 4·7 μg. vitamin B_1. The riboflavin content of the eggs was not

influenced by inclusion of fish or whale solubles but differed with breed. Eggs from Leghorn hens contained 220·7 μg. or 4·24 μg. per g. riboflavin; those from New Hampshire hens, 184 μg. or 3·57 μg. per g. The vitamin B_1 content of the eggs of the New Hampshire hens was much the same on all 3 diets, but the eggs of the Leghorn hens given fish or whale solubles contained 61·9 and 58·3 μg., respectively, compared with 51·1 μg. in eggs from Leghorns having the basal diet only. The eggs of the Leghorns had significantly more vitamin B_1 than those of the New Hampshires. The results showed the existence of a genetic difference between breeds in ability to use vitamin B_1 and possibly other components of the diet.

E. M. Cruickshank.

1698

CHITRE, R. G., DESAI, D. B. and RAUT, V. S. **The nutritive value of pure bred strains of cereals and pulses. 1. Thiamine, riboflavin and nicotinic-acid contents of 107 pure bred strains of cereals and pulses. 2. The effect of storage on thiamine, riboflavin and nicotinic acid in cereals and pulses.** *Indian J. Med. Res.*, 1955, **43**, 575–583; 585–589. [Indian Counc. Med. Res., Nutrit. Res. Unit, Seth G.S. Med. Coll., Parel, Bombay 12.]

1. Data are tabulated individually for the following numbers of samples of cereals and pulses: rice 51, jowar (*Sorghum vulgare*) 7, bajri (*Pennisetum typhoideum*) 2, ragi (*Eleusine coracana*) 1, tenai (*Setaria italica*) 5, wheat 13, red gram (*Cajanus indicus*) 10, green gram (*Phaseolus mungo*) 4, horse gram (*Dolichos biflorus*) 3, black gram (*Phaseolus roxburghii*) 7, Bengal gram (*Cicer arietinum*) 2 and lentil 2. Variations within species were wide and could not be definitely ascribed to environmental or genetic influences. Further investigation by pot culture in a greenhouse is recommended.

2. Pure strains of cereals and pulses were analysed before and after storage for 6 months in sealed bottles of amber glass or in gunny bags. With rice in bottles vitamin B_1 was unchanged and riboflavin increased; in gunny bags there was considerable loss of vitamin B_1 and the gain in riboflavin was larger; with either form of storage the nicotinic acid content was unchanged. In other cereals vitamin B_1 and nicotinic acid did not alter; their riboflavin content rose to the same extent in bottles and gunny bags. For pulses there was also no change in vitamin B_1 or nicotinic acid; riboflavin increased only during storage in gunny bags.—D. Harvey.

1699

FREY, K. J., HALL, H. H. and SHEKLETON, M. C. **Inheritance and heritability of protein, niacin, and riboflavin in oats.** *J. Agric. Food Chem.*, 1955, **3**, 946–948. [Dept. Agronom., Iowa State Coll., Ames.]

See Abst. 4428, Vol. 24.

From examination of 4 varieties of oats and the F_3 progenies from some of the crosses it was found that the contents of nicotinic acid and riboflavin were dominant in each of the crosses. In two crosses a high protein content was dominant; in another cross low protein was dominant. Heritability percentages for nicotinic acid and protein ranged from 83 to 93 and for riboflavin from 0 to 52.—A. Hepburn.

See also Absts. 1549, 1573, 1585, 1592.

VITAMIN B_1 (ANEURIN, THIAMINE)

1700

MARTEN, G. **Quantitative separation of B vitamins by electrophoresis on agar plates.** *Nature*, 1955, **176**, 1064–1066. [Anst. Vitaminforsch., Potsdam-Rehbrücke.]

A brief preliminary note is given of a method for electrophoretic separation of vitamin B_1 and its pyrophosphate, monophosphate and disulphide on an agar plate. Cups cut in the agar held the test substances and the presence of vitamin B_1 was demonstrated with *Lactobacillus fermentum*, of the pyrimidine component with *Rhodotorula mucilaginosa* and of thiazole with *Phycomyces blakesleeanus*. It was possible also to use agar plates to assist separation of vitamins partly distributed by electrophoresis on paper. Full details of the method are to be published.—A. M. Copping.

1701

RIDYARD, H. N. **The determination of thiamine in vitamin concentrates containing Creta Praeparata.** *Analyst*, 1955, **80**, 834–837. [Res. Assoc. Brit. Flour Millers, Cereals Res. Stat., St. Albans, Herts.]

In estimating vitamin B_1 in mixtures containing *creta praeparata*, iron and nicotinic acid, made up with dry flour as a concentrate for enriching flour, it was found essential to use concentrated HCl for making the extracts. The best results were obtained when the vitamin concentrate was added slowly to the acid and the mixture was shaken vigorously during extraction and before samples were taken from subsequent dilutions for fluorimetric measurement. With tubes washed in acid, and other precautions, it was possible to obtain

very small blanks which could be ignored in calculating the results.—A. M. Copping.

1702

HOLT, C. V., BLUM, K. U. and HENRICH, W. D. Beitrag sur Frage der biologischen Activität des Cocarboxylase-disulfides. [**The biological activity of cocarboxylase disulphide.**] *Hoppe-Seyler's Ztschr.*, 1955, **302,** 68–72. [Physiol. Chem. Inst., Univ. Hamburg.]

Daily administration of 1 mg. neopyrithiamine hydrobromide per 100 g. bodyweight induced severe vitamin B_1 deficiency within from 7 to 12 days in rats of from 150 to 250 g. weight. Liver homogenates from the animals showed great reduction of pyruvate oxidation in comparison with normal livers. Addition of cocarboxylase or of cocarboxylase disulphide to the homogenate raised pyruvate oxidation to normal. It was calculated that from 5 to 7 times as much cocarboxylase disulphide was required to give the same effect as an optimum addition of cocarboxylase.

A. M. Copping.

1703

D'AGOSTINO BARBARO, A. Effetti della somministrazione di cocarbossilasi nel beri-beri sperimentale del colombo. [**Effects of giving cocarboxylase in experimental beriberi in the pigeon.**] *Arch. Sci. biol., Bologna,* 1955, **39,** 487–497. [Ist. Chim. Biol., Univ. Messina.]

Six pigeons were fed on a diet of polished rice, and blood sugar in the fasting birds was estimated every 4 or 5 days. When signs of deficiency appeared, an intramuscular injection of 1 mg. cocarboxylase was given immediately after a blood sample had been taken. An hour later blood was taken again and 0·5 mg. cocarboxylase was injected. After half an hour a third blood sample was taken. The bird then fasted for 24 hr. after which it continued to receive the polished rice diet with 0·5 mg. cocarboxylase daily, and further estimations of blood sugar were made. One pigeon died early. Full protocols are given for each bird. After the first treatment with cocarboxylase the signs of polyneuritis disappeared, and the raised blood sugar value fell sharply but then rose again, sometimes sharply, sometimes gradually. Suspension of treatment with cocarboxylase caused it to rise steeply. There was loss of weight with diarrhoea, and the pigeons died after 28, 52, 56, 80 and 88 days from the start of the experiment, but without reappearance of the signs of polyneuritis (see Title 369, Vol. 26).—E. M. Hume.

1704

DI STEFANO, E. and PREVITERA, L. Effetti della cistina e della cisteina sull'iperglicemia beriberica del colombo. [**Effect of cystine and of cysteine on the hyperglycaemia of beriberi in the pigeon.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 197–198. [Ist. Fisiol., Univ. Messina.]

Groups of 3 or 4 pigeons maintained on a diet of polished rice were given daily 130 or 350 mg. cysteine, or 130 mg. cystine, or no addition. Blood sugar was estimated at frequent intervals. Signs of polyneuritis appeared in the birds given no addition, and the blood sugar value rose; polyneuritis yielded to treatment with vitamin B_1 but the blood sugar, though reduced, did not fall to normal. The smaller dose of cysteine hindered the rise of blood sugar but had no other effect. The larger dose produced a toxic effect with nerve signs of cerebellar and labyrynthine involvement and high blood sugar; the birds died in spite of the administration of vitamin B_1. Cystine had no effect except a toxic one, and the pigeons died in spite of being given vitamin B_1.—E. M. Hume.

1705

BARBIERI, E. Sui rapporti tra acido ascorbico e cocarbossilasi. [**Relations between ascorbic acid and cocarboxylase.**] *Arch. Sci. biol., Bologna,* 1955, **39,** 443–449. [Ist. Chim. Biol., Univ. Padua.]

Groups of 5 or 6 female guineapigs weighing about 350 g. were maintained on a scorbutogenic diet with or without 15 mg. ascorbic acid every 3 days, or on a stock diet. Some were killed after 12 and some after 25 days, with or without an intraperitoneal injection 30 min. previously of 20 mg. vitamin B_1 per kg. bodyweight. Cocarboxylase was estimated in the liver, heart, striped muscle, brain and uterus, and in the liver only of those given vitamin B_1. In all organs of the guineapigs not given vitamin B_1, the amount of cocarboxylase declined with the progress of scurvy, the relative loss being greatest in the liver and least in the brain. After injection of vitamin B_1 the concentration of cocarboxylase was doubled in the liver of non-deprived guineapigs; the percentage increase after 12 days' deprivation was 75·4 and after 25 days' 54·2. The results with animals given stock diet were the same as with animals given the scorbutogenic diet and ascorbic acid.—E. M. Hume.

1706

ANDERSON, B. M. and PARKER, H. E. **The effects of dietary manganese and thiamine levels on growth rate and manganese concentration in tissues of rats.** *J. Nutrition,* 1955, **57,** 55–59. [Dept. Biochem., Purdue Univ. Agric. Exp. Stat., West Lafayette, Ind.]

Weanling rats were given purified diets lacking vitamin B_1 and containing 0·8, 5·0 or 50·0 mg. manganese per kg. Vitamin B_1 was depleted in 16 days in all groups irrespective of Mn supplement. Doses of 2·5, 16, or 100 μg. vitamin B_1

were then given daily for 4 weeks. In this period the amount of Mn given as well as of vitamin B_1 affected the rate of weight increase, but there was no evidence of antagonism between them. The Mn content of the liver and heart was estimated and found to depend on the Mn content of the diet and to be unaffected by the amount of vitamin B_1 given.
A. M. Copping.

1707

KOIKE, M. **Competitive inhibition of thiaminetriphosphate action by oxythiaminetriphosphate in the carboxylase system.** *J. Vitaminol., Japan*, 1955, **1**, 254–259. [Dept. Biochem., Med. Sch., Kumamoto Univ., Ninomaru.]

Oxythiamine triphosphate was synthesised by treating oxythiamine with orthophosphoric acid and purified by precipitation with cold acetone and alcohol. The pure triphosphate was tested with yeast carboxylase in presence of thiamine triphosphate. When oxythiamine triphosphate was added to the reaction mixture before thiamine triphosphate, it had an inhibitory effect, but oxythiamine did not inhibit cocarboxylase.—A. M. Copping.

1708

MATSUKAWA, T. and YURUGI, S. **On thiamine-destructive factor. 2.** *J. Vitaminol., Japan*, 1955, **1**, 173–179. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

In continuation of the experiments on chemical degradation of vitamin B_1 by sulphurous acid (Abst. 4873, Vol. 25) its effect on analogues of vitamin B_1 and on vitamin B_1 in presence of certain analogues was studied. Synthesis is described of analogues with nitrobenzyl, aminobenzyl and aminopyrimidyl groups and with ethyl and methyl groups in different positions. The destruction of vitamin B_1 was affected by amine substitution; the effect appeared to be related to that which occurs in the presence of aniline (Abst. 4873, Vol. 25). The similarity in effect of these chemical reactions to those of the enzyme thiaminase are discussed with reference to the observations of Sealock and Livermore (Abst. 403, Vol. 19).—A. M. Copping.

1709

RIGDON, R. H. and DRAGER, G. A. **Thiamine deficiency in sea lions (*Otaria californiana*) fed only frozen fish.** *J. Amer. Vet. Med. Assoc.*, 1955, **127**, 453–455. [Lab. Exp. Pathol., Univ. Texas Med. Branch, Galveston.]

One female and 2 male sea lions which had been fed on an exclusive diet of frozen fish died suddenly. The males were about 3 and 2 years old and the female about 7 years. Post-mortem examination showed myelin degeneration and heart changes, which were attributed to deficiency of vitamin B_1. The result is in harmony with other observations showing the presence in fresh fish of a substance which destroys vitamin B_1.—T. D. Bell.

RIBOFLAVIN

1710

CERLETTI, P. and SILIPRANDI, N. Separazione della riboflavina e dei suoi esteri fosforici mediante cromatografia su colonna di cellulosa. [**Separation of riboflavin and its phosphoric esters by chromatography on a cellulose column.**] *Acta vitaminol.*, 1955, **9**, 145–148. [Ist. Chim. Biol., Univ. Rome.] French, English, German and Spanish summaries.

The method of separation was studied on pure specimens of riboflavin, riboflavin phosphate and riboflavin pyrophosphate. An absorption column was prepared of Whatman Cellulose Powder B. Mixtures containing not more than 1 mg. of each substance in 4 ml. water were poured on the column and eluted with buffer solution of Na acetate at *p*H 5·1 or of trimethyl ammonium formate at *p*H 4·8. The yellow band quickly separated into 3 parts moving successively down the column, the pyrophosphate moving first, followed by the phosphate and then by riboflavin. The process took place as far as possible in absence of light.
E. M. Hume.

1711

CERLETTI, P. and SILIPRANDI, N. **Electrophoretic separation and determination of flavins.** *Biochem. J.*, 1955, **61**, 324–328. [Inst. Biol. Chem., Univ. Rome.]

A method of paper electrophoresis was applied to separate riboflavin, flavin mononucleotide, flavin adenine dinucleotide, lumichrome and lumiflavin. The fractions could be identified by their fluorescence in ultraviolet light. Recovery as measured by the fluorescence of the eluted spots tended to be incomplete but total recovery was obtained by measuring the extinction coefficients by spectrophotometer. Quantitative elution of the fractions could be obtained after electrophoresis of mixtures on a cellulose column. (See also preceding Abst.)—A. M. Copping.

1712

SULMAN, F. G. **A note on the resorption and excretion of riboflavine from aluminium monostearate suspensions in the rat.** *J. Pharm.*, 1955, **7**, 473–476. [Dept. Appl. Pharmacol.,

Hebrew Univ.-Hadassah Med. Sch., Jerusalem.]

Depots of riboflavin for slow absorption were made by injecting rats subcutaneously with a riboflavin suspension in 2 per cent. aluminium monostearate. Such a depot of 50 mg. took up to 105 days to be absorbed and smaller quantities took shorter periods, 20 mg. being absorbed in 52 days.

K. H. Coward.

1713

MIANI, N. and MUNARI, P. F. Sulla localizzazione della riboflavina e dei suoi derivati nella fibra gigante di *Sepia officinalis*. Ricerche con la tecnica cromatografica. [**Location of riboflavin and its derivatives in the giant nerve fibre of *Sepia officinalis*. Chromatographic investigation.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 265–267. [Ist. Anat., Univ. Padua.]

The axoplasm was separated from the myelin sheath in the giant fibres of several specimens of squid, and riboflavin, riboflavin phosphate and flavin adenine dinucleotide were estimated in extracts by paper chromatography. The greatest concentration in both parts of the nerve was of flavin adenine dinucleotide; riboflavin was less and riboflavin phosphate still less. Riboflavin phosphate was slightly more concentrated in the axoplasm, but the other two substances were more concentrated in the myelin sheath.

E. M. Hume.

1714

PFALTZ, H. Einfluss von Vitaminmangel auf Fertilität, Trächtigkeitsverlauf und Entwicklung der Embryonen bei der Ratten. [**Effect of vitamin deficiency on the fertility, course of pregnancy, and development of the embryos in rats.**] *Münch. med. Wochenschr.*, 1955, **97**, 1677–1681. [Med. Lab., F. Hoffmann-La Roche Co. A.G., Basle.] English and French summaries.

For a lecture, a large part of the material previously published with other workers (Abst. 1904, Vol. 25) is drawn upon, but some X-ray photographs are published for the first time. They show skeletal defects, especially shortening or absence of the radius, ulna, tibia and fibula of newborn rats whose mothers had been deprived of riboflavin in pregnancy.—E. M. Hume.

1715

GUGGENHEIM, K. and DIAMANT, E. J. **Effect of riboflavin and choline deficiencies on water metabolism in rats.** *J. Nutrition*, 1955, **57**, 249–260. [Lab. Nutrit., Dept. Biochem., Hebrew Univ.-Hadassah Med. Sch., Jerusalem.]

Young male rats were given a complete purified diet with or without riboflavin, and for testing the effect of deprivation of choline a high-fat and a low-fat diet were used. Rats deprived of riboflavin or choline showed delayed diuretic response to a water load. Injection of cortisone or adrenocorticotropic hormone increased excretion of urine by rats deprived of riboflavin, but had no effect on normal rats. Tests *in vitro* showed that the ability of the liver to inactivate pitressin was unchanged in riboflavin deficiency and decreased when choline was lacking. The effect of choline deficiency was apparent with diets containing 5 or 20 per cent. fat and was not related to the protein content of the diet. Administration of vitamin B_{12} or aureomycin to rats deprived of choline improved the capacity of the liver to inactivate pitressin. The different mechanisms affecting water metabolism in deficiency of riboflavin or choline are discussed with reference to previous observations in relation to deficiency of other members of the vitamin B complex (*cf.* Absts. 3019, Vol. 24; 460, Vol. 25).—A. M. Copping.

1716

PURPURA, R. and LA GRUTTA, A. Lesioni epatiche nella aribоflavinosi sperimentale dei ratti e loro modificazioni dopo trattamento aureomicinico. Prime osservazioni. [**Lesions of the liver in experimental riboflavin deficiency of rats and their modification by treatment with aureomycin. Preliminary observations.**] *Sperimentale*, 1954, **104**, 106–121. [Ist. Clin. Pediat., Univ. Palermo.]

Three groups of from 3 to 6 rats weighing from 41 to 64 g. were given a diet of, per cent., casein 18, starch 68, butter 8, salts 4 and cod liver oil 2, with all B vitamins except riboflavin. One group received no addition, one after 52 days had 100 mmg. aureomycin per kg. bodyweight daily, and one had 0·5 mmg. riboflavin per kg. bodyweight daily [units are given as quoted but may be mg.]. A fourth group of 3 rats had a stock diet. The rats given riboflavin grew normally. Those deprived of riboflavin soon ceased to grow and showed signs of riboflavin deficiency; 2 died of pneumonia within 28 days. The rest of the group died in from 54 to 74 days. In 3 of the latter the liver at autopsy showed fatty degeneration. Those given aureomycin after 52 days resumed growth and signs of deficiency disappeared; 2 of them killed 13 days after aureomycin treatment began showed only residual signs of change in the liver.

E. M. Hume.

1717

KOTAKE, Y. and SHIBATA, Y. **On anthranilic acid excreted as a result of tryptophan administration to albino rats afflicted with V.B_2 deficiency and its inter-relations with 5-hydroxyanthranilic acid.** *Wakayama Med. Rep.*, 1955, **2**, 125–132. [Nutrit. Lab., Wakayama Med. Coll.]

Albino rats fed for about 4 weeks on a diet deficient in riboflavin excreted more anthranilic acid and xanthurenic acid and less creatinine in the urine in response to a dose of tryptophan than normal rats. The excretion of anthranilic acid was greatly reduced and the excretion of the others returned to normal when 5-hydroxyanthranilic acid was given simultaneously with the tryptophan; at the same time bodyweight tended to increase and the signs of deficiency to disappear.

A. Hepburn.

1718

MORRIS, H. P., WAGNER, B. P. and VELAT, C. A. **Tumors induced by 2-acetylaminofluorene in Buffalo-strain rats ingesting different levels of riboflavine.** *J. Nat. Cancer Inst.*, 1955, **16,** 489–493. [Lab. Biochem. Nat. Cancer Inst., Bethesda, Md.]

A constant amount of 6 mg. 2-acetylaminofluorene per 100 g. bodyweight was given weekly to rats of the Buffalo strain receiving diets containing 1, 2 or 10 μg. riboflavin per g. The amount of riboflavin in the diet did not appear to affect the incidence of tumours in the liver, but, with the highest dose of riboflavin, there seemed to be increased numbers of mammary tumours, squamous cell carcinomata in the ear duct, and tumours in sites other than the liver. With the lowest dose of riboflavin the carcinogen proved highly toxic, so that only about 40 per cent. of the animals survived long enough for tumours to develop.

A. M. Copping.

1719

COLES, R. and CUMBER, F. **Observations on the relationship between riboflavin, hatchability and clubbed down.** *J. Agric. Sci.*, 1955, **46,** 191–198. [Minist. Agric., London.]

A flock of White Leghorns was inbred for 6 years in an attempt to improve hatchability, but after rapid initial progress the hatchability of fertile eggs became stable at about 80 per cent. The standard diet provided about 3·6 μg. riboflavin per g., and clubbed down was sometimes found on chicks dead in shell.

In 1954, 7 pens were made up, each containing on the average 12 pullets and a cockerel; the pullets were of full sister families divided at random between the pens, which were on grass. Three rations were used, containing from 1·60 to 1·72, from 3·31 to 3·66 and from 13·72 to 14·20 μg. riboflavin per g. and called rations L, N and H. They were given to 2, 3 and 2 pens of birds from 14 January, egg collection began on 19 February, settings were made from 28 February to 21 March and then the groups on rations L and H exchanged diets and those on N went on as before. Settings continued until 22 April.

Total egg production for 63 days was almost 39 eggs per bird, from 35 to 36 of them fertile; there was no significant difference between pens. Pullets which started on ration L produced a larger number of fertile eggs after the change to ration H, about an equal proportion of chicks dead in shell, but fewer with clubbed down. Pullets started on ration H, after the change to ration L, produced a larger number of eggs, a larger percentage of chicks dead in shell and slightly more with clubbed down.

It is concluded that there was no significant effect of riboflavin on hatchability and that the presence of clubbed down, although readily influenced by riboflavin intake, was no indication that a higher riboflavin intake would improve hatchability. In a long discussion it is suggested that hatchability depends more on the supply of vitamin B_{12}, or more probably of an unidentified animal-protein factor, than on the supply of riboflavin.

D. Duncan.

1720

HOFFER, A., LEVINE, M. N. and GEDDES, W. F. **Effect of leaf and stem rust on the content and distribution of riboflavin in hard red spring wheats at successive stages of kernel development.** *Cereal Chem.*, 1955, **32,** 347–355. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

The paper forms part of a thesis (Hoffer, Univ. Minnesota, 1944) and reports part of an extensive study made during the war under the Work Projects Administration on the effects of leaf and stem rust on wheat, hitherto mostly unpublished.

Riboflavin was estimated by the method previously described (Abst. 308, Vol. 15) in grain, chaff and straw from samples taken twice weekly (for method, see Abst. 3228, Vol. 12) from plants of Thatcher and Marquis wheat subjected to 3 degrees of controlled inoculation with leaf and stem rust, respectively. Kernel weight and moisture content of tiller were determined also. The results are presented in tables.

Ripe kernel weight and moisture content of tiller were reduced by the rusts. The total riboflavin content of the entire tiller decreased greatly during maturation of the grain; it was reduced by the rusts, especially the leaf rust. The total riboflavin content of the kernel increased to about the medium-dough stage (21 days after flowering) in Thatcher and then declined; in Marquis the decline was earlier. The rusts seemed to interfere with translocation of riboflavin into the kernel. The riboflavin concentration of the dry matter in all parts declined with maturity and was not much affected by the rusts.—W. M. Deans.

See also Abst. 2345.

NICOTINIC ACID (NIACIN)

1721

HEMSLEY, L. A. **Suspected "blacktongue," nicotinic acid deficiency in a dog.** *Vet. Rec.*, 1955, **67**, 790. [Croydon.]

Blacktongue in a 3-year-old sheepdog is reported. The clinical signs and progress are described. The diet was of porridge and table scraps, but 2 other dogs on the same diet were healthy. There was no response to treatment with compound vitamin tablets, but 50 mg. nicotinic acid daily gave a good response within a few days. The diet was changed to contain a high proportion of animal protein.

T. D. Bell.

1722

FRANCE, W. H. **Bracken poisoning in cattle.** *Vet. Rec.*, 1955, **67**, 802–803. [Kirkby Lonsdale.]

When signs of bracken poisoning have become obvious it is usually too late to save the affected animals. In an investigation of 3 herds with 52 animals in all, where bracken poisoning was suspected, blood samples were examined. Thrombocytes usually were few or absent. Prophylactic treatment with nicotinamide was tried and was successful if the thrombocyte count was not too low. It is suggested that where bracken poisoning is suspected frequent blood tests should be made, and nicotinamide given if the thrombocytes are low. In advanced cases blood transfusion and penicillin should be given, and the animals should be removed from the offending pasture.

T. D. Bell.

1723

KRULICH, L., HELLER, J. and ŠTĚPÁN, J. Über die Pharmakologie von Produkten des Cholins mit Nicotinsäure. [**Pharmacology of compounds of choline with nicotinic acid.**] *Arch. exp. Pathol. Pharmakol.*, 1955, **226**, 328–334. [Physiol. Inst., Karls Univ., Prague.]

1724

VAN EYS, J., TOUSTER, O. and DARBY, W. J. **The purification of a glucuronide of nicotinic acid from rat urine.** *J. Biol. Chem.*, 1955, **217**, 287–292. [Dept. Biochem., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

Nicotinoyl glucuronide was isolated from rat urine by precipitation with lead acetate, decomposition of the lead salt and adsorption on Dowex 50. Subsequent paper chromatography and chemical and microbiological studies established the identity of the glucuronide as β-nicotinoyl-D-glucuronide. It appeared to be a normal constituent of rat urine, since 70 μg. were isolated from 10 ml. urine without previous administration of nicotinic acid.—A. M. Copping.

1725

HAYMAN, S., SHAHINIAN, S. S., WILLIAMS, J. N. (Jr.) and ELVEHJEM, C. A. **Effect of 3-acetylpyridine on pyridine nucleotide formation from tryptophan and niacin.** *J. Biol. Chem.*, 1955, **217**, 225–228. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Weanling male rats were depleted of liver pyridine nucleotide by a diet free from protein and nicotinic acid. After a depletion period of from 2 to 3 weeks a single dose of 2·5 mg. nicotinic acid or 4·15 mg. tryptophan with or without 2·61 mg. acetylpyridine was given and rats were killed at intervals up to 18 hr. afterwards. Acetylpyridine alone proved highly toxic to depleted rats, but apparent pyridine nucleotide increased in the liver. When acetylpyridine was given with tryptophan or nicotinic acid there was increased formation of pyridine nucleotide in the liver, as estimated by the spectrophotometric method of Feigelson *et al.* (Title 3126, Vol. 20). The high mortality which occurred from 4 to 5 hr. after administration of acetylpyridine alone was prevented when tryptophan or nicotinic acid was given at the same time or shortly afterwards.—A. M. Copping.

1726

MORET, V. Sul meccanismo di ossido-riduzione delle deidrasi niaciniche. 1. Confronto del comportamento polarografico del cloruro di N-metilniacinamide e della niacinamide. [**The oxidation - reduction mechanism of nicotinic dehydrases. 1. Comparison of the polarographic behaviour of the chloride of N-methylnicotinamide and of nicotinamide.**] *Arch. Sci. biol., Bologna*, 1955, **39**, 456–473. [Ist. Chim. Biol., Univ. Padua.]

From polarographic studies of oxidation and reduction of N-methylnicotinamide chloride and of nicotinamide, it was confirmed that the reduction of the nicotinic acid ring in both substances takes place at the quaternary pyridine N atom.

E. M. Hume.

1727

PORCELLATI, G. Attività nicotinamidasica: determinazione spettrofotometrica. [**Spectrophotometric estimation of nicotinamidase activity.**] Disintegrazione cellulare ed idrolisi enzimatica della nicotinamide. [**Cellular disintegration and enzymic hydrolysis of nicotinamide.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 141–144; 145–146. [Centro Enzimol., presso Ist. Chim. Biol., Univ. Naples.]

A spectrophotometric method was used to estimate the nicotinic acid derived from nicotinamide by enzymic hydrolysis in homogenates of rat's and rabbit's brain, liver and kidney. Some nicotinic acid was formed by all 3 organs of both species, the percentage of the substrate transformed being in the rat 10·2 for liver, 12·5 for brain and 14·8 for kidney; the corresponding values for the rabbit were 4·5 for liver, 6·5 for kidney and 8·2 for brain. When the amount of nicotinamide in the substrate was increased with rat homogenates, the amount hydrolysed increased, but the percentage did not change greatly.

In the same way the production of nicotinic acid by homogenates and slices of rat liver and kidney was compared. The amount formed by slices was always somewhat less. Suggestions are made to account for the difference.—E. M. Hume.

1728

BORIANI, A. Azione della'acido nicotinico e di alcuni suoi derivati sull'attività della colinesterasi serica. [**Action of nicotinic acid and some of its derivatives on the activity of serum cholinesterase.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 135–136. [Ist. Farmacol., Univ. Modena.]

Percentage inhibition of cholinesterase in horse serum *in vitro* by nicotinic acid and certain of its derivatives was for nicotinic acid 48·4, nicotinamide 56·6, trigonellin 100·0, N^1-methyl-6-hydroxynicotinic acid 33·7, N^1-methyl-2-hydroxynicotinic acid 81·4, 2-hydroxytrigonellinamide 37·3 and 6-hydroxytrigonellinamide 37·3.—E. M. Hume.

1729

FISHER, H., SCOTT, H. M. and JOHNSON, B. C. **Quantitative aspects of the nicotinic acid-tryptophan interrelationship in the chick.** *Brit. J. Nutrition*, 1955, **9**, 340–349. [Div. Animal Nutrit. and Dept. Animal Sci., Univ. Illinois, Urbana.]

Day-old male chicks were fed on a basal diet containing, per cent., hydrolysed casein 22, salts 5·3, maize oil 3, cellulose 3, glucose 64, choline chloride 0·2, DL-methionine 0·3, L-arginine hydrochloride 1·0 and glycine 1·0, with adequate amounts of vitamins A, D, E and all B vitamins. Growth tests began after 3 days, with 4 chicks in each group, receiving the diet supplemented with from 0·1 to 0·4 per cent. L-tryptophan without nicotinic acid, and with from 2·5 to 20 mg. nicotinic acid per cent. In absence of nicotinic acid an average bodyweight of 138 g. was attained after 3 weeks with 0·2 per cent. tryptophan, or with 0·15 per cent. when 2·5 mg. nicotinic acid per cent. was given as well. With the marginal amount of 0·10 per cent. tryptophan no benefit was obtained from larger amounts of nicotinic acid up to 20 mg. per cent. There were some scattered cases of perosis.

When the basal diet was further supplemented with, per cent., L-histidine 0·3, DL-threonine 0·8 and L-leucine 0·65 at the expense of glucose, perosis was frequent and more tryptophan and nicotinic acid were needed for protection.

When maize replaced glucose in the basal diet, 0·15 per cent. tryptophan with 1·25 mg. nicotinic acid per cent. was adequate for growth, but perosis was frequent. Reduction of the casein from 22 to 16 per cent. improved growth and there was less perosis. It is suggested that, by reduction in quantity and quality of the protein in the diet, the tryptophan that could be used for protein synthesis may have been reduced, so that more may have been available for synthesis of nicotinic acid. On the maize diets the amount of nicotinic acid needed for optimum growth and prevention of perosis was about 10 mg. per cent.; the increased need is attributed to a stress condition imposed by the amino-acid composition and balance of maize. No support is given for the presence of a toxic principle in maize responsible for perosis.

Practical starting rations containing, per cent., soya bean 30 or fishmeal 23 with maizemeal 54 or 65, and tryptophan 0·31 or 0·26 were adequate for growth to weights between 275 and 297 g. at 3 weeks of age, and were not improved by addition of up to 5·6 mg. nicotinic acid per cent. (See also Absts. 1949, 1950, Vol. 22.)—H. Chick.

1730

ADAMO, G. Il contenuto in acido nicotinico nel caffè. [**Nicotinic acid content of coffee.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 79–82. [Ist. Merceol., Univ. Bari.]

Trigonellin and nicotinic acid were estimated chemically in alcoholic extracts of green coffee and in roasted coffee, which in the process of roasting is brought to a temperature up to 220° C. In 3 kinds of coffee the percentage of trigonellin before roasting ranged from 1·15 to 1·28, and after roasting from 0·24 to 0·35. The percentage of nicotinic acid before roasting was less than 0·001, and after roasting ranged from 0·47 to 0·51. It is pointed out that in coffee less strongly roasted than is customary in Italy, less nicotinic acid is likely to be produced from trigonellin.—E. M. Hume.

See also Absts. 2205, 2343.

VITAMIN B_6 (PYRIDOXINE, ADERMIN)

1731

FUJITA, A., MATSUURA, K. and FUJINO, K. **Fluorometric determination of vitamin B_6. 1. Determination of pyridoxine.**

FUJITA, A., FUJITA, D. and FUJINO, K. **2. Determination of pyridoxamine. 3. Fractional determination of pyridoxal and 4-pyridoxic acid.**

FUJITA, A. and FUJINO, K. **4. Fractional determination of vitamin B_6 components and 4-pyridoxic acid in the urine.** *J. Vitaminol., Japan*, 1955, **1**, 267–274 ; 275–278 ; 279–289 ; 290–296. [Biochem. Lab., Kitasato Inst., Minato-ku, Tokyo.]

1. A method was devised for estimating pyridoxine by converting it into the fluorescent lactone derivative of 4-pyridoxic acid (*cf.* Huff and Perlzweig, Abst. 3199, Vol. 14). Pyridoxine was extracted from tissues with dilute H_2SO_4, the acid was neutralised by barium hydroxide, and interfering substances were removed by adsorption on Permutit. Pyridoxine was converted to 4-pyridoxic acid by oxidation with permanganate and thence to the lactone by heating with 6*N* HCl. Fluorescence of the product was measured in alkaline solution at *p*H 10. Other analogues of vitamin B_6 did not interfere with the estimation of pyridoxine by this procedure.

2. Pyridoxamine was estimated by the method just described after preliminary treatment of extracts with sodium nitrite to deaminate pyridoxamine and convert it to pyridoxine. The nitrite treatment did not affect pyridoxine and pyridoxal in the extracts and their presence did not interfere with estimation of pyridoxamine.

3. Pyridoxal was oxidised to 4-pyridoxic acid by heating with ammoniacal silver nitrate. Both pyridoxal and 4-pyridoxic acid were extracted from tissues by the acid and alkaline treatments required to obtain free pyridoxal. The 4-pyridoxic acid was removed by adsorption on an ion-exchange substance and pyridoxal was then converted to pyridoxic acid lactone for measurement of fluorescence. By this method it was possible to measure all components of vitamin B_6, and a table is given showing values for tissues and foods, with comparative figures reported by investigators using other methods. From the results the fluorimetric method seemed to be satisfactory.

4. In order to apply the fluorimetric method of estimating vitamin B_6 components to urine it was essential first to remove 4-pyridoxic acid with ion-exchange resin. Pyridoxal could be selectively adsorbed on another suitable resin and pyridoxine on Permutit. Details of the fractional separation of the components are given, with results from studies of normal urine and blood.

A. M. Copping.

1732

BIANCHI DONNASIBILLA, L. and MAGGIORA, L. Carenza piridossinica da desossipiridossina nel ratto. Studio del sangue periferico e del midollo osseo. [**Pyridoxine deficiency produced by deoxypyridoxine in the rat : the peripheral blood and bone marrow.**] *Acta vitaminol.*, 1955, **9**, 211–217. [Ist. Clin. Pediat., Univ. Pavia.] French, English, German and Spanish summaries.

Of 30 rats weighing from 150 to 200 g., fed on a stock diet, 20 were given daily by intramuscular injection 400 μg. deoxypyridoxine. Blood from the tail was examined after 20, 30, 40 and 50 days and, at the same intervals, rats were killed for comparison of the bone marrow with that of the 10 normal rats. In the peripheral blood there was no change in red cells, lipids or polysaccharides. Of the white cells, the lymphocytes diminished progressively and severely. The granulocytes diminished slightly at first, then increased up to the 40th day, and again fell, the number being less than the initial one by the 50th day. In the bone marrow there was no change affecting the red cells, but there was an increase of immature eosinophils, a slight progressive increase in the number of haemocytoblasts, and a decrease in the number of neutrophil myelocytes and metamyelocytes.—E. M. Hume.

1733

BIANCHI DONNASIBILLA, L. and CORTESI, M. Ulteriori indagini sui poteri immunitari nella carenza piridossinica sperimentale da desossipiridossina. [**Further studies of immunising power in experimental pyridoxine deficiency produced by deoxypyridoxine.**] *Acta vitaminol.*, 1955, **9**, 219–222. [Ist. Clin. Pediat., Univ. Pavia.] French, English, German and Spanish summaries.

Of 18 normally fed rabbits weighing from 900 to 1200 g., 10 were injected with 3 mg. deoxypyridoxine daily. On the 5th and 8th day 2 in each group were injected with 500 mg. DL-tryptophan. Those given deoxypyridoxine responded with an excretion of xanthurenic acid which proved them to be in a state of deficiency of vitamin B_6. On the first and 10th day of the experiment all the rabbits were injected with a typhoid vaccine, and on the first and 5th day with a diphtheria toxoid. On the 10th, 20th and 30th day, the degree of immunity induced was measured by

estimating in the serum the amount of H and O agglutinins and the degree of haemagglutination, respectively. Both groups showed an immune reaction which was not diminished by deficiency of vitamin B_6 induced with deoxypyridoxine.

E. M. Hume.

1734

WERTMAN, K., O'LEARY, W. M. and SMITH, L. W. **The effects of pyridoxine deficiency on some physiological factors of importance in resistance to infection.** *J. Nutrition*, 1955, **57**, 203–214. [Div. Bacteriol., Dept. Biol. Sci., Univ. Pittsburgh, Pa.]

Rats weighing about 45 g. were given a purified diet with or without vitamin B_6. Some of those receiving the vitamin had their food intake restricted to that of the deprived rats. After 8 weeks samples of blood were taken from the tail and an intraperitoneal injection of Locke's solution and nutrient broth was given to cause inflammation. Twelve hr. later the rats were anaesthetised and bled by heart puncture. Cell counts were made on the peripheral blood samples, the bone marrow and the inflammatory exudates. No difference was found in total erythrocyte count between the groups. Microcytosis and leucopenia occurred in blood of rats deprived of vitamin B_6 and not of those with restricted food intake. The deprived rats showed an increase of polymorphonuclear leucocytes and a decrease of lymphocytes. Cellular migration to the inflamed area was less in deficient rats. Granulocytosis and lymphopenia were greater in inflammatory exudates and bone marrow of deprived rats than of those given the vitamin, whether the food was restricted or not. There was no change of capillary permeability in any group.—A. M. Copping.

1735

BOONE, I. U., TURNEY, D. F. and LANGHAM, W. H. **Isoniazid in vitamin B_6-deficient rats.** *J. Lab. Clin. Med.*, 1955, **46**, 549–559. [Los Alamos Sci. Lab., Univ. California, N. Mex.]

Four groups of 20 rats received from 6 weeks of age a basal diet deficient in vitamin B_6 with daily supplements of 50 μg. pyridoxine, or 100 μg. deoxypyridoxine, or 50 mg. isoniazid per kg. bodyweight, or 120 mg. isoniazid per kg. bodyweight and 50 μg. pyridoxine. Some animals in the groups given pyridoxine had the food intake restricted. Weight loss was most severe in rats given isoniazid alone, and this group and those given isoniazid and pyridoxine had convulsions but no acrodynia. Severe acrodynia occurred in rats given deoxypyridoxine but they did not have convulsions. Excretion of xanthurenic acid in response to a dose of tryptophan was raised in rats given isoniazid but not as much as in those given deoxypyridoxine. Atrophy of the thymus gland occurred in rats given deoxypyridoxine or isoniazid. All signs of metabolic disturbance due to isoniazid, including convulsions, disappeared rapidly when large doses of pyridoxine were given. Toxic effects of isoniazid were more severe in animals deprived of vitamin B_6 than in normal animals. The results are discussed with reference to the possible occurrence of vitamin B_6 deficiency in patients treated with isoniazid.—A. M. Copping.

1736

CHARCONNET-HARDING, F. and ABRAHAM, J. Influence comparée de la carence B_6 et de l'isonicotinylhydrazide (INH) sur le métabolisme du L-tryptophane et du D-tryptophane chez le rat blanc. [**Comparative effect of vitamin B_6 and *iso*nicotinylhydrazide on the metabolism of L- and D-tryptophan in the white rat.**] *C.R. Acad. Sci.*, 1955, **241**, 993–995.

In rats receiving *iso*nicotinylhydrazide the excretion of indole derivatives in response to a dose of D- or DL-tryptophan closely resembled that found in rats deprived of vitamin B_6, but a dose of L-tryptophan produced no increase of indole excretion, an effect different from that reported in man (Biehl and Vilter, Abst. 4442, Vol. 24).

A. M. Copping.

1737

SANDMAN, R. and SNELL, E. E. **Some effects of ω-methyl analogues of vitamin B_6 in rats.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90**, 63–67. [Biochem. Inst., Univ. Texas, Austin.]

When large doses of ω-methylpyridoxal, ω-methylpyridoxamine or ω-methylpyridoxine were given with a diet lacking vitamin B_6, rats gained weight for about 4 weeks but weight gain then slackened and they died. Convulsive seizures occurred within the first 2 weeks of treatment with the ω-methyl compounds even when weight increase was still good. Convulsions and weight loss were prevented if pyridoxal was given in addition to the ω-methyl compounds. Enzyme studies showed that transaminase and thionase activities were low in rats given ω-methyl analogues. ω-Methylpyridoxal phosphate had only about 10 per cent. of the activity of pyridoxal phosphate as an activator of transaminase. The metabolic role of the ω-methyl analogues is discussed.

A. M. Copping.

1738

HURWITZ, J. **Enzymatic phosphorylation of vitamin B_6 analogues and their effect on tyrosine decarboxylase.** *J. Biol. Chem.*, 1955, **217**, 513–525. [Dept. Biochem., Sch. Med., Western Reserve Univ., Cleveland, Ohio.]

The possibility of enzymic phosphorylation by a kinase preparation in presence of adenosine triphosphate was studied with 11 analogues of

pyridoxine, pyridoxal and pyridoxal phosphate being used as standards for comparing the effects of analogues and phosphates on tyrosine decarboxylase. Analogues substituted in the 6 position of the ring could not be phosphorylated. All analogues which formed phosphates had the 6 position free and the 5 position occupied by a hydroxymethyl group to which the phosphate group could be attached. The structural requirements for union of pyridoxal phosphate and tyrosine decarboxylase could not be defined from the reactions obtained with the analogues.

A. M. Copping.

1739

BLAKLEY, R. L. **The interconversion of serine and glycine : participation of pyridoxal phosphate.** *Biochem. J.*, 1955, **61,** 315–323. [Dept. Biochem., John Curtin Sch. Med. Res., Australian Nat. Univ., Canberra.]

The activity of an enzyme, prepared from rabbit liver, which catalyses the synthesis of serine from glycine and formaldehyde, was studied manometrically. With successive purifications, increased requirement for pyridoxal phosphate was shown. The enzyme was almost completely inactivated by incubation at *p*H 9 and 37° C. for from 15 to 30 min. It could be re-activated by brief incubation in presence of pyridoxal phosphate at *p*H 7·2. Re-activation was inhibited by deoxypyridoxine phosphate and by pyridoxine phosphate. A number of metals were tested for participation in the enzymic synthesis of serine ; all exhibited inhibition and none activated the reaction. Ethylenediamine tetra-acetate did not inhibit synthesis. Direct evidence for formation of Schiff's bases between pyridoxal phosphate and amino-acids was obtained in spectrophotometric studies which gave further evidence about the mechanism of enzyme reactions employing pyridoxal phosphate.—A. M. Copping.

1740

CHRISTENSEN, H. N. **Possible role of chelation between alkali metals and pyridoxal in biological transport.** *Science*, 1955, **122,** 1087–1088. [Dept. Biochem. Nutrit., Tufts Univ. Sch. Med., Boston, Mass.]

Spectrophotometric and titrimetric evidence was obtained that chelated compounds of pyridoxal and magnesium, calcium, lithium, sodium and potassium were formed when pyridoxal was added to a solution of a metal chloride containing small quantities also of a metal hydroxide. The strongest chelation occurred with Mg, Li and Na, which are the metals that cause the apotryptophanase and pyridoxal phosphate system to dissociate, whereas K tends to stabilise the enzyme system. A possible role of the metallic complexes in transfer of metals through cellular boundaries is suggested.—A. M. Copping.

1741

FOWST, G. Piridossina, ipofisi e corticosurrene. [**Pyridoxine, the pituitary gland and the adrenal cortex.**] *Acta vitaminol.*, 1955, **9,** 205–210. [Lab. Direzione Med. Centrale, Lepetit S.p.A., Milan.] French, English, German and Spanish summaries.

The results in the literature on the relationship between pyridoxine and the pituitary gland and adrenal cortex are reviewed and discussed.

E. M. Hume.

1742

GINOULHIAC, E., TENCONI, L. T. and VANDELLI, I. Influence des stéroïdes sexuels sur le métabolisme du tryptophane. [**Influence of sex steroids on metabolism of tryptophan.**] *Acta vitaminol.*, 1955, **9,** 193–198. [Lab. Direction Méd. Centrale, Lepetit S.p.A., Milan.] Italian, English, German and Spanish summaries.

The work continues that reported in Abst. 4279, Vol. 23.

In adult rats with ovaries removed, the amounts of kynurenine and diazo substances found in the urine after tryptophan had been given were much less than in normal rats ; the amount of xanthurenic acid was unchanged 42 days after operation but increased after 150 days.

Treatment with folliculin 500 days after operation reduced the output of xanthurenic acid to normal and, in the largest dose, caused a particularly high output of kynurenine and diazo substances. Cortisone and hydrocortisone had similar effects, but the increases in excretion of kynurenine and diazo substances were less. Progesterone and testosterone were without effect, and progesterone failed to modify the effect of folliculin. Hexoestrol behaved like folliculin. Folliculin reduced the high output of xanthurenic acid in intact rats deprived of pyridoxine, but not to the normal amount.

It is concluded that the effects of pyridoxine and folliculin on tryptophan metabolism are not identical.—D. Duncan.

1743

EDDY, A. A. and KIRSOP, B. **Accumulation of indole metabolites and of anthranilic acid in cultures of *Saccharomyces cerevisiae* deprived of pyridoxin.** *J. Inst. Brewing*, 1955, **61,** 382–385. [Brewing Indust. Res. Found., Nutfield, Surrey.]

In cultures of 10 out of 13 strains of *Saccharomyces cerevisiae* in a medium without pyridoxine, a positive indole reaction was detected with the Ehrlich reagent. The cultures containing indole

showed blue fluorescence in ultraviolet light. From a detailed investigation of one culture, indole, tryptophol and an unidentified indole derivative were isolated by ether extraction and paper chromatography. The blue fluorescence was found to be due to anthranilic acid. The role of these metabolites in the synthesis of tryptophan by micro-organisms is briefly discussed.

A. M. Copping.

See also Absts. 2134, 2352.

PANTOTHENIC ACID

1744

DUBOST, S., BRIGNON, J. and WOLFF, R. Sur la croissance de *Lactobacillus helveticus* en présence d'acide pantothénique et de pantéthéine et son application au dosage microbiologique du coenzyme A dans les tissus. [**Growth of *Lactobacillus helveticus* in the presence of pantothenic acid and pantotheine and its application to the microbiological estimation of coenzyme A in tissues.**] *C.R. Soc. Biol.*, 1955, **149,** 1008–1011. [Lab. Chim. Biol., Fac. Méd., Nancy.]

With turbidity as criterion it was shown that pantotheine was a growth factor for *Lactobacillus helveticus*. A characteristic alteration in shape of the curve of response was obtained when pantothenic acid and pantotheine were present. Pantotheine was formed when coenzyme A was treated with intestinal phosphatase, and the coenzyme A content of tissues could thus be estimated by the use of *L. helveticus*. Results obtained with the method and with the double enzyme technique of Lipmann (Abst. 466, Vol. 19) were in good agreement.

A. M. Copping.

1745

LEFEBVRES-BOISSELOT, J. Contribution à l'étude des besoins en acide pantothénique de l'embryon et du foetus. Résultats expérimentaux obtenus chez le rat. [**Pantothenic acid requirements of the embryo and foetus. Experimental results obtained with the rat.**] *Arch. Sci. physiol.*, 1955, **9,** 145–155. [Lab. Physiol., École Hautes-Études, Paris.]

The progress and results of gestation were recorded in rats receiving amounts of pantothenate ranging from 0 to 150 μg. daily. With up to 10 μg. pantothenate in a purified diet all the embryos were resorbed. With from 20 to 25 μg. about 60 per cent. of the embryos were resorbed and of the young born half showed abnormalities. With increasing amounts the number of resorbed embryos and deformed young decreased. The least amount permitting all young to be normal was 50 μg. daily. When the dose was from 40 to 45 μg. almost 10 per cent. of the young were deformed. The requirement of the foetus appeared to decrease with age according to a curve constructed from results obtained in the present study and reported by other observers.—A. M. Copping.

1746

STOTHERS, S. C., SCHMIDT, D. A., JOHNSTON, R. L., HOEFER, J. A. and LUECKE, R. W. **The pantothenic acid requirement of the baby pig.** *J. Nutrition*, 1955, **57,** 47–53. [Michigan State Coll., East Lansing.]

Baby pigs removed from the sow from 72 to 96 hr. after birth were given a basal synthetic milk without pantothenic acid or with 5·0, 7·5, 10·0, 12·5 or 15·0 mg. Ca pantothenate per kg. solids. Diarrhoea occurred in from 14 to 28 days in those deprived of pantothenate, and those which survived developed signs of inco-ordination from 7 to 10 days later. Injection of 100 mg. pantothenate daily cured the diarrhoea and weakness. Pigs in groups receiving less than 10·0 mg. pantothenate per kg. milk solids developed diarrhoea within 38 days, and there was some inco-ordination and weakness of the hind quarters. At least 12·5 mg. pantothenate per kg. solids was required for normal growth and efficiency of use of feed.

Histological examination of tissues from the deficient pigs showed lesions in the large intestine and nervous system like those described by Wintrobe (Abst. 3444, Vol. 10).

A. M. Copping.

1747

SERONDE, J. (JR.), ZUCKER, L. M. and ZUCKER, T. F. **The influence of duration of pantothenate deprivation upon natural resistance of rats to a corynebacterium.** *J. Infect. Dis.*, 1955, **97,** 35–38. [Dept. Pathol., Coll. Phys. Surg., Columbia Univ., New York.]

In continuation of previous studies (Absts. 4450, 4451, Vol. 24) the resistance of 2 strains of rats to *Corynebacterium* 197 was examined when they were deprived of pantothenate for 10, 20, 30 or 40 days from weaning. One strain proved far more susceptible than the other, developing severe and fatal infections in 20 days, while the less susceptible did so only after 40 days' deprivation. With the highly susceptible strain and with another related strain the effect of varying the size of the inoculum was investigated for 30 days without pantothenate. There was little difference in response between undiluted broth and a broth diluted 1 in 5 with saline. With more dilute broth, lesions were less severe. Again there were differences in susceptibility between the strains of rats.—A. M. Copping.

1748

ASCHKENASY, A. (with NEVEU, C.) Études sur les changements pondéraux de divers organes et tissus provoqués par la surrénalectomie chez le rat. Rôle joué par le facteur temps, le sexe des animaux et la teneur du régime en protéines et en acide pantothénique. [**Study of weight changes in organs and tissues induced by adrenalectomy in the rat. Role of time, sex and the protein and pantothenic acid content of the diet.**] *Arch. Sci. physiol.*, 1955, **9**, 157–181. [Hôp. Pitié, Paris.]

The early and late results of adrenalectomy were studied in 142 rats of about 150 g. original weight. During the week after operation there was some loss of bodyweight, but during the next 5 weeks adrenalectomised male rats on a normal diet grew as well as intact males, and the weight increase of adrenalectomised females was slightly above that of intact females. If the diet was low in protein the adrenalectomised rats' appetite was poor and they lost weight. With only 2 per cent. protein in the diet weight loss was severe and the rats died. When extra pantothenic acid was added to a normal diet adrenalectomised male rats grew a little better than intact animals.

The weight of the muscles, liver, kidney, testes, seminal vesicles, preputial glands, spleen and thymus, thyroid and submaxillary glands was recorded for comparable adrenalectomised and intact rats. With a normal diet there was hypertrophy of the lymphoid organs and decrease in the weight of the liver after the operation. Hypertrophy of the spleen disappeared after 6 weeks but that of the muscle, thyroid gland and testes increased with time of survival. Female rats showed no change in the weight of the liver after adrenalectomy, but had greater hypertrophy of the thymus gland and spleen than males. With a limited protein intake, hypertrophy of the organs and tissues was almost completely abolished in both males and females, but liver atrophy was increased in males, an effect which could be prevented by large doses of pantothenic acid.

A. M. Copping.

1749

BONOMO, B. and MAINARDI, L. Studio radiologico degli effetti dell'acido pantotenico sulla funzione motoria dell'intestino nei ratti a midollo reciso. [**Radiographic study on the effects of pantothenic acid on the motor function of the intestine in rats with the spinal cord cut.**] *Acta vitaminol.*, 1955, **9**, 163–171. [Ist. Radiol., Univ. Pavia.] French, English, German and Spanish summaries.

Normally fed rats weighing from 200 to 300 g. were given a barium meal after a fast of 3 hr. In some the spinal cord was cut at the level of the fourth dorsal vertebra. At intervals for 24 hr. X-ray photographs were taken. There was marked retardation in the passage of the barium meal in the rats in which the cord had been cut. The experiment was repeated with 2 groups of 15 rats; the cord was cut in all. To one group an intramuscular injection of 5 mg. Ca pantothenate per kg. bodyweight was given 15 min. and 15 hr. after the barium meal. The X-ray photograph was taken after 24 hr., when it was apparent that the barium meal had passed out of the small intestine in 13 of the rats given Ca pantothenate and in only 4 of those not given it.—E. M. Hume.

1750

CHERNICK, S. S., MOE, J. G. and SCHWARZ, K. **Dietary necrotic liver degeneration and coenzyme A.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 520–523. [Lab. Biochem. Nutrit., Nat. Inst. Arthritis Metabol. Dis., Nat. Insts. Health, Bethesda, Md.]

Necrotic degeneration of the livers of rats caused by a diet containing 30 per cent. of torula yeast as sole source of protein, lacking vitamin E and low in cystine (Abst. 5235, Vol. 21; 1037, Vol. 22) was found to be preceded by a metabolic lesion characterised by reduced uptake of oxygen. Low values for coenzyme A were found in affected livers and addition of vitamin E to the diet did not raise the coenzyme A content of the liver, but almost normal values were obtained if cystine, methionine or cysteine was added. The effect of supplements on the content of coenzyme A was not related to their protective effect against necrotic degeneration.—A. M. Copping.

1751

TURCHETTO, E., INFANTE, R. and SECHI, A. M. Influenza della tiroxina sulla attività lipotropa dell'acido pantotenico. [**Effect of thyroxine on the lipotropic activity of pantothenic acid.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 233–234. [Ist. Chim. Biol., Univ. Bologna.]

Fifty rats weighing from 125 to 130 g. in 10 groups were maintained for 16 days on a diet high in fat, low in protein and containing 0·5 per cent. cholesterol. They received additions of pantothenic acid with or without thyroxine or neither. Total lipids were estimated in the liver. The mean values, per cent., were for no addition 16·2, for 10, 20 and 50 mg. pantothenic acid daily 8·0, 8·0 and 6·1, and for the same amounts of pantothenic acid with 100 or 200 μg. thyroxine daily from 2·0 to 3·5.—E. M. Hume.

1752

SWELL, L., BOITER, T. A., FIELD, H. (Jr.) and TREADWELL, C. R. **Pantothenate and dietary cholesterol in the maintenance of blood and tissue cholesterol esters.** *J. Nutrition*, 1955,

57, 121–132. [Gen. Med. Res., Veterans Admin. Centre, Martinsburg, W. Va.]

After a preliminary study of blood cholesterol values with a normal diet, rats weighing from 60 to 70 g. were given a purified diet with no fat or with 25 per cent. olive oil, and with or without 1 per cent. cholesterol and 0·5 per cent. sodium taurocholate. Some groups were deprived of pantothenate and others received it. Blood cholesterol was estimated after 10, 20 and 35 days of the diets; the rats were then killed and the liver and adrenal glands were analysed.

No change in blood cholesterol occurred when a fat-free diet without added cholesterol was given to rats with or without pantothenate. When cholesterol and bile salt were added to the fat-free diet, rats deprived of pantothenate showed very little rise in blood cholesterol, but rats not deprived of pantothenate showed a rise. Addition of fat to the diet increased blood cholesterol further in non-deprived animals and raised it in those deprived of pantothenate. The cholesterol content of the liver and adrenal glands was increased in all animals which had high values for blood cholesterol. In pantothenate-deficient rats most groups showed low values for adrenal cholesterol except where addition of fat, cholesterol and bile salts to the diet had raised blood cholesterol. The amount of cholesterol in the liver was less in rats deprived of pantothenate than in those having comparable diets containing pantothenate.

A. M. Copping.

1753

BRÆKKAN, O. R. **Role of pantothenic acid in the reproductive cycle of ovaries in fish.** *Nature*, 1955, **176,** 598. [Govt. Vitamin Lab., Norwegian Fish. Res. Inst., Bergen.]

Pantothenic acid was estimated microbiologically in the ovaries of young and mature cod (*Gadus morrhua*) during the months from April to September. The content, up to 375 μg. per g. fresh weight, was highest in ovaries of young and mature fish in the early stages of regeneration after spawning. Later in the regeneration cycle and during maturation of the reproductive organs, the pantothenic acid content of the ovaries decreased to values of from 10 to 30 μg. per g. tissue shortly before spawning. The maximum values are the highest reported for pantothenic acid from natural sources.—A. M. Copping.

1754

PIERPOINT, W. S., HUGHES, D. E., BADDILEY, J. and MATHIAS, A. P. **The phosphorylation of pantothenic acid by *Lactobacillus arabinosus* 17-5.** *Biochem. J.*, 1955, **61,** 368–374. [Med. Res. Counc. Unit Res. Cell Metabol., Dept. Biochem., Univ. Oxford.]

When dried cells of *Lactobacillus arabinosus* were incubated with pantothenic acid in presence of adenosine triphosphate and phosphate buffer the pantothenic acid was converted into a phosphoric ester. Treatment with phosphatase gave complete recovery of pantothenic acid. The presence of fluoride increased the extent of phosphorylation. A study of the effect of intestinal phosphatase on known pantothenic phosphates showed that the phosphate formed by *L. arabinosus* was pantothenic-4′-phosphate. The result was confirmed by chromatography and by tests of stability to acid and alkali.—A. M. Copping.

1755

WIELAND, T., MAUL, W. and MÖLLER, E. F. Verfolgung des Schicksals radioaktiver Pantothensäure in Mikroorganismen mit Hilfe der Papierelektrophorese. [**Fate of radio-active pantothenic acid in micro-organisms followed by electrophoresis on paper.**] *Biochem. Ztschr.*, 1955, **327,** 85–92. [Inst. Org. Chem., Univ. Frankfurt a.M.]

The synthesis of pantothenic acid containing ^{14}C in the β-alanine group was achieved, starting from ^{14}C-cyanoacetic ethyl ester. The use of the marked pantothenic acid by *Streptobacterium plantarum* and by *Saccharomyces carlsbergensis* was studied with the aid of paper chromatography and electrophoresis. All radio-activity appeared to migrate to the anode, so that the pantothenic components intermediate in the synthesis of coenzyme A by the micro-organisms were acidic and not neutral or basic derivatives. The paper chromatograms from extracts of cultures of the organisms showed different distributions of the components, which were identified as dephosphocoenzyme A, 4-phosphopantothene, panthenylcysteine, coenzyme A and pantothenic acid for *Streptobacterium*, and as pantothenic acid, coenzyme A and 4-phosphopantothenic acid for *Saccharomyces*. The possible metabolic pathways suggested by the observations are discussed.—A. M. Copping.

BIOTIN

1756

KATSH, S., KOSARICK, E. and ALPERN, J. **Effect of biotin deficiency on body and organ growth and accessory reproductive structures in male rats.** *Growth*, 1955, **19,** 45–56. [Kerckhoff Labs. Biol., California Inst. Technol.]

Groups of young male albino rats were given normal or purified diets with and without

sulphaguanidine, or diets containing egg white and sulphaguanidine with or without added biotin. Other groups had normal diets in amounts restricted to those of rats given egg white and no biotin, or those given a purified diet.

The earliest signs of biotin deprivation appeared in rats given egg white and the lesions were prevented by inclusion of biotin in the diet. When severe biotin deficiency developed after 60 days all the rats in the group and in comparable groups were killed. Others were kept for 100 days on the experimental diets. Bodyweight, and weight of the pituitary, thyroid, adrenal, prostate and thymus glands and of the spleen and seminal vesicles were recorded. Testicular lesions were present in rats given egg white and no biotin. No other histological change was noted, and changes in organ weights appeared to be related to bodyweight as determined by limited or unlimited food intake.—A. M. Copping.

1757

DELOST, P. and TERROINE, T. Étude des modifications pathologiques du développement du testicule provoquées par la carence en biotine chez le rat. [**Pathological modifications in development of the testicle induced by biotin deficiency in the rat.**] *C.R. Soc. Biol.*, 1955, **149,** 907–910. [Lab. Physiol. Gén., Sorbonne, Paris.]

When male rats aged 1 month were given a diet without biotin and containing egg white, signs of testicular degeneration appeared within a short time. The weight of the testes was below normal from the first week and spermatogenesis was retarded, with degeneration of spermatocytes. The seminal tubules were deformed from about the seventh week of deprivation and from then until the ninth week the degeneration progressed rapidly. Rats given restricted amounts of a diet containing biotin showed no testicular abnormality.

A. M. Copping.

1758

DELOST, P. and TERROINE, T. Action inhibitrice de la carence en biotine sur le développement du tractus génital du rat mâle. [**Inhibitory effect of biotin deficiency on the development of the genital tract of the male rat.**] *C.R. Soc. Biol.*, 1955, **149,** 1236–1239. [Lab. Physiol. Gén., Sorbonne, Paris.]

The genital organs of male rats, which received for 3 months from 4 weeks of age a diet without biotin, were lighter and less well developed than those of rats having an adequate diet in restricted or unrestricted amounts. The seminal vesicles and prostate epithelium remained underdeveloped; the epididymis was almost normal. The ductus deferens was of small diameter. The mechanism of the effect is discussed.—A. M. Copping.

p-AMINOBENZOIC ACID

1759

RUSSELL, C., BHANDARI, R. R. and WALKER, T. K. **Studies of lactic acid bacteria associated with brewery products. 4. Interrelationships in requirements for purines, folic acid and *p*-aminobenzoic acid.** *J. Sci. Food Agric.*, 1955, **6,** 633–636. [Coll. Technol., Univ. Manchester.]

For previous parts see *J. Sci. Food Agric.*, 1954, **5,** 27; 1955, **6,** 133; *J. Gen. Microbiol.*, 1954, **10,** 371.

The requirements for adenine, guanine, xanthine and uracil in presence or absence of folic acid and *p*-aminobenzoic acid were estimated for 34 lactic acid bacteria isolated from beer or yeast. Uracil was necessary for 17 organisms, xanthine for none, adenine for 6 and guanine for one. The effects of folic and *p*-aminobenzoic acid varied with different strains but the requirements as ascertained existed in the presence of both these.

A. M. Copping.

FOLIC ACID (PTEROYLGLUTAMIC ACID)

1760

MITBANDER, V. B. and SREENIVASAN, A. **Synthesis of citrovorum factor in rats given chloretone.** *Biochem. J.*, 1955, **61,** 607–610. [Dept. Chem. Technol., Univ. Bombay.]

When 20 mg. chloretone were given daily by mouth for 4 days to male rats weighing from 80 to 100 g. and having a normal diet, excretion of ascorbic acid in the urine increased and there was a slight increase in the amount in the liver. Some animals were given 4 μg. folic acid daily as well as chloretone. Folic acid and citrovorum factor increased in the liver of all rats given chloretone with or without folic acid. The extent to which folic acid was converted to citrovorum factor increased on succeeding days on which chloretone was given. The effect of the narcotic on xanthine, choline and tyrosine oxidases in the liver was to depress their activity unless folic acid was given, which was considered to be a direct effect of the narcotic on general metabolism.

A. M. Copping.

1761

DOCTOR, V. M. and TRUNNELL, J. B. **Effect of sex hormones on conversion of folic acid to citrovorum factor by rat.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 251–253. [Sect. Exp. Med., Univ. Texas, Houston.]

The urinary excretion of citrovorum factor estimated with *Leuconostoc citrovorum* was used as an index of its synthesis by adult male rats given a normal basal diet with a supplement of folic acid or oestradiol dipropionate or testosterone or combinations of them. Oestradiol dipropionate alone or with folic acid increased the excretion of citrovorum factor. Testosterone alone caused a decrease but had no effect on the increased excretion in response to folic acid or oestradiol.

A. M. Copping.

1762

PENHOS, J. C. and FAJER, A. B. Interactions entre la somatotropine, les oestrogènes et l'acide folique chez les rats hypophysectomisés. [**Interactions between somatotropin, oestrogens and folic acid in hypophysectomised rats.**] *C.R. Soc. Biol.*, 1955, **149,** 1281–1283.

Somatotropin, oestradiol benzoate and folic acid were injected separately or in various combinations into young hypophysectomised, castrated female rats of about 90 g. weight. With oestrogen and folic acid the loss of weight was greater than in hypophysectomised rats given no vitamin or hormone. Somatotropin alone or with folic acid or oestrogen caused weight increase. Injection of oestrogen increased the weight of the uterus but decreased that of the thymus, liver and kidney. Folic acid and somatotropin had no effect on the weight of the uterus but increased that of the thymus, liver and kidney. None of the treatments affected the weight of the thyroid or adrenal glands.—A. M. Copping.

1763

MÉTAIS, P. and MANDEL, P. Action de l'acide 4-amino-ptéroylglutamique sur les acides nucléiques de la moelle osseuse du rat. Étude quantitative. [**Quantitative study of the effect of 4-aminoopteroylglutamic acid on the nucleic acids of the bone marrow in the rat.**] *C.R. Soc. Biol.*, 1955, **149,** 1022–1026. [Lab. Clin. Méd., Fac. Méd., Strasbourg.]

Doses of 10, 20, 40 or 80 μg. aminopterin daily for 3 days, or 20 μg. for 8 days, or single doses of 100 μg., were given intraperitoneally to male rats weighing about 250 g. With repeated small doses or a single large dose the deoxyribonucleic acids of the bone marrow showed a greater decrease than the ribonucleic acids. With repeated large doses both types of nucleic acid decreased. Simultaneous injection of cytosine, uracil or adenine had no effect. Large doses of folic acid, thymine and guanine were to some extent protective against the effects of aminopterin.—A. M. Copping.

1764

BALIS, M. E. and DANCIS, J. **Effects of A-methopterin on nucleic acid synthesis in leukemic spleen breis.** *Cancer Res.*, 1955, **15,** 603–608. [Labs. Sloan-Kettering Inst. Cancer Res., New York 21.]

In spleen homogenates from normal or leucaemic mice, amethopterin reduced the amount of formate incorporated into purines and thymine. The incorporation of formate and the effect of amethopterin were less in mice with leucaemia resistant to amethopterin than in those with non-resistant leucaemia.

In experiments in which the amethopterin was given to the mice 1 or 2 hr. before they were killed, there was increased synthesis of purine from formate, but reduced synthesis of thymine. The difference between the effects of amethopterin *in vivo* and *in vitro* suggested that in the body it was converted to another active substance. The independent and opposite effects on synthesis of thymine and of purines provided evidence that the routes of formation of the two substances are different.—D. Duncan.

1765

STOLYGVO, N. S. and TSIELENS, E. A. Vliyanie folievoi kisloty na rezistentnost' organizma k tuberkulezu. [**The influence of folic acid on resistance to tuberculosis.**] *Vop. Pitan.*, 1955, **14,** No. 5, 13–15. [Inst. Microbiol., Akad. Nauk Latv. SSR, Riga.]

Of 7 groups of from 12 to 26 rats weighing from 185 to 230 g., one received a stock diet and 6 a low-choline diet containing, per cent., casein 18, starch 69, soya bean oil 6, cod liver oil 1, cellulose 2 and Osborne and Mendel salt mixture 4, yeast autolysate, vitamin B_1 and riboflavin. One group had no addition, and the other 5 had, per 100 g., 50 mg. choline chloride, or 3 μg. vitamin B_{12}, or 0·5 mg. folic acid, or both vitamin B_{12} and folic acid, or fresh greenstuff. After 2 months the rats were given 3 mg. bacterial mass of bovine tubercle bacilli, and were killed from 75 to 80 days later.

Active lesions were found in 14 and healing lesions in 7 of the 17 rats on the unsupplemented low-choline diet; corresponding values were for the group on stock diet 3 and 1 out of 23, choline supplement 0 and 0 out of 26, vitamin B_{12} 12 and 6 out of 17, folic acid 2 and 0 out of 12, vitamin B_{12} and folic acid 3 and 0 out of 14, and green food 3 and 1 out of 17. The choline content of the liver was normal in all except those having the low-choline diet with and without the vitamin B_{12} supplement and these 2 were the only groups showing fatty infiltration of the liver.—D. Duncan.

VITAMIN B_{12}

1766

DROOP, M. R. **A suggested method for the assay of vitamin B_{12} in sea water.** *J. Marine Biol. Assoc. U.K.*, 1955, **34**, 435–440. [Marine Stat., Millport.]

In order to avoid the difficulty of removing salt from sea water extracts so that vitamin B_{12} could be estimated with freshwater organisms, the use of marine organisms for the purpose was investigated. *Monochrysis lutheri*, a supralittoral, euryhaline phytoflagellate, gave a reasonably sensitive response to vitamin B_{12}, though it responded also to pseudovitamin B_{12} and factor A. Its specificity in this respect resembled that of *Lactobacillus leichmannii*. It could be used to estimate vitamin B_{12} in sea water and statistical analysis of typical tests showed the suitability of the method. A disadvantage of *Monochrysis* was the length of time required for the test, since cultures required about 3 weeks to reach maturity. The amount of vitamin B_{12} found in water from incoming tides in February and March was between 5 and 10 mμg. per litre.

A. M. Copping.

1767

MATSUDA, T. **Isolation of vitamin B_{12} from trichomycin fermentations.** *J. Vitaminol., Japan*, 1955, **1**, 221–228. [Govt. Indust. Res. Inst. Nagoya, Hiratemachi, Kita-ku.]

The waste liquor from fermentation by *Streptomyces hachijoensis*, used for preparation of the antibiotic trichomycin, proved a rich source of vitamin B_{12}. The original material contained 0·33 μg. per litre and 65 per cent. of it was recovered from a charcoal adsorbate. Extraction with phenol and butanol and chromatography on Amberlite IRC-50 yielded the pure vitamin, which was crystallised by addition of acetone. The final product was cyanocobalamin whether potassium cyanide was used in the extraction process or not. Absorption spectra in ultraviolet and visible light and countercurrent distribution curves were used to identify the vitamin B_{12} fractions obtained.—A. M. Copping.

1768

MADER, W. J. and JOHL, R. G. **Countercurrent analysis of vitamin B_{12}.** *J. Amer. Pharm. Assoc.*, 1955, **44**, 577–579. [Merck and Co., Inc., Chem. Div., Rahway, N.J.]

Compounds similar to the cobalamins occurring in the commercial preparation of vitamin B_{12} were separated by the countercurrent method and examined biologically and spectrophotometrically. Some of them had biological activity for *Lactobacillus leichmannii*.—K. H. Coward.

1769

TRUFANOV, V. A. Vitamin B_{12} (Kobalamin). [**Vitamin B_{12}, cobalamin.**] *Vop. Pitan.*, 1955, **14**, No. 5, 3–12.

1770

MACEK, T. J. and FELLER, B. A. **Note on stability of the B vitamins in solution: crystalline vitamin B_{12}.** *J. Amer. Pharm. Assoc.*, 1955, **44**, 254. [Merck and Co., Inc., Rahway, N.J.]

Solutions of the B vitamins could be prepared in which crystalline vitamin B_{12} was stable for prolonged periods of time at normal storage temperatures. A paper on the effect of vitamin B_1 hydrochloride on the stability of solutions of vitamin B_{12} will be published soon.

K. H. Coward.

1771

ANDREENKO, G. V. and KUDRYASHOV, B. A. Ismenenie tromboplasticheskoi aktivnosti krovi pri vvedenii v organizm zhivotnykh vitamina B_{12}. [**Change in the thromboplastic activity of the blood on introduction of vitamin B_{12} into the animal organism.**] *Dokl. Akad. Nauk SSSR*, 1955, **102**, 787–788.

Intraperitoneal injection of vitamin B_{12} increased thromboplastic activity in the blood of normal animals; the effect was still demonstrable after 7 days. When the injections were discontinued thromboplastic activity fell rapidly to the physiological level. It is concluded that formation of prothrombokinase as well as of platelets depends on vitamin B_{12}.—E. S. Fountain.

1772

JONES, C. C., BROWN, S. O., RICHARDSON, L. R. and SINCLAIR, J. G. **Tissue abnormalities in newborn rats from vitamin B_{12} deficient mothers.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90**, 135–140. [Dept. Biol., Texas Agric. and Mech. Coll., Galveston.]

Female rats which had been given diets low in vitamin B_{12} weaned from 40 to 70 per cent. of their young, but normal females weaned 95 per cent. The young of deprived mothers were light in weight and immature in general development. There were abnormalities of the heart, liver, kidney and spleen. The pathological changes were prevented in young from mothers which received 25 μg. vitamin B_{12} per kg. basal diet.

A. M. Copping.

1773

FERGUSON, T. M., RIGDON, R. H. and COUCH, J. R. **A pathologic study of vitamin B_{12}-deficient chick embryos.** *Arch. Pathol.*, 1955, **60**, 393–400. [Dept. Biochem. Nutrit., Agric. and Mech. Coll. Texas, College Station.]

Live embryo chicks were removed after 17 days' incubation from the eggs of hens on a normal diet or one low in vitamin B_{12} with or without a supplement of crystalline vitamin B_{12}. In 139 embryos from hens deprived of vitamin B_{12} the size was reduced and there were haemorrhages in the body cavity, heart, kidney, liver and brain, areas of necrosis in the liver, brain and spinal cord, accumulation of fat in the parenchymatous tissues and general oedema. There was gross evidence of pathological changes in 74 per cent. of the embryos from deprived hens. The significance of the observations is considered in relation to the use of vitamin B_{12} for neurological disorders.

A. M. Copping.

1774

LANDBOE-CHRISTENSEN, E. and HOFF-JØRGENSEN, E. **Observations on the histo-topographic localization of the vitamin B_{12} binding factor in the fundus, pylorus and duodenum.** *Acta pathol. microbiol. scand.*, 1955, *Suppl.* 105, 104–117. [Dept. Anat., Univ. Copenhagen.]

Studies were made of post-mortem and operation material from pigs, and operation material from partial gastrectomy in man. Details are given of the methods used. Frozen material from the animals was sectioned at right angles to the surface and then separated into layers parallel to the surface, in each of which the vitamin B_{12} binding factor was estimated.

In the pig the mucosa of the fundus and pylorus and the duodenal wall all showed vitamin B_{12} binding activity, greatest in the middle layers which contained the gastric glands, the pyloric glands proper and Brunner's glands, respectively. The greatest concentration of vitamin B_{12} per mg. wet tissue was bound by the pyloric gland layer, range 29 to 43 mμg., and by the Brunner's gland layer, range 6 to 24 mμg. The cardiac mucosa showed no binding power, the superficial and deep layers of the gastric mucosa only very little, and the tunica muscularis of the duodenum none.

In man the binding activity of the mucosa was greatest in the mucosa from the fundus and lowest in the pyloric mucosa, but the highest activity found, 180 to 280 mμg. per g. wet tissue, was only about 1 per cent. of the maximum values found in material from the pig. The human material was not separated into layers. To exclude the possibility that the operative procedure might account for the low value, material from pigs was obtained by operation in the same way but showed no great reduction of binding activity.—L. Wills.

1775

WATSON, G. M. and FLOREY, H. W. **The absorption of vitamin B_{12} in gastrectomised rats.** *Brit. J. Exp. Pathol.*, 1955, **36**, 479–486. [Sir William Dunn Sch. Pathol., Oxford.]

Vitamin B_{12} containing ^{60}Co was given by mouth to normal rats and to gastrectomised rats, alone, or with an extract of rat stomach or a dialysed filtrate of pig pyloric juice. Excretion in the faeces of normal rats was on the average 66·5 per cent. of the amount given. Gastrectomised rats excreted 93·8 per cent. on the average if they had no treatment. Extract of rat stomach reduced excretion almost to normal, but results with pig pyloric juice were irregular. Most of the rats subjected to gastrectomy survived and showed good appetite and weight increase for many months after operation, but some hyperplasia and hyperkeratosis occurred in the squamous epithelium of the remnant of the stomach, and in a few animals ulcers occurred. The reasons for ulceration were not clear; mechanical irritation as well as loss of gastric secretion may have been responsible.—A. M. Copping.

1776

CHOW, B. F., QUATTLEBAUM, J. K. (Jr.) and ROSENBLUM, C. **Effect of intrinsic factor concentrate on vit. B_{12} absorption by gastrectomized rats.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90**, 279–281. [Dept. Surg., Med. Sch., Johns Hopkins Univ., Baltimore, Md.]

Doses of from 50 to 200 mμg. vitamin B_{12} containing ^{60}Co were given by tube to gastrectomised rats, and the excretion of radio-active material in the faeces was used as a measure of absorption. In a second test the same dose of vitamin B_{12} was given with a concentrate of intrinsic factor and excretion of radio-activity was measured. Absorption of vitamin B_{12} by gastrectomised rats was negligible whether intrinsic factor was given or not. When intact rats were given concentrates of intrinsic factor absorption of vitamin B_{12} was inhibited in proportion to the dose of intrinsic factor.—A. M. Copping.

1777

VISTOLI, G. Sulle interazioni di alcuni aminoacidi con la vitamina B_{12} nella prevenzione della steatosi epatica dietetica del ratto. [**Interaction of some amino-acids with vitamin B_{12} in the prevention of dietary fatty liver in the rat.**] *Acta vitaminol.*, 1955, **9**, 199–204. [Lab. Provinciale Igiene.] French, English, German and Spanish summaries.

Adult male rats were given a diet of, per cent., casein 10, sucrose 59, cottonseed oil 10, lard 15, liver oil 2, salts 3, cholesterol 0·5, inositol 0·3, and vitamins except vitamin B_{12}. Three sets of 12

were divided each into 2 groups of 6 receiving subcutaneously 100 μg. vitamin B_{12} per kg. bodyweight daily or no addition ; or 10 mg. tryptophan per kg. bodyweight daily with or without the same dose of vitamin B_{12} ; or 10 mg. glycine per kg. bodyweight daily with or without the same dose of vitamin B_{12}. [The duration of the experiment is not recorded.] Histochemical examination was made of the liver for phospholipins, total and free cholesterol, glycogen and nucleic acids. It provided no evidence of lipotropic action except by tryptophan.—E. M. Hume.

1778

INFANTE, R., TURCHETTO, E. and RABBI, A. Influenza della tiroxina sulla attività lipotropa della vitamina B_{12}. [**Influence of thyroxine on the lipotropic activity of vitamin B_{12}.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 157–159. [Ist. Chim. Biol., Univ. Bologna.]

Ten groups of 5 rats weighing about 160 g. were fed for 15 days on one of 2 diets to produce a fatty liver. Two groups were given no addition, 2 were given 0·2 μg. vitamin B_{12} three times a week with 50 or 100 μg. thyroxine daily. Total fat was estimated in the liver and, in rats given no supplement, amounted to 15 or 16 g. per 100 g. fresh tissue. Vitamin B_{12} alone, in the amounts given, had no power to reduce the liver fat but when it was given with thyroxine the amount was reduced. The larger dose of vitamin B_{12} and the smaller dose of thyroxine, or the smaller dose of vitamin B_{12} and the larger dose of thyroxine, had about the same effect, reducing the percentage of fat to 11 or 12 ; with the larger doses of both substances the percentage was still lower, about 6.

E. M. Hume.

1779

PICCARDO, M. G. and SALVETTI, F. Lipotropi e metabolismo del fosforo : l'azione della vitamina B_{12} sul metabolismo del fosfato di sodio segnato con P^{32}. [**Lipotropic substances and metabolism of phosphorus: action of vitamin B_{12} on the metabolism of sodium phosphate labelled with ^{32}P.**] *Arch. Fisiol.*, 1955, **54,** 315–319. [Ist. Patol. Med., Univ. Palermo.] English summary.

Radio-active ^{32}P as Na phosphate was injected intraperitoneally into 17 rats weighing about 150 g. ; 7 of them immediately afterwards received an intraperitoneal injection of 200 μg. vitamin B_{12}. The rats were killed soon afterwards and radio-activity was estimated in the heart, liver and kidneys. In the rats given vitamin B_{12} the amount of radio-activity in the heart was nearly double that in those not given vitamin B_{12}, and in the liver it was about one-third more, but in the kidneys there was no difference.

E. M. Hume.

1780

ERICSON, L. E. and HARPER, A. E. **Effect of diet on betaine-homocysteine transmethylase of rat liver. 3. B-vitamins other than vitamin B_{12}.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 298–300. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

In order to investigate the specificity of the vitamin B_{12} requirement of the rat to maintain betaine-homocysteine transmethylase activity in the liver, the effect of withholding other members of the vitamin B complex was examined. Lack of biotin or choline caused a slight decrease of transmethylase, but an increase occurred if vitamin B_1, riboflavin, nicotinic acid, pyridoxine, pantothenic acid or folic acid was lacking. The findings are discussed with reference to other reported increases in enzyme activity in rats deprived of certain B vitamins.—A. M. Copping.

1781

SAHASHI, Y., IWAMOTO, K. and HAYASHI, J. **Effect of vitamin B_{12} on the intermediary metabolism of chicks.** *J. Vitaminol., Japan*, 1955, **1,** 312–318. [Tokyo Univ. Agric., Setagaya.]

The effect of vitamin B_{12} on enzymes containing vitamin B_1, nicotinic acid or pantothenic acid was studied in chicks depleted of vitamin B_{12}. Conjugated forms of the 3 vitamins diminished in the liver and blood of depleted chicks. In the depleted birds the vitamin B_{12} content of the liver was low but that of the blood was not less. It is considered that vitamin B_{12} is concerned in the formation of coenzymes containing vitamin B_1, nicotinic acid and pantothenic acid, and further enzyme studies are in progress.—A. M. Copping.

1782

BOXER, G. E., SHONK, C. E., GILFILLAN, E. W., EMERSON, G. A. and OGINSKY, E. L. **Changes in coenzyme A concentration during vitamin B_{12} deficiency.** *Arch. Biochem. Biophys.*, 1955, **59,** 24–32. [Res. Labs., Chem. Div., Merck and Co., Inc., Rahway, N.J.]

Coenzyme A was estimated by measurement of acetylation of sulphanilamide by aged pigeon liver and by phosphotransacetylase from *Bacterium coli*, and pyridoxal phosphate by tyrosine decarboxylase from *Streptococcus faecalis*. Rats were given diets containing only vegetable protein with or without vitamin B_{12}. In some experiments thyroid powder was included. The concentration of coenzyme A in liver and kidney in rats deprived of vitamin B_{12} was between two and three times that in non-deprived rats fed to appetite or pair-weighed. Addition of thyroid to the diet did not affect the rise in coenzyme A in deprived rats. In deprived rats there was no change in the

coenzyme A content of the brain or in the pyridoxal phosphate content of the liver. Degradation of coenzyme A proceeded at the same rate in homogenates from the liver of rats with or without vitamin B_{12}, and there was no marked difference in the oxidation of α-ketoglutarate, succinate, pyruvate or acetate by their liver and kidney homogenates.

No difference was found in the coenzyme A content of cells of *Bact. coli* grown with or without vitamin B_{12}, though the vitamin stimulated the oxidation of acetate and glutamate in the presence of deficient cells.—A. M. Copping.

1783

JOHNSON, E. L. **Turkeys require vitamin B_{12} and choline.** *Poultry Sci.*, 1955, **34**, 1013–1016. [Dept. Poultry Husb., Iowa State Coll., Ames.]

Poults hatched from the eggs of turkey hens maintained on a diet containing animal protein were given a basal all-vegetable diet. The addition to it of choline or a vitamin B_{12} concentrate improved growth up to 6 weeks of age, but not to the level of growth on a practical ration.

In a second experiment poults from hens maintained on a diet containing no animal protein were given a basal all-vegetable diet. Growth on this diet alone was poor, but was significantly increased by supplements of crystalline vitamin B_{12}. The further addition of choline did not always improve growth, but did significantly increase survival rate. A significantly greater response to supplements of vitamin B_{12} was given by poults hatched late in the season, when the parent birds had been for a long time on a vegetable diet, than by the poults of earlier hatches. It is suggested that the poult's requirement for vitamin B_{12} is not more than 3 μg. per kg. feed.—E. M. Cruickshank.

1784

JUCKER, H. Die Wirkung abgestufter vitamin B_{12}- und Antibiotika-Zulagen auf Wachstum und Futterverwertung, geprüft an Ratten und Kücken. [**Effect of graded supplements of vitamin B_{12} and antibiotics on growth and feed utilisation, tested on rats and chicks.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1955, **46**, 288–311. [Eidg. Tech. Hochsch., Zürich.] French and English summaries.

Groups of 3 male rats were given basal diets with or without animal protein and with 0, 20 or 40 μg. vitamin B_{12}, or 0, 15 or 30 mg. terramycin, per kg. diet. In some tests both vitamin B_{12} and terramycin were included. Significant increase of growth on diets containing animal protein was obtained with the higher dose of vitamin B_{12} or terramycin; the lower doses stimulated the growth of rats receiving only vegetable protein. Efficiency of feed utilisation was increased by the supplements to vegetable- but not to animal-protein diets. There was no apparent interaction between vitamin B_{12} and terramycin in rat growth tests.

In tests with chicks there were significant increases in weight gain when 20 μg. vitamin B_{12} or 20 mg. terramycin was added to a diet containing animal protein, but with a diet based on vegetable protein there was no definite effect on weight and no improvement in efficiency of feed utilisation.—A. M. Copping.

1785

ARSCOTT, G. H., SHORB, M. S. and BOGGS, U. **Effect of vitamin B_{12} and antimetabolites of vitamin B_{12} on chick hatchability.** *Poultry Sci.*, 1955, **34**, 986–988. [Dept. Poultry Husb., Univ. Maryland, College Park.]

Eggs were collected from hens maintained on a basal diet containing, per lb., 1 μg. vitamin B_{12} or none, until the hatching capacity of the fertile eggs of the hens on the diet lacking vitamin B_{12} was appreciably reduced. Injection before incubation of 0·5 or 1·0 μg. vitamin B_{12} into eggs from hens having the deficient diet improved hatching capacity to some extent, but did not restore it to normal. Fifty μg. of 1 : 2-dichloro-4 : 5-diaminobenzene, an analogue of 1 : 2-dimethyl-4 : 5-diaminobenzene, an apparent precursor of vitamin B_{12}, did not seem to affect the hatching capacity of eggs from hens deprived of vitamin B_{12}. This amount slightly decreased the hatching capacity of eggs from hens given 1 μg. vitamin B_{12} per lb. diet; 500 μg. reduced it much more. Fifty μg. of 2 : 5-dimethylbenzimidazole completely inhibited hatching of eggs lacking vitamin B_{12}, and 500 μg. depressed it considerably in eggs from hens receiving 1 μg. vitamin B_{12} per lb. diet. The results showed that analogues related to potential precursors of vitamin B_{12} may be used to study the function of the vitamin in the development of the embryo chick.—E. M. Cruickshank.

1786

RAKO, A. and ZELJKO, M. O utjecaju vitamina B_{12} i bacitracina na prirast težine prasadi. [**The effects of vitamin B_{12} and bacitracin on the growth of domestic pigs.**] *Vet. Arhiv*, 1955, **25**, 175–180. English and French summaries.

The addition of from 10 to 14 μg. vitamin B_{12} per kg. feed, alone or in combination with 5 mg. bacitracin per kg., did not improve the growth rate of pigs, regardless of the quality or quantity of protein in the ration in different experiments. (From summary.)—J. S. Thomson.

1787

ODLAND, L. M., MAYFIELD, H. L. and PAGE, L. **The influence on palatability of certain grain combinations, fish solubles and a vitamin B_{12}-aureomycin supplement in poultry rations.** *Poultry Sci.*, 1955, **34**, 822–831. [Dept. Home Econ. Res., Montana State Coll. Agric. Exp. Stat., Bozeman.]

Broad Breasted Bronze turkeys and White Leghorn and New Hampshire broilers were reared on diets containing a simple or a complex mixture of grains, or on diets supplemented with 3 per cent. fish solubles or a preparation containing vitamin B_{12} and aureomycin. The eating quality of the flesh of the roasted turkeys and the broiled chickens was tested by a panel of 10 judges. One half of each bird was cooked when fresh, the other half after storage at — 10° F. for 6 months. Methods of cooking and storage are described. When the grain portion of the ration consisted of wheat and oats or wheat and barley, the broilers were superior in eating quality to the birds receiving more complex grain mixtures of wheat, wheat products and barley, with or without maize. The reverse was true of the turkeys. The addition of fish solubles to the diet did not improve the palatability of the flesh of White Leghorn broilers, but it did increase the general desirability of both light and dark meat of turkeys and did not produce a fishy flavour in the fresh or stored meat. The addition to the diet of an antibiotic and vitamin B_{12} supplement had no effect on the quality of turkey meat, but significantly improved the tenderness and texture of the light meat of White Leghorn broilers.

E. M. Cruickshank.

1788

TARR, H. L. A. **The nutritive value of fish meal and condensed fish solubles. 10. The vitamin B_{12} content of herring stickwater and condensed solubles.** *Fish. Res. Board Canada, Progr. Rep. Pacific Coast Stat.*, 1955, No. 103, 18. [Pacific Fish. Exp. Stat.]

Vitamin B_{12} was estimated microbiologically in herring press water and condensed solubles from November to February. The values in mg. per lb. dry weight ranged from 0·42 to 0·77 for stickwater (press water) and from 0·32 to 0·55 for condensed solubles. It is calculated that 2 per cent. condensed herring solubles in a ration would satisfy the vitamin B_{12} requirement of chicks.

A. M. Copping.

1789

EVANS, R. J., BANDEMER, S. L., BAUER, D. H. and DAVIDSON, J. A. **The vitamin B_{12} content of fresh and stored shell eggs.** *Poultry Sci.*, 1955, **34**, 922–928. [Dept. Agric. Chem., Michigan State Coll., East Lansing.]

Eggs were collected from hens given a diet of maize, oats, wheat by-products, dried alfalfa, meat scraps, fishmeal, dried milk, soya bean oilmeal, minerals and vitamins A and D. They were stored at 0° C. for up to 12 months. Vitamin B_{12} was estimated in the boiled eggs by the method of Skeggs *et al.* (Abst. 1820, Vol. 20) with *L. leichmannii* as the test organism. The vitamin was liberated from the yolks and whites by autoclaving with a buffer containing sodium bisulphite. The vitamin B_{12} content of the yolks of eggs from individual hens varied considerably, from 112 to 678 millimicrograms per yolk. Fresh whole eggs contained, on the average, 387 mμg. vitamin B_{12}, of which 362 were in the yolk and 25 in the white. No change in the vitamin B_{12} content of the whites took place during 12 months' storage, but the concentration increased as the result of transfer of water from the white to the yolk. The yolks lost 34 per cent. of their original vitamin B_{12} content during 12 months' storage, mostly during the last 5 months. After 12 months' storage whole eggs contained 260 mμg. vitamin B_{12} per egg or 5·03 mμg. per g. The yolk contained 237 mμg. or 11·35 mμg. per g. and the white 23 mμg. or 0·77 mμg. per g.—E. M. Cruickshank.

1790

SREENIVASAMURTHY, V., SWAMINATHAN, M. and SUBRAHMANYAN, V. **Vitamin B_{12} content of some animal foods.** *Indian J. Physiol. Allied Sci.*, 1955, **9**, No. 1, 33–38. [Central Food Technol. Res. Inst., Mysore.]

Vitamin B_{12} was estimated microbiologically with *Lactobacillus leichmannii* 4797 in goat and sheep muscle, goat liver, fish and eggs. Samples were autoclaved with and without cyanide for estimation of hydroxocobalamin and cyanocobalamin, and bound and free forms were estimated after digestion with papain. Goat liver was an excellent source of vitamin B_{12} with 526 mμg. per g. fresh weight, nearly all in the free form. Sheep muscle also was a good source with 300 mμg. per g., but only 94 in the free form. Hen's egg contained 104 mμg. per g. with 29 in the free form, and the values for fish ranged from 50 to 210 mμg. per g. with from 38 to 81 in the free form.

J. S. Thomson.

1791

FORD, J. E. and HUTNER, S. H. **Role of vitamin B_{12} in the metabolism of microorganisms.** *Vitamins and Hormones*, 1955, **13**, 101–136. [Nat. Inst. Res. Dairying, Univ. Reading.]

OTHER B VITAMINS

1792

RABBI, A., VIVIANI, R. and MARCHETTI, M. Attività xantinossidasica del fegato di ratto carente di fattori proteici animali (FPA) della caseina. [**Xanthine oxidase activity of the liver of rats deprived of the animal-protein factor from casein.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 159–161. [Ist. Chim. Biol., Univ. Bologna.]

Xanthine oxidase was estimated by the method of Litwack *et al.* (Title 2702, Vol. 23) in the liver of rats of the first generation bred on a diet of purified casein (Abst. 3530, Vol. 21) lacking the animal-protein factor, and maintained on the diet for from 150 to 220 days. There was an increase in the amount of activity of the enzyme, which was greater the more definite the signs of deficiency. When the signs of deficiency were severe the amount of xanthine oxidase was doubled or trebled.—E. M. Hume.

1793

MERTZ, W. and SCHWARZ, K. **Impaired intravenous glucose tolerance as an early sign of dietary necrotic liver degeneration.** *Arch. Biochem. Biophys.*, 1955, **58,** 504–506. [Lab. Biochem. Nutrit., Nat. Inst. Arthritis Metabol. Dis., Nat. Inst. Health, Bethesda, Md.]

Liver necrosis was produced in rats by the diet described in Abst. 464, Vol. 23. After different periods on the diet rats fasted for 18 hr. and sugar tolerance tests were made after a single intravenous injection of 125 mg. glucose per 100 g. bodyweight. When excess blood sugar was plotted against time, straight lines were obtained. From these lines was calculated the mean rate of removal of excess sugar from the blood in percentage per min. Mean rates were 4·1 in rats on stock diet and 2·8 in rats after 30 days on experimental diet. Addition of cystine to the experimental diet delayed the decline in glucose tolerance, so that it was still normal after from 25 to 30 days. Vitamin E did not prevent the decline in glucose tolerance, but factor 3 from crude casein (Abst. 464, Vol. 23) did, which is another sign that the two substances are not simple substitutes for one another.

D. Duncan.

1794

STANDERFER, S. B. and HANDLER, P. **Fatty liver induced by orotic acid feeding.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 270–271. [Dept. Biochem. Nutrit., Sch. Med., Duke Univ., Durham, N.C.]

Thirteen groups each of 10 male rats were given a diet of, per cent., casein 18, salts 5, sucrose 75 and maize oil 2, supplemented with cod liver oil, vitamin K, vitamins of the B group and sulphadiazine, without orotic acid or with 0·2, 0·5 or 1 per cent. Some groups were given supplements of folic acid, vitamin B_{12}, methionine, choline, thymine or uracil. The last two are known to be synthesised from orotic acid. The animals were killed after 28 days and liver fat was estimated. There was fatty liver when orotic acid was given, and none of the supplements prevented its appearance. Thymine and uracil did not promote it.—G. F. Garton.

VITAMIN C (ASCORBIC ACID)

1795

BARAKAT, M. Z., SHEHAB, S. K. and EL-SADR, M. M. **A new titrimetric method for the determination of ascorbic acid.** *Analyst*, 1955, **80,** 828–833. [Dept. Biochem., Fac. Med., Abbassia Ibrahim Pasha El-Kebir Univ., Cairo.]

The quantitative reduction by ascorbic acid of the orange-coloured reagent sodium 1 : 2-naphthoquinone-4-sulphonate to the colourless hydroquinone was the basis of the method. Ascorbic acid acidified with metaphosphoric acid was titrated from a microburette. Pharmaceutical products and citrus fruit juices were examined. Comparative analyses were made with the new method and that using 2 : 6-dichlorophenolindophenol. [A table suggests greater accuracy with the new method, but the authors do not make any claim.]

A. Hepburn.

1796

BERENDS, W. and KONINGS, J. **Direct oxidation of L-gulono-γ-lactone to vitamin C.** *Rec. Trav. chim. Pays-Bas*, 1955, **74,** 1365–1370. [Biochem. Lab., Technol. Univ., Delft.]

1797

CSŰRÖS, Z. and PETRÓ, J. **Investigations on catalysts. 13. Autoxidation of ascorbic acid as a function of pH values.** *Acta chim. hung.*, 1955, **7,** 199–222. [Inst. Org. Chem. Technol., Tech. Univ., Budapest.] Russian and German summaries.

1798

BAKER, L. C., LAMPITT, L. H. and WITTENBERG, E. **Ascorbic acid. Photochemical oxidation in solutions containing oxalic acid. 1. Catalysis**

by traces of iron salts. *J. Sci. Food Agric.*, 1955, **6**, 682–688. [Lyons Labs., 149 Hammersmith Rd., London, W.14.]

Ascorbic acid in a solution containing oxalic acid and a trace of iron salt was lost when exposed to light from a mercury vapour lamp. Apparently it was oxidised to dehydroascorbic acid and diketogulonic acid. The photochemical reaction depended upon irradiation, a supply of air and a trace of iron salt. Oxidation occurred in the absence of oxalate in both darkness and light. As oxalate concentration increased the oxidation of ascorbic acid in the dark decreased to zero ; in light oxidation increased rapidly and then declined.

A. Hepburn.

1799

MAPSON, L. W. **The biosynthesis of ascorbic acid.** *Vitamins and Hormones*, 1955, **13**, 71–100. [Low Temp. Res. Stat., Univ. Cambridge.]

1800

CURTIN, C. O. and KING, C. G. **The metabolism of ascorbic acid-1-C^{14} and oxalic acid-C^{14} in the rat.** *J. Biol. Chem.*, 1955, **216**, 539–548. [Dept. Chem., Columbia Univ., New York.]

When ascorbic acid, dehydroascorbic acid or 2 : 3-diketogulonic acid, each labelled with ^{14}C in carbon atom 1, was injected intraperitoneally into rats, 2, 9 or 12 per cent., respectively, of the radio-activity was recovered as oxalate in the urine within 24 hr. The percentages of the first two substances converted to radio-active respiratory CO_2 in 24 hr. were 19 and 29, respectively. The percentage of 2 : 3-diketogulonic acid thus converted depended on the *p*H, and was 17 at *p*H 7 and 47 at *p*H 3.

With labelled oxalate no more than 0·4 per cent. of the radio-activity was recovered as CO_2 and there was no apparent conversion to other compounds. After 10 days radio-activity was widely distributed in the tissues.

The half-life of the radio-active ascorbic acid was calculated to be 3·6 days and of oxalic acid 2·5. The rate of synthesis of ascorbic acid was calculated to be from 5 to 8 mg. daily.

A. Hepburn.

1801

SCHREIBER, V. Vztahy mezi kyselinou askorbovou a korou nadledvin. [**Relation between ascorbic acid and the adrenal cortex.**] *Čas. Lék. čes.*, 1955, **94**, 514–519.

1802

WEXLER, B. C., PENCHARZ, R. and THOMAS, S. F. **Adrenal ascorbic acid and histological changes in male and female rats after half-body X-ray irradiation.** *Amer. J. Physiol.*, 1955, **183**, 71–74. [Res. Lab. Exp. Biol., Stanford Res. Inst., Calif.]

Groups of about 20 rats with the entire sagittal halves of their bodies protected by lead shields were exposed to X-rays, 625 r. They were killed from 1 to 168 hr. later. The initial depletion of ascorbic acid from the adrenal glands and its subsequent repletion which occurred after about 6 hr. was much greater than had been found after total body exposure (Abst. 584, Vol. 22). The response was more acute in the male. The adrenal gland from the shielded body half was heavier and contained more ascorbic acid than the unshielded gland. Both had qualitatively similar changes in ascorbic acid and both were shown histologically to lose lipids rapidly after treatment.

A. Hepburn.

1803

BERNARDINI, A. and CALTABIANO, S. L'azione dei raggi Roentgen sul metabolismo dell'acido ascorbico. 2. [**Action of X-rays on ascorbic acid metabolism. 2.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 293-295. [Ist. Patol., Univ. Catania.]

It was previously found (Abst. 5003, Vol. 25) that the amount of ascorbic acid in the liver, adrenal glands and spleen was greatly reduced, and that in the urine was increased, when rats were exposed to X-rays over the whole body. In the present experiment groups of 7 rats had the head only, or the thorax and abdomen, or the whole body, exposed. Others were not exposed. Fifteen days later ascorbic acid was estimated by the methylene blue method in the liver, adrenal glands, spleen and brain. Decrease in the ascorbic acid content of all the tissues was greatest when the head was the part exposed ; the effect was less when it was the whole body, and less still when it was the thorax and abdomen. There was no localisation of effect.—E. M. Hume.

1804

KLEIN, P. D., HANDA, D. T. and SWICK, R. W. **Fate of ascorbic acid in early radiation damage.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90**, 204–208. [Argonne Nat. Lab., Div. Biol. Med. Res., Lemont, Ill.]

Ascorbic acid was estimated by the method of Roe and Kuether (Abst. 261, Vol. 13) in organs and tissues of groups from 4 to 6 rats killed 4, 28 or 72 hr. after irradiation with X-rays, 600 r, and of rats not exposed to X-rays. The concentration and total content of ascorbic acid in the liver, brain, pancreas, kidneys, muscle, testes and brown adipose tissue was not much affected. The concentration in the thymus, lymph nodes and spleen dropped within 4 hr. and continued to drop for the remaining 68 hr. The concentration in the intestinal mucosa increased sharply during the first 4 hr. and then declined. Stimulation of ascorbic acid synthesis by chloretone did not alter

the effects, and tissue hydration could not explain them. Aminopterin produced a small rise in the concentration of ascorbic acid in the mucosa but the concentration in the lymph nodes, spleen and liver was unchanged; the changes did not reproduce those caused by exposure to X-rays.

A. Hepburn.

1805

NATH, M. C. and BHATTATHIRY, E. P. M. **Reaction of alloxan with ascorbic acid.** *Nature*, 1955, **176**, 787–788. [Dept. Biochem., Univ. Nagpur, India.]

Ascorbic acid reacted with alloxan in phosphate buffer at *p*H 7·2 and 30° C. to give dehydroascorbic acid and possibly alloxantin. The last is highly diabetogenic, which could explain the work of Levey and Suter (Abst. 506, Vol. 17), who found that ascorbic acid increased the rise of blood sugar produced by alloxan.—A. Hepburn.

1806

KYO, T. **[Ascorbic acid content of the adrenal gland in alloxan diabetes.]** *Iryo*, 1955, **9**, 341–343. In Japanese.

1807

BUTTURINI, U. and MANCINI, A. M. Azione dell'STH, dell'ACTH e del cortisone sull'acido ascorbico e suoi gruppi sulfidrilici del fegato e dei tessuti linfatici. (Ricerche istochimiche.) **[Action of STH, ACTH and cortisone on the ascorbic acid and sulphydryl groups of the liver and lymphatic tissues. Histochemical studies.]** *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 13–16. [Int. Anat., Univ. Bologna.]

Four groups including in all 34 normally fed male rats weighing from 150 to 200 g. were daily given adrenocorticotropic hormone (Ciba) 1·5 mg. by intramuscular injection for 12 days, or cortisone (Merck) 3 mg. by intramuscular injection for 15 days or 6 mg. for 5 days, or somatotropic hormone (Choay) 1·5 Evans unit by intraperitoneal injection for 10 days, or no treatment. In the liver and lymphoid tissue the distribution of vitamin C was studied histochemically by silver nitrate staining, and of protein sulphydryl groups by the histochemical method of Chevremont-Fredericq. Vitamin C could scarcely be demonstrated in the liver. In lymphoid tissue the amount was uninfluenced by adrenocorticotropic hormone; it was increased by somatotropic hormone and by the larger dose of cortisone; by the smaller dose of cortisone it was decreased. The distribution of protein sulphydryl groups in the liver and lymphoid tissue was not affected by adrenocorticotropic hormone; it was decreased by cortisone and increased by somatotropic hormone, except in the centre of the liver.—E. M. Hume.

1808

BERGERON, G. A. and BOURBEAU, G. Effets de la cortisone, de l'ACTH et de la vitamine 'C' sur l'hypertension expérimentale à la DCA. **[Effects of cortisone, of adrenocorticotropic hormone and of vitamin C on experimental hypertension produced with deoxycorticosterone acetate.]** *Laval méd.*, 1955, **20**, 465–480. [Dept. Physiol., Laval Univ., Quebec.]

One kidney was removed from 78 male rats weighing about 109 g. Five days later, in 5 groups of 15 or 16 animals, they were given deoxycorticosterone acetate (DCA), or cortisone, or both, or cortisone and vitamin C, or all 3. The mortality rate was high among the rats given DCA, the number of survivors after 21 days, in the order given above, being 10, 13, 12, 7 and 6. Cortisone and DCA, separately or together, caused severe hypertension, and vitamin C did not mitigate it. The effect of cortisone ceased when administration ceased, but that of DCA did not.

In a second similar experiment, 6 groups of from 9 to 13 rats, after removal of one kidney, received adrenocorticotropic hormone (ACTH), or ACTH and vitamin C, or ACTH and DCA, or all 3, or DCA, or no treatment. After 25 days all the rats were surviving in the 3 groups not receiving DCA, but of those given DCA, whether alone or not, only 4, 4 and 5 survived. ACTH had no effect on blood pressure and, with or without vitamin C, did not counteract the effect of DCA.

E. M. Hume.

1809

BACCHUS, H. and LAMPKIN, J. M. **Influence of citric acid cycle intermediates on the *in vitro* metabolism of corticosteroids in ascorbic acid deficiency.** *Endocrinology*, 1955, **57**, 531–540. [Endocrine Lab., Dept. Physiol., Sch. Med., George Washington Univ., Washington, D.C.]

Liver slices from guineapigs fed on a scorbutogenic diet for up to 24 days metabolised the 17-hydroxy-20 : 21-ketol side chain of cortisone *in vitro* to a greater extent than slices of normal liver. After from 31 to 36 days of the diet, when the animals were moribund, the ability decreased. Pyruvate, α-ketoglutarate, citrate, ascorbate or, to a less extent, oxaloacetate, could prevent the increase, but succinate, fumarate and malate had no effect. All the 3 last substances and oxaloacetate could increase the metabolism of the side chain of cortisone by normal liver slices, but the others had no effect. Rinsing or storing liver in cold buffer solution tended to abolish the metabolic differences between the livers of normal guineapigs and of those deprived of ascorbic acid.

A. Hepburn.

1810

KERSTEN, H., KERSTEN, W. and STAUDINGER, H. Stoffwechsel der Nebennierenrinde und Biosynthese der Corticosteroide. 9. Weiterer Beitrag zum Mechanismus der Ascorbinsäurewirkung. [**Metabolism of the adrenal cortex and biosynthesis of corticosteroids. 9. Further contribution on the mode of action of ascorbic acid.**] *Biochem. Ztschr.*, 1955, **327**, 284–291. [Zentrallab., Städt. Krankenanst., Mannheim.]

Dehydroascorbic acid was reduced to ascorbic acid by a homogenate of whole adrenal gland, but not by adrenal mitochondria. Ascorbic acid, but not dehydroascorbic acid, at *p*H 6·6 activated 11 β-oxidation of deoxycorticosterone by isolated mitochondria from pig adrenal glands, and the action was increased by ultraviolet light. Ultraviolet light activated total corticosteroid synthesis by adrenal homogenates in the presence of ascorbic acid.

It is concluded that ultraviolet light favours the formation of an active form of ascorbic acid, which influences the transport of hydrogen or electrons in the adrenal cell.—D. Duncan.

1811

ALLISON, J. E. **Total plasma ascorbic acid as index of stress in the rat.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90**, 277–279. [Dept. Anat., Sch. Med., Univ. St. Louis, Mo.]

Electrical stimulation of the cervical sympathetic trunk in rats produced on the average a decrease in the number of eosinophils and lymphocytes, little change in the number of neutrophils and an increase in the total plasma ascorbic acid. The last effect was taken as a reliable index of the severity of the stress and possibly of the production of adrenocorticotropic hormone.

A. Hepburn.

1812

RINFRET, A. P. and HANE, S. **Depletion of adrenal ascorbic acid following stress in the infant rat.** *Endocrinology*, 1955, **57**, 497–499. [Metabol. Unit Res. Arthritis and Allied Dis., Univ. California Sch. Med., San Francisco.]

The concentration of ascorbic acid in the adrenal glands of infant rats, from 4 to 7 days old, decreased 2 hr. after laparotomy. In older rats the effect was greater.—A. Hepburn.

1813

DESMARAIS, A. **Skin metabolism in rats exposed to cold.** *Canad. J. Biochem. Physiol.*, 1955, **33**, 758–760. [Dept. Exp. Physiol., Laval Univ., Quebec.]

Succinic dehydrogenase activity was estimated in strips of skin taken from the backs of rats weighing from 160 to 180 g. and maintained on a normal diet. The activity increased when the animals were exposed to cold. The increase was prevented by injection of sodium ascorbate, which at room temperature had no effect on the enzyme activity. (See Title 5178, Vol. 21.)—A. Hepburn.

1814

HOLMES, W. N. **Variations in adrenal ascorbic acid concentration of the hamster during the pre-hibernatory period.** *Endocrinology*, 1955, **57**, 409–413. [Dept. Zool., Univ. Liverpool.]

The ascorbic acid concentration in the adrenal glands of hamsters kept at 2° C. increased significantly for 3 hr., then declined to the original value during a further 135 hr. Hibernating hamsters had values similar to those of a non-hibernating group.—A. Hepburn.

1815

HEYWANG, B. W. and KEMMERER, A. R. **The effect of procaine penicillin and ascorbic acid on egg weight and shell thickness during hot weather.** *Poultry Sci.*, 1955, **34**, 1032–1036. [Agric. Res. Serv., U.S. Dept. Agric., Animal Poultry Res. Husb. Branch, Glendale, Ariz.]

In 2 experiments during which the maximum air temperature was from 101° to 104° F., laying hens were given a basal diet alone or supplemented with 30 p.p.m. procaine penicillin or 0·10 per cent. ascorbic acid. The supplements had no appreciable effect on the weight of the eggs produced or on the thickness of their shells.—E. M. Cruickshank.

1816

SABALITSCHKA, T. Einwirkung von l-Ascorbinsäure auf lagernde Butter. [**Effect of *l*-ascorbic acid on stored butter.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102**, 342. [Berlin.]

Reply to an abstractor's criticism of a method for adding ascorbic acid to butter described by the author in a paper with the above title (*Milchwissenschaft*, 1953, **8**, 300).—W. M. Deans.

1817

GUTHRIE, E. S. **Role of ascorbic acid in development of oxidized flavors in dairy products.** *Cornell Univ. Agric. Exp. Stat. Memoir* No. 340, June 1955, pp. 56.

Experiments over several years confirmed the theory of Krukovsky and Guthrie (Abst. 2059, Vol. 15) that oxidation of ascorbic acid is the most important cause of oxidised flavour in milk. Contributory causes are light, homogenisation, presence of metals, especially copper, oxygen and high temperature.

Pasteurisation for 30 min. caused less oxidation of ascorbic acid at 165° F. than at 143° F. and

oxidised flavour did not develop so readily. Fresh concentrated milk kept a fresh flavour longer than ordinary milk. Of 18 cows, 1 consistently gave milk susceptible to oxidation and 4 always gave non-susceptible milk; the milk from the other cows varied. Intensity of oxidised flavour was slightly greater in winter than in summer. Ascorbic acid had disappeared from the pasteurised milks of 5 cows after 7 days' storage but was still found in 5 other milks after 28 days.

Washing cream with warm water removed ascorbic acid and improved the keeping quality.

Milk exposed to daylight developed oxidised flavour which was greater when the milk had previously been homogenised. Amber bottles partly protected the milk even when homogenised. The worst flavour was found in cream.

An extensive review of the literature is given.

A. Hepburn.

1818

HOOVER, M. W. **Influence of maturity and storage treatments upon the ascorbic acid content of the seeds of Southern peas.** *Food Res.*, 1955, **20,** 469–473. [Univ. Florida Agric. Exp. Stat., Gainesville.]

Three types of Southern pea were harvested at 6 different stages of maturity, the first stage being as early as the seeds could be separated from the pericarp, about 10 days after flowering, and at 2-day intervals afterwards. Storage temperatures were 40°, 70 and 100° F. and samples were analysed fresh and after storage for 24, 48 and 72 hr. Vitamin C was estimated by the indophenol method.

At the earliest stage of maturity the peas contained from 51 to 58 mg. ascorbic acid per 100 g. fresh weight, the value falling gradually to from 7 to 15 mg. at the 6th stage of maturity. Peas at the 4th stage of maturity, containing about 32 mg. per 100 g. fresh weight, lost very little ascorbic acid when stored at 40° F. for 72 hr. but when the storage temperature was 100° F. the loss was 54 per cent.—J. S. Thomson.

1819

FLOCH, H. and GÉLARD, A. Dosage de l'acide ascorbique dans les fruits guyanais. [**Estimation of ascorbic acid in the fruits of Guiana.**] *Arch. Inst. Pasteur Guyane franç. Publ.* No. 337, August 1954, pp. 6.

Data are tabulated for the vitamin C content of citron, watermelon, pineapple, *Chrysobalanus icaco*, L., banana, sapodilla plum (*Achras sapota*, L.), guava and round cherry (*Malpighia punicifolia*, L.). The last 2 with 272 and 1326 mg. per 100 g. were by far the richest.

D. Harvey.

1820

FLOCH, H. and GÉLARD, A. "La cerise ronde de Cayenne", Malpighia punicifolia L. Sa richesse exceptionnelle en vitamine C. [**The round cherry of Cayenne, *Malpighia punicifolia*, L. Its exceptional richness in vitamin C.**] *Arch. Inst. Pasteur Guyane franç. Publ.* No. 368, July 1955, pp. 6.

An essay on the usefulness of the fruit as a source of vitamin C.

See also Absts. 1549, 2258, 2462.

OTHER VITAMINS

1821

LANG, K. and WEYLAND, H. Über den Stoffwechsel des Rutins und Quercetins. [**Metabolism of rutin and quercetin.**] *Biochem. Ztschr.*, 1955, **327,** 109–117. [Physiol. Chem. Inst., Johannes Gutenberg Univ., Mainz.]

The metabolism of rutin and of quercetin was studied manometrically in the presence of liver and kidney preparations from rats, and with cyclophorase systems from brain, muscle and heart. Breakdown of the flavonols seemed to be closely associated with cyclophorase systems in all tissues. The most active enzyme was present in liver and kidney; those of brain, heart and muscle were less active. The breakdown appeared to be rapid and no intermediary product was identified.

When doses of from 0·2 to 2·0 g. rutin or quercetin per kg. bodyweight were given by mouth or parenterally to rats or rabbits, only very small quantities were excreted unchanged in the urine. There was no increase of phenols or keto-acids in the urine of animals receiving large doses of rutin or quercetin.—A. M. Copping.

1822

D'AMICO, G. Intorno all'azione della vitamina P sulle lesioni gastriche da acido fenilchinolincarbonico. [**Action of vitamin P on gastric lesions caused by phenylquinolinecarbonic acid.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 385–386. [Ist. Clin. Chirurg., Univ. Messina.]

Of 2 groups of 6 dogs given daily 0·25 g. Atophan (phenylquinolinecarbonic acid) per kg. bodyweight, I received in addition 2 daily intramuscular injections of vitamin P. Three dogs died; the rest were killed after 6 or 20 days. The incidence of gastric haemorrhage and ulcers was the same in the 2 groups.—E. M. Hume.

1823

SCHÄFER, E. and GREUEL, H. Der Einfluss des Rutins auf den Verlauf der experimentellen Meerschweinchentuberkulose. [**Influence of rutin on the course of experimental tuberculosis in the guineapig.**] *Ztschr. Tuberkulose*, 1955, **106,** 238–244. [1. Med. Klin., Med. Akad., Düsseldorf.]

In tests with 97 guineapigs, 25 mg. rutin every second or third day had no effect on survival time or severity of lesions after infection with tuberculosis. There appeared to be a slight retardation in the development of the tuberculous process in animals receiving rutin, but the results of the tests did not justify the recommendation of rutin for treating tuberculosis in man.—A. M. Copping.

1824

ZAPROMETOV, M. N. [**Production of vitamin P from the leaves of the tea plant.**] *Vestn. Akad. Nauk SSSR*, 1955, **25,** No. 8, 56.

See Abst. 553, Vol. 25.

1825

D'AGOSTINO BARBARO, A. and ZANNELLI, C. Azione del complesso T sulle funzioni riproduttive. [**Action of the T complex on reproductive functions.**] Osservazioni sulla presunta azione auxologica del complesso T. [**Observations on the alleged growth-promoting action of the T complex.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 112–115; 199–203. [Ist. Fisiol., Univ. Messina.]

Of 12 female rats from 50 to 55 days old and weighing about 88 g., maintained on a normal diet, 6 were given daily by mouth 8 drops of T-Vitamin Goetsch (Pharmazell, Raubling) for from 86 to 102 days, after a preliminary period during which vaginal smears were made daily or twice daily for 40 days. After 3 months from the beginning of the experiment all were mated with fertile males. Vitamin T had no favourable effect on growth or reproductive performance.

Young rats, 21 male and 28 female, newborn or 10, 20 or 30 days old were given vitamin T in amounts increasing progressively from 1 drop every other day to 3 drops daily, for about 65 days. There was no beneficial effect on growth; sexual maturity was attained normally.

E. M. Hume.

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4. PHYSIOLOGY OF NUTRITION

ENZYMES

1826

MIKHLIN, S. YA. and ISMAILOV, N. I. Soderzhanie fermentov v duodenal'nom soke i kale pri spru. [**Enzymes in the duodenal secretion and faeces in sprue.**] *Vop. Pitan.*, 1955, **14,** No. 5, 40–41. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

1827

KUIMOV, D. K. Prisposoblyaemost raboty podzheludochnoi zhelezy k vidu korma u tonkorunnykh ovetz. [**Adaptability of the function of the pancreas to the nature of the feed in fine-wooled sheep.**] *Fiziol. Zh. SSSR Sechenova*, 1954, **40,** 711–716. [Nauch.-Issled. Inst. Obtzev. Kozov., Stavropol.]

Studies on the pancreatic juice of sheep showed that the concentration of lipolytic, proteolytic and carbohydrate-splitting enzymes depended on the diet. The *p*H of the juice varied from 6·52 to 6·90. Adaptation of secretion, especially of proteolytic enzymes, to a change in diet was better when the change was gradual.—D. W. Taylor.

1828

BARRETT, J. L., NISHIKAWARA, M. T. and HAIST, R. E. **Effects of hypophysectomy and of undernutrition on amylolytic activity of the pancreas of the rat.** *Amer. J. Physiol.*, 1955, **182,** 35–38. [Dept. Physiol., Univ. Toronto.]

Unoperated control rats were given the amount of food eaten by pair-fed rats of both sexes with pituitaries removed. The diets were either ground fox ration or a mixture of dog food, bread, milk and sucrose.

Operated rats failed to grow, controls grew slightly. The activity of pancreatic amylase per g. pancreas or per mg. N was reduced by removal of the pituitary, and absolute activity was even less because the pancreas was small. In young rats, fasting reduced the size of the pancreas, but not its amylolytic activity per g. tissue. Restriction of food so as just to permit normal rats to maintain bodyweight did not reduce amylase activity per g. pancreas.

It is concluded that loss of amylase activity after removal of the pituitary cannot be ascribed solely to undernutrition.—D. Duncan.

1829

HOLZER, H., GOEDDE, H. W. and SCHNEIDER, S. Umsatz von Oxybrenztraubensäure und Glykolaldehyd mit Carboxylase und Alkoholdehydrase aus Hefe. [**Conversion of hydroxypyruvic acid and glycolaldehyde with carboxylase and alcohol dehydrase from yeast.**] *Biochem. Ztschr.*, 1955, **327**, 245–254. [Physiol. Chem. Inst., Univ. Hamburg.]

Purified carboxylase from brewer's yeast decarboxylated both pyruvate and hydroxypyruvate. The relative rates of reaction were 76 : 1. Breakdown of pyruvate and hydroxypyruvate in the presence of carboxylase could be calculated from the rate of loss of substrate as estimated with lactic dehydrase; breakdown of pyruvate was quicker, but separation of the two substances on this basis was impossible. Hydroxypyruvate inhibited decarboxylation of pyruvate, and it probably regulates carbohydrate metabolism by this competition for carboxylase. The product of decarboxylation of hydroxypyruvic acid was glycolaldehyde, which was reversibly converted to ethylene glycol by alcohol dehydrase and reduced diphosphopyridine nucleotide. This provided an optical test for the rate of decarboxylation of hydroxypyruvate.—D. Duncan.

1830

KREBS, H. A. and DAVIES, D. D. **Inhibition of the " malic enzyme " by fluorocitrate.** *Arch. Sci. biol., Bologna*, 1955, **39**, 533–538. [Med. Res. Counc. Unit Res. Cell Metabol., Dept. Biochem., Univ. Oxford.]

1831

PUIG MUSET, P., CALVET, F. and VALLS, J. Activation de la digestion tryptique de la caséine par le peroxyde d'hydrogène. [**Activation of tryptic digestion of casein by hydrogen peroxide.**] *Arch. internat. Pharmacodyn.*, 1955, **103**, 270–280. [Lab. Pharmacol., Fac. Méd., Barcelona.]

The tryptic digestion of casein was increased by up to 35 per cent. in the presence of hydrogen peroxide. Casein treated with H_2O_2 before digestion gave similar results and was not reconverted to the less digestible form by hydrogen sulphide. Trypsin was inactivated by H_2O_2 and could not be reactivated by H_2S.—A. Hepburn.

1832

EMANUELSSON, H. **Changes in the proteolytic enzymes of the yolk in the developing hen's egg.** *Acta physiol. scand.*, 1955, **34**, 124–134. [Dept. Zoophysiol., Univ. Lund.]

In the yolks of hen's eggs after different periods of incubation, measurements were made of free amino-acids by chromatographic methods and of enzyme activity by proteolytic action on a solution of Hb. No evidence of change in the amounts of amino-acids or of peptides soluble in alcohol was found. Activity was, in the main, referable to 3 enzymes with optimum *p*H values of 3, 5 and 7. The concentration of the first was doubled in the first day of incubation, then fell and later rose; its lowest concentration on the ninth day was still well above that in the unincubated egg. The second and third enzymes also increased during incubation, but did not reach their maximum activities until the ninth day.

The findings are discussed with reference to the view that the first enzyme reaches the yolk by diffusion from the embryo and that the others are liberated in the yolk during incubation.

D. Harvey.

1833

LANG, K. and KELLER, C. Die Einwirkung des Cyclophorase-Systems auf die schwefelhaltigen Aminosäuren. [**Effect of the cyclophorase system on the sulphur amino-acids.**] *Biochem. Ztschr.*, 1955, **327**, 202–208. [Physiol. Chem. Inst., Johannes Gutenberg Univ., Mainz.]

The cyclophorase system was prepared from rat liver or kidney by the method of Green *et al.* (*J. Biol. Chem.*, 1948, **172**, 389). It was found to deaminate DL-methionine to α-keto-γ-hydroxymethylbutyric acid and α-keto-γ-thiomethylbutyric acid; to oxidise L-cysteine to L-cystine; to oxidise DL-homocysteine to DL-homocystine and also to deaminate 10 to 15 per cent. of it; and to attack cystathionine. In the last-named reaction oxidative deamination occurred, but there was more uptake of oxygen and less production of keto-acids than would be expected on theoretical grounds. It is concluded that the cystathionine was attacked by thionase and that the products were deaminated or were oxidised to disulphides.

The interpretation of the results is discussed.

D. Duncan.

1834

ESTES, F. L., WAINIO, W. W. and ALLISON, J. B. **Effect of limitation of protein intake on hepatic uricase and on urinary uric acid and allantoin.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 619–621. [Dept. Chem., Douglass Coll., New Brunswick, N.J.]

The 3 groups of rats were as described in Abst. 4431, Vol. 23. When they were killed the livers were removed for estimation of uricase activity. Urine samples were collected during each 3-day period of the experiment and pooled for estimation of allantoin and uric acid.

The uricase activity in the livers of the rats on the protein-free diet was lower than that in the livers of the other 2 groups; the fall was not

accompanied by an increase in the uric acid : allantoin ratio in the urine. The allantoin or the uric acid content of the urine and the uricase content of the liver followed the same trend.

G. F. Garton.

1835

TAYEAU, F. Étude sur la cholestérolestérase du sérum sanguin. [**Serum cholesterol esterase.**] *Arch. Sci. biol., Bologna*, 1955, **39,** 545–553. [Lab. Chim. Biol., Fac. Méd., Bordeaux.]

1836

BAMANN, E. and RIEHL, J. Zur Frage der Co-Existenz einer Phospho-mono- und -di-esterase. 1. Mitteilung zur Spezifität der Phosphatase. [**Co-existence of phospho-mono- and -di-esterase. 1. Specificity of phosphatase.**] *Biochem. Ztschr.*, 1955, **327,** 136–148. [Inst. Pharm., Univ. Munich.]

The aromatic ester monophenylphosphoric acid is more readily hydrolysed than the aliphatic phosphoric mono-esters of methyl, ethyl, *n*-propyl and *n*-butyl alcohols, whether by acid or alkaline phosphatases from cattle or pig liver or from potato. This difference is related to a slightly greater rate of splitting of intermediary products of monophenylphosphoric acid. The susceptibility of the aliphatic esters increases with the chain length of the alcohol residue, which is related to the simultaneous increase of the affinity of the substrate for the enzymes and increase in the rate of splitting of intermediary products in the series from monomethyl- to mono-*n*-butylphosphoric acid.

Dimethyl- and diethylphosphoric acid are not attacked by animal or plant phosphatases. Di-*n*-butyl- and diphenylphosphoric acid are attacked by animal phosphatases, but not by those of potato or *Aspergillus oryzae*. This demonstrates that it is possible for the same enzyme to hydrolyse both mono-esters and di-esters.—D. Duncan.

See also Absts. 2046, 2183, 2324, 2325.

DIGESTION AND ABSORPTION

1837

ADAM, A. and CZECH, E. Die Magenverdauung der homogenisierten Milch beim Säugling. [**Gastric digestion of homogenised milk by infants.**] *Monatsschr. Kinderheilk.*, 1955, **103,** 361–365. [Kinderklin., Univ. Erlangen.]

After a test feed of homogenised milk 15 healthy infants secreted less gastric juice than after a similar feed of untreated milk. In 3 infants with digestive disturbances this difference disappeared. Experiments *in vitro* showed that the homogenising process increased the rate of breakdown of the carbohydrate and fat of milk by the gastric and intestinal enzymes, and the finding was thought to explain the smaller secretion of gastric juice after homogenised than after untreated milk.—L. Wills.

1838

CZOK, G. and LANG, K. Wirkungsunterschiede zwischen gefiltertem und ungefiltertem Bohnenkaffee. [**Differences in effect between filtered and unfiltered coffee.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1641–1642. [Physiol. Chem. Inst., Univ. Mainz.]

Coffee made by pouring boiling water on ground coffee, allowing it to stand and carefully pouring it off raised total acidity and free HCl in the gastric juice of 12 healthy subjects much less than coffee prepared with "Melitta" filters. The difference is probably due to the removal of tannins by filtration. Unfiltered coffee had a significantly greater effect in increasing the activity and reducing the electroshock threshold of rats given per kg. bodyweight 5 ml. of an infusion made from 10 g. ground coffee and 200 ml. water.

W. M. Deans.

1839

OLSON, W. H. and NECHELES, H. **Primary depression of gastric secretion by insulin in normal man.** *J. Amer. Med. Assoc.*, 1955, **159,** 1013–1014. [Dept. Gastro-Intestinal Res., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

1840

JAVID, H. **Nutrition in gastric surgery with particular reference to nitrogen and fat assimilation.** *Surgery*, 1955, **38,** 641–651. [Dept. Surg., Univ. Illinois Coll. Med., Chicago.]

Dogs were given a diet supplying daily 80 Cal., 5 g. protein and 4 g. fat per kg. bodyweight. After studies of excretion of N and fat in faeces they underwent, in groups of 6, vagotomy alone, gastroenterostomy without or with vagotomy, or partial gastrectomy without or with vagotomy, with removal of two-thirds of the stomach. The studies of excretion were repeated at intervals of from 6 weeks to 6 months after the operations.

The effects of the operations in the above order were : none ; none ; increase in fat with no change in N excretion ; significant increases in excretions of both fat and N ; increases in excretions which were, on the average, still greater than those after gastrectomy without vagotomy. From the limited set of studies, gastroenterostomy with vagotomy is thought to be less harmful nutritionally than gastrectomy.—D. Harvey.

1841

PONZ, F. and QUERALTÓ, M. R. Paso de compuestos de fósforo de la mucosa a la luz del intestino durante la absorción de azúcares. [**Passage of phosphorus compounds from the mucosa to the lumen of the intestine during the absorption of sugars.**] *Rev. española Fisiol.*, 1955, **11**, 105–141. [Lab. Fisiol. Animal, Fac. Cienc., Univ. Barcelona.] English summary.

The methods for estimation of P fractions are described in detail. The technique of Sols and Ponz (Abst. 3357, Vol. 17) was used to study absorption in rats of 60 to 180 g. bodyweight. The amounts of total, inorganic, ester and lipid P secreted into the intestine were estimated after 15, 30, 45 and 60 min. during absorption of glucose from hypotonic, isotonic and hypertonic solutions, during absorption of arabinose and after withdrawal of glucose solutions.

The secretion of inorganic P increased with the concentration of the glucose solution. A peak of concentration in the lumen was reached after 45 min. Ester P secretion fell as glucose concentration rose, but the total rate of secretion increased through the 60 min. of experiments. Lipid P concentration in the intestinal lumen increased steadily during glucose absorption from isotonic or hypotonic but not from hypertonic solutions. The peak of total P in the intestinal lumen was reached after 45 min. of glucose absorption and after this some P was re-absorbed. Results with arabinose were similar to those with glucose. Secretion of P into the intestine persisted at a reduced rate during 30-min. experiments after glucose had been replaced by isotonic NaCl solution.

Isotonic NaCl solution did not provoke secretion of P, nor did glycine. Secretion in response to glucose was inhibited by phloridzin or uranyl, but iodoacetate inhibited only the secretion of lipid P.

The mechanisms involved are discussed.

D. Duncan.

1842

BUDOLFSEN, S. E. **The influence of potassium on the intestinal absorption.** *Acta physiol. scand.*, 1955, **33**, 132–136. [Dept. Physiol., Univ. Aarhus, Denmark.]

The presence of K in solutions introduced into segments of the ileum of rats reduced the quantity of glucose absorbed. This effect was not found in the colon.—A. T. Phillipson.

1843

ESCRIBANO, J. and PONZ, F. Nuevos inhibidores enzimáticos que afectan a la absorción intestinal de glucosa. [**New enzyme-inhibitors which affect absorption of glucose from the intestine.**] *Rev. española Fisiol.*, 1955, **11**, 153–180. [Lab. Fisiol. Animal, Fac. Cienc., Barcelona.] English summary.

Absorption of glucose in isotonic solutions, 5·4 per cent., was studied in experiments on rats by the Sols and Ponz technique (Abst. 3357, Vol. 17). Tests lasted 30 min., and in 4 successive tests on each rat absorption was studied of glucose alone, glucose with an inhibitor, glucose alone and glucose with the inhibitor again.

Atebrine inhibited absorption at concentrations of 9×10^{-4} *M* or more, and the inhibition was not reversible. Chloral hydrate inhibited, also irreversibly, at from 5×10^{-2} to 10^{-1} *M*. Neosalvarsan caused 20 per cent. inhibition at 10^{-3} *M* and 80 per cent. inhibition at $4{\cdot}3 \times 10^{-3}$ *M*, again irreversible. Triethylene melamine produced irreversible inhibition at between $7{\cdot}4 \times 10^{-4}$ *M* and 3×10^{-3} *M*. All the inhibitors had local action. Phenylacetic acid inhibited only in very concentrated solution, sulphaguanidine and sulphanilamide not at all. Sodium malonate produced 10 to 15 per cent. inhibition at 10^{-2} *M*, showing that succinic dehydrase is of importance for active transport of glucose.

The interpretation of the findings in terms of the mechanism of active transport of glucose is discussed.—D. Duncan.

1844

STERN, P., HUKOVIĆ, S. and FUKAREK, V. Über die Resorption der Kohlehydrate aus dem sterilen Darmkanal des Kaninchens. [**Absorption of carbohydrates from the sterile intestine of the rabbit.**] *Gastroenterologia*, 1955, **83**, 349–353. [Pharmakol. Inst., Med. Fak., Sarajevo.] English and French summaries.

Rabbits were given terramycin and penicillin for 5 or 6 days as described in Abst. 890, Vol. 25, until the faeces were bacteriologically negative except for *Proteus vulgaris*. Absorption of carbohydrate was estimated by a study of the blood sugar after administration by mouth of 20 ml. of 20 per cent. glucose solution, or starch in the form of oats to appetite.

Sugar was absorbed normally from the sterile intestine, but there was no increase in the blood sugar 4 hr. after the starch meal. The diastase activity of the gut wall was normal. It is concluded that starch breakdown in the normal rabbit depends on bacterial activity.—D. Duncan.

1845

PORTMAN, O. W., MANN, G. V. and WYSOCKI, A. P. **Bile acid excretion by the rat : nutritional effects.** *Arch. Biochem. Biophys.*, 1955, **59**, 224–232. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Bile acids were prepared from rat bile and estimated spectrophotometrically by a method similar to that described in Abst. 1894, Vol. 26. The adult rats were given a basal diet with, per cent., casein 25, fat 8, carbohydrate 57·6 and Cellu flour 5, minerals and vitamins, at the rate of 4 g. protein and 64 Cal. daily. Groups of from 4 to 10 rats received this diet or modifications of it or commercial Purina chow for 15 days and then their bile ducts were cannulated and bile was collected for 24 hr.

Rats on Purina chow excreted more total bile acids and a higher proportion of cholic acid than those on the synthetic diets. On both chow and basal diets, 5 per cent. cholesterol significantly increased bile acid and cholesterol output. Raising the maize oil from 8 to 15 per cent. had no effect on bile acids or cholesterol. Substitution of egg albumin for casein increased bile acid output, but addition of methionine, cystine or taurine to the casein diet did not. There was no significant effect of supplements of dried liver or brewer's yeast or of vitamin B_{12} given intraperitoneally. When rats previously fed on chow were fasted for 24 hr. before cannulation and during the collection of bile they excreted less bile acid than those fed on chow; but with rats on the basal diet fasting increased output of bile acids. When starch was given instead of sucrose there was a larger excretion of bile acids and a larger proportion of cholic acid, but dextrose had not this effect. An increase of Cellu flour from 5 to 20 per cent. also increased the output of bile acids and cholic acid.

It was concluded that sucrose and dextrose inhibit excretion of bile acids in the rat.

D. Duncan.

1846

Clément, G., Clément, J., Drevet, M. and Abadie-Debat, J. Sur le mécanisme chimique de l'hydrolyse enzymatique des huiles et graisses naturelles. 2. Études des constituants lipidiques du contenu intestinal du rat après administration d'huiles ou de graisses diversement saturées. Influence de suc pancréatique et de la bile. [**Chemical mechanism of the enzymic hydrolysis of natural oils and fats. 2. The lipid constituents of the intestinal contents of the rat after oils or fats of differing saturation. Effect of pancreatic juice and bile.**] *Bull. Soc. Chim. biol.*, 1955, **37**, 857–865. [Inst. Res. Sci. Cancer, C.N.R.S., Paris.]

For part 1 see Abst. 3665, Vol. 25.

Normal rats and rats with bile and pancreatic duct fistulae were given 1 ml. fat or fatty acids by stomach tube and were killed 3 hr. later. Total lipids were extracted from intestinal contents and fractionated into free fatty acids, soaps, glycerides and phospholipins, the I value of each of which was estimated. The fats used included soya bean oil, linseed oil, mutton fat and karite butter [shea butter, *Butyrospermum parkii*].

It was concluded that the course of intestinal hydrolysis of fats involved the formation of fatty acids and soaps of lower I value than that of the remaining glycerides and that intestinal enzymic hydrolysis preferentially removed the more saturated fatty acids from a fat. Formation of phospholipins was favoured by administration of unsaturated fat, but not of saturated fat.

G. A. Garton.

1847

Blomstrand, R. **The intestinal absorption of phospholipids in the rat.** *Acta physiol. scand.*, 1955, **34**, 147–161. [Dept. Physiol. Chem., Univ. Lund.]

Phospholipins labelled with oleic acid-1-^{14}C, palmitic acid-1-^{14}C and ^{14}C-labelled glycerol, or palmitic acid-1-^{14}C and ^{32}P were given by stomach tube to rats with thoracic duct fistulae. Lymph was collected for 24 hr. and its lipids were fractionated into neutral fat and phospholipins for measurement of their radio-activity.

Most of the ^{14}C activity in the lymph lipids was associated with the glyceride fraction, a significantly greater proportion of the radio-activity than was found in earlier experiments when the labelled fatty acids were given free or in glyceride combination.

The data indicated that there was extensive hydrolysis of ingested phospholipins in the intestine and that a small amount of glyceride glycerol was derived from the phospholipin glycerol, suggesting synthesis from a mono- or di-glyceride. The relative specific activity of lymph phospholipin glycerol was about 30 per cent., suggesting that there had been direct absorption of unchanged phospholipin; the experiment with ^{32}P-labelled phospholipin supported this hypothesis.

G. A. Garton.

1848

Ivy, A. C., Lin, T. M. and Karvinen, E. **Absorption of dihydrocholesterol and soya sterols by the rat's intestine.** *Amer. J. Physiol.*, 1955, **183**, 79–85. [Dept. Clin. Sci., Univ. Illinois Coll. Med., Chicago.]

Balance studies showed that rats had a limited capacity to absorb cholesterol from the diet, about 92 mg. per 250 g. rat or 370 mg. per kg. bodyweight daily. Excess amounts of sterols which do not give the Liebermann Burchardt reaction were not excreted until cholesterol was given in excess of the animals' capacity for intestinal absorption. When 192 mg. dihydrocholesterol or soya bean sterols (93 per cent. sitosterols) was given to rats weighing 200 to 250 g. about 22 per cent. was absorbed. When 192 mg. dihydrocholesterol and 96 mg. cholesterol were given together, 18 and 36 per cent., respectively, was

absorbed. When 96 mg. cholesterol was given alone, 61 per cent. was absorbed, so the dihydrocholesterol reduced absorption of cholesterol by about 40 per cent. Soya bean sterols similarly affected the absorption of cholesterol from the diet.

It is suggested that dihydrocholesterol and soya bean sterols decrease absorption of cholesterol by competing for the total absorptive capacity.

G. A. Garton.

1849

ROBINSON, D. S., JEFFRIES, G. H. and POOLE, J. C. F. **Further studies on the interaction of chyle and plasma in the rat.**

FRENCH, J. E., ROBINSON, D. S. and HARRIS, P. M. **The role of cholesterol in the interaction of chyle and plasma.** *Quart. J. Exp. Physiol.*, 1955, **40,** 297–308; 320–330. [Sir William Dunn Sch. Pathol., Oxford.]

1850

GRIM, E., LEE, J. S. and VISSCHER, M. B. **Water exchange between intestinal contents, tissues and blood.** *Amer. J. Physiol.*, 1955, **182,** 359–363. [Dept. Physiol., Univ. Minnesota, Minneapolis.]

In dogs cannulae were inserted at the ends of a loop, about 20 cm. in length, of the lower ileum, and the loop was perfused with fluid containing D_2O. Blood samples for analysis were withdrawn from the mesenteric vein draining the loop; in some experiments the loop was excised and the mucosal and muscular layers were separated and analysed.

The concentration of D_2O in the mucosal tissue was never, even after lavage for 2 hr., more than 25 per cent. and in the mixed venous blood never more than 5 per cent. of the concentration in the perfusing fluid.

Possible explanations are discussed.

D. Harvey.

1851

DOUGHERTY, R. W. and HABEL, R. E. **The cranial esophageal sphincter, its action and its relation to eructation in sheep as determined by cinefluorography.** *Cornell Vet.*, 1955, **45,** 459–464. [New York State Vet. Coll., Ithaca.]

The activity of the cranial oesophageal sphincter was studied in 6 lambs of 45 to 60 lb. liveweight, after a mixture of CO_2 and methane had been insufflated through a rumen cannula to stimulate eructation. The cranial sphincter remained tightly closed except during swallowing and eructation. It did not open when the rumen and oesophagus were forcibly filled with warm water and ingesta to a pressure of 40 mm. Hg, which overcame the resistance of the cardial and diaphragmatic sphincters. The process of eructation is described.

D. Duncan.

1852

DZIUK, H. E. and SELLERS, A. F. **Physiological studies of the vagal nerve supply to the bovine stomach. 2. Studies on the eructation mechanism in adult cattle.** *Amer. J. Vet. Res.*, 1955, **16,** 499–504. [Div. Vet. Physiol. Pharmacol., Sch. Vet. Med., St. Paul, Minn.]

For part 1 see Abst. 526, Vol. 26.

In 3 cows with rumen fistulae electrodes were applied to the dorsal vagal trunk in the thorax. Studies of responses to stimulation could be made for from 3 to 6 months after operation. Movements of the rumen, reticulum and cardia were recorded by pressure changes.

In all 3 cows stimuli at a frequency of 10 cycles per sec., 5 millisec. pulse duration and 10 volts applied for 2 to 5 min. caused increased rumen movements and about doubled the frequency of eructation when air was insufflated into the rumen at constant rate. Stronger stimuli, either of greater frequency or higher voltage, produced spasmodic contractions of rumen, reticulum and cardia. Even when the rumen contained much water and the cow's hindquarters were raised to submerge the cardia, eructation occurred regularly and was increased by vagal stimulation.

D. Duncan.

1853

WILLIAMS, E. I. **A study of reticulo-ruminal motility in adult cattle in relation to bloat and traumatic reticulitis with an account of the latter condition as seen in a general practice. 1. A study of reticulo-ruminal motility in adult cattle with reference to the eructation of ruminal gases and bloat. 2. A survey of sixty-four cases of traumatic reticulitis diagnosed by the "reticular grunt" method.** *Vet. Rec.*, 1955, **67,** 907–911; 922–927. [St. Clears, Carms, S. Wales.]

1. Reticulo-ruminal motility was studied in 400 normal adult cattle by combined palpation with the hand in the left iliac fossa and auscultation with the stethoscope placed at the costochondral junction of the left seventh rib. A remarkably constant cycle of movement is described. Belching usually accompanied those rumen contractions which occurred without contraction of the reticulum. The rhythm of primary reticulo-ruminal contractions and extra ruminal contractions was 1 : 1 in 295 animals, 2 : 1 in 64 and 1 : 2 in 41. The 2 : 1 rhythm was mostly found with relatively empty stomachs.

Movements were studied also in the course of rumenotomy operations on 69 animals, 64 of them for traumatic reticulitis. In all the cattle with reticulitis there was a 1 : 1 rhythm of contractions. Eructation did not accompany the extra ruminal contraction unless the incision was sealed round the operator's arm with cotton-wool. In the 2

animals with frothy bloat the extra ruminal contractions were absent, but the primary contractions were particularly forceful. The cardia was normally closed, and was opened by contraction of the dorsal sac. Massage in the region of the reticulo-ruminal fold sometimes initiated regurgitation.

The mechanism of eructation is discussed.

2. Diagnosis of traumatic reticulitis from a grunt accompanying reticular contraction was extremely reliable. In most animals the grunt occurred during the phase of reticular relaxation and contraction of the dorsal ruminal sac.

D. Duncan.

1854

POUNDEN, W. D., HIBBS, J. W. and CONRAD, H. R. **Rumen content in young calves.** *Vet. Med.*, 1955, **50,** 435–440. [Dept. Vet. Sci., Ohio Agric. Exp. Stat., Wooster.]

Fluid was removed by stomach tube from the rumens of young Jersey and Holstein calves. In Jerseys there was an increase between the eighth and tenth days of life, and then the quantity gradually fell. In Holsteins there was an increase between the sixth and ninth days, a fall and then another increase between the tenth and thirteenth days, and then a tailing-off.

During the first day of life there was milk in the rumens of more than half the calves examined. From 1 to 9 days old milk was present in only a quarter of the animals. For the next 20 days milk or curd was found in one in 8 calves getting concentrates and hay, and in one in 30 getting only hay as dry feed. At post-mortem examination fibre- and hairballs were found in fewer calves under 10 or over 21 days old than in those between these ages.

The average *p*H of rumen contents of calves under 10 days old was 6·83 with range 5·97 to 7·60 in those with no milk present. When milk was present the *p*H was lower, 4·43 to 6·27, average 5·42. From calves aged from 11 to 25 days getting grain and hay to appetite the *p*H was 6·69, and in those getting only milk was 6·50.

The importance of giving roughage at an early age is discussed.—T. D. Bell.

1855

LAMPILA, M. **Preliminary studies on the variations of pH and volatile fatty acid concentration of the rumen contents of the cow.** *Maataloust. Aikakausk.*, 1955, **27,** 142–153. [Agric. Res. Centre, Dept. Animal Husb., Tikkurila, Finland.] Finnish summary.

Measurements were made of the *p*H at different levels in the rumen of a cow with a fistula, and samples of contents were taken from neighbouring points for estimation of volatile fatty acids. Observations were made with 5 different diets during stall feeding, and at pasture.

The *p*H changes in the course of the day were negligible when the cow was at pasture. Their rate and extent during stall feeding depended on the ration. The lowest *p*H was always in the uppermost part of the rumen and the highest *p*H at the bottom. The greatest changes occurred in the upper part. The low *p*H in the upper part was related to a higher concentration of volatile fatty acids, at times as much as 50 per cent. more than in the lower parts. The *p*H values measured *in vitro* were from 0·15 to 0·65 units higher than those *in vivo*.

D. Duncan.

1856

CUNNINGHAM, H. M. and BRISSON, G. J. **Note on alcoholic fermentation in the stomachs of lambs fed high-glucose diets.** *Canad. J. Agric. Sci.*, 1955, **35,** 511–512. [Div. Chem., Sci. Serv., Canada Dept. Agric., Ottawa.]

Signs of alcoholic intoxication were seen in lambs fed on a fat-free high-glucose diet. The stomach contents smelt of alcohol and concentrations up to 0·62 per cent. were found. Alcohol was present in the blood and urine. Alcohol was not detected when the carbohydrate of the diet was lactose.

The signs of intoxication in lambs given absolute alcohol at the rate of 5 to 10 ml. per kg. bodyweight were identical with those seen after the high-glucose diet.—A. T. Phillipson.

1857

RAYNAUD, P. Diverses formes d'azote dans les réservoirs digestifs des bovidés. [**Different forms of nitrogen in the digestive tract of cattle.**] *Arch. Sci. physiol.*, 1955, **9,** 83–96. [Labs. Physiol., Fac. Sci., Toulouse.]

See also Abst. 3655, Vol. 25.

The N content of material from the rumen, abomasum and duodenum of cattle was divided into protein, ammonia, polypeptide and residual, mainly mono-amino-, fractions.

Protein N increases from rumen to duodenum, but forms a decreasing proportion of the total N. Ammonia N is lowest in the abomasum, high in rumen and duodenum. Polypeptide N increases from rumen to duodenum, and forms its highest proportion of the soluble N in the abomasum. Residual N is almost absent in the rumen, unimportant in the abomasum, but rises to a mean of 17 per cent. of the total and 42 per cent. of the soluble N in the duodenum. Thus there seems to be little digestion of polypeptides in the stomach, such as there is in non-ruminants.—D. Duncan.

1858

LEWIS, D. **Amino-acid metabolism in the rumen of the sheep.** *Brit. J. Nutrition*, 1955, **9,** 215–230. [Agric. Res. Counc. Inst. Animal Physiol., Babraham, Cambridge.]

Amino-nitrogen was estimated in the rumen liquor after concentration at *p*H 9 *in vacuo*. The quantities found ranged from 0·1 to 1·4 mg. per 100 ml. The principal acids present were glycine, alanine, valine, glutamic acid and proline. Individual amino-acids introduced into the rumen gave rise to ammonia. Washed suspensions of rumen bacteria deaminised mixtures of amino-acids more rapidly than individual acids. Of the acids tested individually, aspartic acid gave rise to most ammonia. The optimum *p*H for deamination was 6·5.—A. T. Phillipson.

1859

OTAGAKI, K. K., BLACK, A. L., GOSS, H. and KLEIBER, M. ***In vitro* studies with rumen microorganisms using carbon-14-labeled casein, glutamic acid, leucine, and carbonate.** *J. Agric. Food Chem.*, 1955, **3**, 948–951. [Dept. Animal Husb., Univ. California, Davis.]

The action of rumen bacteria on protein and amino-acids was investigated. The bacterial fraction from sheep's rumen fluid was incubated anaerobically at 39° C. in 50-ml. amounts of suitable nutrient media, with the addition of ^{14}C-labelled casein, glutamic acid, leucine or carbonate. At the end of 48 hr. enzymic activity was terminated and the distribution of isotope in bacterial protein, volatile fatty acids and CO_2 was found. With casein, the greatest amount was accounted for in the volatile fatty acids, with little in the bacterial protein. With glutamate, a considerable proportion was found in CO_2, as well as in the volatile fatty acids, indicating amino-acid breakdown. With leucine, by contrast, little was found in CO_2, but half was recovered from fatty acids. With ^{14}C-carbonate fixation of CO_2 was demonstrated in all amino-acid components of the protein fraction.—J. C. Appleby.

1860

DAIN, J. A., NEAL, A. L. and DOUGHERTY, R. W. **The occurrence of histamine and tyramine in rumen ingesta of experimentally over-fed sheep.** *J. Animal Sci.*, 1955, **14**, 930–935. [Dept. Biochem. Nutrit., Cornell Univ., Ithaca, N.Y.]

Acute indigestion was produced in sheep overfed with 4 lb. fresh wheat or cracked maize. Samples of rumen contents were withdrawn through a rumen fistula at intervals and analysed by paper chromatography for histamine and tyramine, and the *p*H of the samples was estimated.

Value for histamine of 70 μg. per ml. were obtained in some experiments after 36 to 42 hr. At this level of histamine the animals died. At 5 μg. per ml. the animals were obviously, but not critically, ill. The severity of signs was directly related to the level of histamine. The *p*H fell as the histamine level rose. When the histamine level was high enough to be fatal the *p*H was about 4·5.—T. D. Bell.

1861

HUNGATE, R. E., FLETCHER, D. W. and DYER, I. A. **Effects of chlortetracycline feeding on bovine rumen microorganisms.** *J. Animal Sci.*, 1955, **14**, 997–1002. [Dept. Bacteriol., State Coll., Washington, Pullman.]

By a manometric technique described elsewhere (*Applied Microbiol.*, in the press), total fermentation products of the rumen contents of bullocks fed on rations with or without chlortetracycline (aureomycin) were estimated and the effect of the addition of more chlortetracycline to the fermentation apparatus was studied. The inhibition of fermentation by added antibiotic was greater in the rumen contents of animals which had not had chlortetracycline, and this showed that the rumen flora had been altered by the antibiotic in the ration.—T. D. Bell.

1862

RAVAUD, M. Recherches sur la physiologie et la pharmacodynamie des mouvements intestinaux chez les ruminants. [**Research on the physiology and pharmacodynamics of the intestinal movements of ruminants.**] *Thesis*, Toulouse, 1955, pp. 128.

The intestinal movements were studied in 28 small ruminants narcotised with chloralose, by recording pressure changes from balloons in the lumen or by simple observation of the intestines exposed in a chamber at 39° C. and high humidity. "Normal" motility was studied for 4 or 5 hr. and then the effects of different drugs.

The motility was on the whole similar to that seen in non-ruminant species, but somewhat weak. Veratrine and emetine were without effect; anticholinesterases were the most active and least dangerous stimulants of motility and atropine was the most effective inhibitor.—D. Duncan.

1863

HERNDON, J. F. and HOVE, E. L. **Surgical removal of the cecum and its effect on digestion and growth in rabbits.** *J. Nutrition*, 1955, **57**, 261–270. [Dept. Animal Husb. Nutrit., Alabama Polytech. Inst., Auburn.]

Rabbits aged 6 weeks or older were given a diet containing, per cent., extracted casein 25, maize starch 33·8, cellulose 10, vitamin mixture in sucrose 5, salts 5, cod liver oil 1, lard 19 and $KHCO_3$ 1·2, with 10 mg. α-tocopherol acetate weekly. When the rabbits were at least 8 weeks old the caecum was removed by a method which is described. The operation was successful in 5 rabbits.

After operation the rabbits lost weight for about 2 days and then resumed growth at an average

rate of about 22 g. daily, against 27 g. for normal rabbits on the same diet. They remained outwardly normal, but after periods of up to 9 months after operation enlargement of the adrenals and colon was found, and the kidneys were large, pale and slightly scarred. The rabbits excreted two types of faeces, one hard, dry and white, the other dark, irregularly shaped and moist. The faeces did not show the high protein content, the tough mucous covering or the grape-like clustering of true soft faeces, and the two types differed only in the presence of bile in the dark faeces. The rabbits did not eat their faeces.

Balance experiments with 2 normal and 2 operated rabbits in metabolism cages showed that digestibility of fat and protein were somewhat low in operated rabbits, digestibility of cellulose was normal, utilisation of Ca was normal, but losses of Na and K were 5 times normal.

It is concluded that the rabbit is not dependent on caecal micro-organisms for digestion of fibre or synthesis of vitamins, and that its digestive system is closer to that of other mammals with simple stomachs than to that of the ruminant.

D. Duncan.

1864

MYERS, K. **Coprophagy in the European rabbit (*Oryctolagus cuniculus*) in Australia.** *Austral. J. Zool.*, 1955, **3**, 336–345. [Wildlife Survey Sect. Field Stat., C.S.I.R.O., Albury, N.S.W.]

Rabbits were captured at all times of the day and night and dissected immediately. The distribution of hard and soft faecal pellets in the rectum and the presence or absence of pellets in the stomach were studied.

Soft pellets were passed and eaten underground, during the day, and hard pellets during feeding at night. The change from one type to the other commonly occurred before the rabbits moved up or down. In winter the rabbits remained above ground longer than in summer, and production of soft faeces did not last so long.

In young rabbits coprophagy began at an early age, with bodyweights of 6 oz. upwards.

It is suggested that coprophagy is most extensive and also most valuable to the rabbit during the dry summer months, when green feed is scarce.

D. Duncan.

See also Absts. 1775, 1776, 2020, 2021, 2064, 2121, 2444.

COMPOSITION OF BODY FLUIDS AND TISSUES

BLOOD

1865

KÜNZER, W. Untersuchungen zur Reifungszeit der Reticulocyten von Neugeborenen, jungen Säuglingen und Frühgeburten. Zugleich ein Beitrag zur Frage der Lebensdauer von Neugeborenenerythrocyten. [**Maturation time of reticulocytes of the newborn, young infants and premature infants, with a contribution on the problem of the duration of life of erythrocytes in the newborn.**] *Ztschr. Kinderheilk.*, 1955, **77**, 249–260. [Kinderklin., Univ. Würzburg.]

Samples of 3 to 5 ml. venous blood were placed in siliconed flasks with a few drops of Liquemin Roche and incubated at 37° C. Reticulocyte counts were made initially and after 2, 4, 6, 8, 10, 24 and 36 hr. in preparations stained with brilliant cresyl blue. Ten samples were of umbilical vein blood and 10 each from premature infants, infants 2 to 14 weeks old and adults.

The curves of reticulocyte counts during incubation were similar within all 4 groups. The initial values were highest in umbilical blood and declined with age. In all groups there were few or no reticulocytes to be found after 48 hr. The rate of fall of counts was steeper the higher the initial value, *i.e.*, the mean maturation time was less in infants than in adults. It is concluded that red cell formation in premature and newborn infants is at least enough to maintain the cell count in the first 3 months, and anaemia in such infants must be the result of increased breakdown.

D. Duncan.

1866

BRING, S. V., WARNICK, K. P. and WOODS, E. **Nutritional status of school children 15 and 16 years of age in three Idaho communities; blood biochemical tests.** *J. Nutrition*, 1955, **57**, 29–45. [Dept. Home Econ. Res., Univ. Idaho, Moscow.]

Hb, packed cell volume, sedimentation rate, and, in serum, vitamin A, carotene, riboflavin, ascorbic acid, cholesterol, alkaline phosphatase, Fe and Cu were estimated in fasting venous blood samples from 280 subjects. The results of a dental and dietary survey of the children were reported previously (Absts. 1257, 5505, Vol. 25).

Significant positive correlations were found between ascorbic acid in the diet and serum ascorbic acid and between vitamin A in the diet and serum carotene. For both boys and girls significant positive correlations were found between some blood constituents, namely, vitamin A and carotene, free and total riboflavin, free and total cholesterol, Hb and packed cell volume, carotene and ascorbic acid, vitamin A and both free and total cholesterol, Cu and sedimentation rate.

Some other constituents were significantly correlated in blood of boys only. Mean values for girls were significantly higher than for boys for sedimentation rate, ascorbic acid, free cholesterol and Cu. Boys had significantly higher mean values than girls for alkaline phosphatase, Hb and packed cell volume. The only age difference was in alkaline phosphatase, which was significantly higher at 15 than at 16 years.—F. C. Aitken.

1867

SCHULTZE, A. B. **Changes of certain characters of the blood of dairy calves during one year of life and their possible relation to rate of gain in body weight.** *Growth*, 1955, **19,** 141–149. [Dept. Dairy Husb., Univ. Nebraska.]

Red cell count, sulphydryl content, sugar, Hg, haematocrit and eosinophil count were estimated in the blood of 29 Holstein calves at intervals of 30 days or less during the first year of life. There were significant differences between calves of the same age in red cell count, sulphydryl content, Hb and haematocrit. Significant changes occurred with advancing age in all the values studied. That most closely related to rate of weight gain was the haematocrit. A significant correlation was found between sulphydryl content and haematocrit at 90 to 125 days and the rate of gain of the calf from 100 to 360 days of age. Most of the calves were born in winter or spring, and only 7 in summer. The influence of season and the time of birth on the changes is discussed.—T. D. Bell.

1868

HOLMAN, H. H. **The blood picture of the cow.** *Brit. Vet. J.*, 1955, **111,** 440–457. [Agric. Res. Counc., Field Stat., Compton, Berks.]

Blood samples of 81 Ayrshire cows over 3 years old were examined. From the results, and those of other workers, values of: Hb 11 g. per 100 ml., packed cell volume 35 per cent., M.C.H.C. 33 per cent., red cells 6 million per c. mm., sp. gr. 1·052, percentage distribution of leucocytes, neutrophils 30, lymphocytes 52, monocytes 7 and eosinophils 11, are suggested as good working averages for European cattle in temperate zones.

From the estimated correlations between red cell measurements it is shown that a better indication of anaemia is obtained from packed cell volume or sp. gr. than from red cell count.

Causes of variations in the blood picture are discussed, and values of cell measurements which could be considered pathological are suggested.

T. D. Bell.

1869

EFTIMOV, B., PETROV, K. and KONSTANTINOV, G. Vliyanie na lyatnoto lagerno-pasishchno otglezhdane vorhu doini kravi. [**Effect of summer pasture-camps on dairy cows.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia*, 1953–54, **4/5,** 261–269. Russian summary.

In cows after 3 months at summer pasture the pulse rate was 10 per cent. higher, respiration rate 32·5, red cell count 9·8, leucocyte count 24·9, Hb 4·04, Ca 11·5, and alkali reserve 7·8 per cent. higher than during the stall-feeding period. Cows at pasture from July to October gave 11·8 per cent. more milk than they gave indoors in the same period of the previous year.

A period at pasture is considered to be good for the health and productivity of cows under Bulgarian conditions. (From summary.)

D. Duncan.

1870

WELBOURN, H. F. **Haemoglobin estimations in African children attending child welfare clinics.** *East African Med. J.*, 1955, **32,** 401–404. [Child Welfare Clin., Mengo District, Uganda.]

In a survey in which the grey-wedge photometer was used directly or as a check on other methods, the mean Hb values for African children at all ages were similar to those for English children of the same ages. The mean values for children with malarial parasites in the blood were significantly lower at all ages. There was no significant fall in Hb during the second year, when kwashiorkor and other nutritional disturbances are common.

L. Wills.

1871

ROSSI-FANELLI, A., CAVALLINI, D., DE MARCO, C. and TRASATTI, F. Emoglobina fetale. 1. Analisi quantitative degli aminoacidi della emoglobina umana fetale cristallizzata ed alcuni accorgimenti tecnici. [**Foetal haemoglobin. 1. Quantitative estimation of the amino-acids in crystalline human foetal haemoglobin, and some hints on technique.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 328–330. [Ist. Chim. Biol., Univ. Rome.]

Sixteen amino-acids were estimated by paper chromatography in crystalline foetal human Hb after hydrolysis for 24, 48 or 72 hr. with 6*N* HCl. The values are tabulated; they did not vary much with progress of hydrolysis, except those for lysine and serine, which decreased. Comparative values are tabulated for the amino-acids in adult and foetal term Hb and in that of an 8-month foetus.

E. M. Hume.

1872

HUISMAN, T. H. J., JONXIS, J. H. P. and DOZY, A. **Is foetal haemoglobin present in the blood of normal human adults?** *Biochem. biophys. Acta*, 1955, **18,** 576–577. [Dept. Paediat., Univ. Groningen.]

Small amounts, 0·3 to 0·4 per cent., of alkali-resistant Hb were shown to be present in blood samples from the 3 authors. The amino-acid

composition of this fraction was similar to that of foetal Hb.—G. F. Garton.

1873

SMITH, S. G. (with LASATER, T. E.) **Normal hemoglobin formation in the dog.** *Amer. J. Physiol.*, 1955, **182,** 433–438. [Dept. Bacteriol., Sch. Med., Duke Univ., Durham, N.C.]

The blood picture was studied every month or two from weaning at 7 weeks until 65 weeks in 6 healthy mongrel dogs and from weaning until $10\frac{1}{2}$ years in one dog, all of which were given a diet of casein 40, sucrose 34, cottonseed oil 10, cod liver oil 2, salt mixture 4 and dried brewer's yeast 10 per cent., with added vitamins of the B group. Food intake was recorded daily and bodyweight twice weekly.

The normal Hb value of the mature dog is 18 g. or more per 100 ml. blood. In the 6 dogs the mean values from reaching maturity at 30 weeks until the end of the experiment were: red cell count $7{\cdot}39 \pm 0{\cdot}088$ million per c. mm., Hb $18{\cdot}5 \pm 0{\cdot}139$ g. per 100 ml. and haematocrit $55 \pm 1{\cdot}65$ per cent. The dog studied for $10\frac{1}{2}$ years maintained comparable values from maturity at 37 weeks except when it was ill.—G. F. Garton.

1874

CRUMP, E. P., SCHECK, J. F., MUKHERJI, B. K., HARRIS, R. and TURNER, W. D. **Oxygen therapy in the newborn premature infant. 1. Its relation to some aspects of protein metabolism.** *J. Pediat.*, 1955, **47,** 442–449. [Meharry Med. Coll., Nashville, Tenn.]

Infants breathing unfortified incubator air were compared with similar infants for whom the incubator air was fortified with oxygen, usually 24 to 34 per cent. but sometimes 38 to 42 per cent.

Infants exposed to extra oxygen lost more weight on the average than did the controls. During the first week of life extra oxygen did not affect plasma protein values, but at 7 to 14 days values were lower for control than treated infants. Blood N.P.N. was consistently higher in treated infants than in controls. A similar pattern was found for blood urea N. Both N.P.N. and blood urea N values rose during the 2 weeks of study. Blood uric acid fell sharply between the fifth and seventh days and the fall was greater in infants not receiving oxygen.—F. C. Aitken.

1875

CLOSE, J. Le taux des protéines sériques chez le nourrisson africain. [**Concentration of serum proteins in African infants.**] *Ann. Soc. belg. Méd. trop.*, 1955, **35,** 129–144. [Inst. Recherche Sci. Afrique Centrale, Centre Recherche Sci. Kivu, Lwiro, Belgian Congo.] Flemish summary.

Total protein and protein fractions were estimated by electrophoresis in the serum from 141 apparently healthy country infants up to 24 months old. The values were grouped by periods of 2 months. Mean total protein in g. per 100 ml. was at birth $5{\cdot}35 \pm 0{\cdot}092$; it decreased to $4{\cdot}94 \pm 0{\cdot}094$ in the first 2 months and then increased steadily to the 18th month, when it dropped slightly, to increase again to $6{\cdot}62 \pm 0{\cdot}261$ in the period from $22\frac{1}{2}$ to $24\frac{1}{2}$ months. Serum albumin, which was $3{\cdot}66 \pm 0{\cdot}104$ g. per 100 ml. at birth and $3{\cdot}75 \pm 0{\cdot}116$ at 24 months, also showed a slight fall immediately after birth and during the 18th to 22nd months. The α- and β-globulins rose immediately after birth and subsequently varied only slightly, but γ-globulin fell from $1{\cdot}11 \pm 0{\cdot}084$ g. per 100 ml. at birth to $0{\cdot}44 \pm 0{\cdot}054$ during the first 2 months, and then showed a steady rise to $1{\cdot}43 \pm 0{\cdot}139$ at the age of $16\frac{1}{2}$ to $17\frac{1}{2}$ months, after which it dropped to $1{\cdot}15 \pm 0{\cdot}116$ between $20\frac{1}{2}$ and $22\frac{1}{2}$ months and then rose again to $1{\cdot}64 \pm 0{\cdot}211$ in the next 2 months. With increasing age the dispersal about the mean increased. This is thought to be explained by the different foods given after weaning, infestation with parasites and infection.

In the American infant the albumin value rises steadily during the first 10 months, but in the African infant it does not rise appreciably above the birth value during the first 2 years. It is suggested that the failure to synthesise albumin results from protein deficiency caused by the African woman's insufficient secretion of milk, which is especially marked about the 5th month, at which time the rate of weight increase slackens and the albumin value ceases to rise. The initial albumin level found was the same as that of 4 newborn European infants in Katana. The α- and β-globulin values resembled those of the European infants. γ-Globulin at birth was lower than the mean for the 4 European infants; there was a similar fall after birth in both groups, but the rise in the value for Africans was greater than in the European infants. The findings are related to the critical period at weaning experienced by African infants. The changes in the albumin value can be related to protein deficiency in the diet, but the cause of the variations in globulin is less definite; deficient diet may play a part, but racial characteristics and liver insufficiency must be considered.—L. Wills.

1876

ORLANDINI T., O., SASS-KORTSAK, A. and EBBS, J. H. **Serum gamma globulin levels in normal infants.** *Pediatrics*, 1955, **16,** 575–584. [Dept. Paediat., Univ. Toronto.] Spanish and Interlingua summaries.

Proteins were measured in samples of blood serum from 28 mothers within 20 hr. before delivery, in the cord blood of their infants immediately after delivery and, for comparison, in samples from 13 adult women. Mean values in mg. per 100 ml. for the subjects in that order were : γ-globulin 0·82, 0·90 and 0·96, total globulin 3·19, 2·61 and 3·31, albumin 3·50, 3·63 and 4·44 and total protein 6·68, 6·24 and 7·75. The difference for γ-globulin between mothers and infants was significant only at the 5 per cent. level. Total globulin in infants was significantly lower than in mothers.

The changes with ageing were studied in 122 [112 in Table 2, p. 579] other children aged from 1 week to 24 months. In the first month there was a fall in γ-globulin which was most rapid in the first week. The level remained low until 3 months, mean for 7 infants 0·32 g., and thereafter rose steadily, mean for 14 children from 18 to 24 months 0·77 g. Data collected over the first week for 18 infants, of whom 13 were breast fed and 5 artificially fed, indicated no effect of γ-globulin in colostrum on the level in the infants' blood. Since total globulin in serum did not change during the first week of life, the tentative conclusion is that the amounts of α- and β-globulins may have risen. These findings are discussed with those of other workers on antibody production, and the hypothesis that practically no γ-globulin is formed in the first month of life seems warrantable.

D. Harvey.

1877

GEUBELLE, F. and NEVEN, M. Étude du taux de gamma-globulines chez le prématuré. 1. Taux pendant la première semaine de la vie. [**Concentration of gamma globulin in the premature infant. 1. Concentration to the first week of life.**] 2. Évolution du taux de la première à la cinquième semaine. [**2. Course of the concentration from the first to the fifth week.**] *Acta paediat. belg.*, 1955, **9,** 145–151. [Clin. Policlin. Maladies de l'Enfance, Univ. Liège.]

1. In 22 premature infants weighing from 1000 to 2500 g. at birth serum γ-globulin during the first week of life ranged from 0·20 to 1·25 g. per cent. ; in general γ-globulin varied directly with birthweight, but there was no relation between γ-globulin and degree of prematurity.

2. In most of the 12 infants examined again during the fifth week of life γ-globulin had fallen by from 40 to 65 per cent. of the initial value.

L. Wills.

1878

SMITHIES, O. **Zone electrophoresis in starch gels: group variations in the serum proteins of normal human adults.** *Biochem. J.*, 1955, **61,** 629–641. [Connaught Med. Res. Labs., Univ. Toronto.]

Protein was separated by zone electrophoresis in a starch gel made up in buffer and detected by staining. As little as 0·02 ml. serum could be used. Serum samples from over 40 normal adults were divided into 3 groups on the basis of the presence of several previously undescribed non-dialysable components. These were able to bind Hb and they migrated in the α_2-globulin position during filter paper electrophoresis.—A. Hepburn.

1879

BERRY, E. R. and CHANUTIN, A. **Detailed electrophoretic analyses of sera of healthy young men.** *J. Clin. Invest.*, 1955, **34,** 1513–1519. [Dept. Biochem., Sch. Med., Univ. Virginia, Charlottesville.]

1880

SATOSKAR, R. S. and LEWIS, R. A. **The effect of antibiotic dietary supplements upon the plasma proteins of Indian students.** *Indian J. Med. Res.*, 1955, **43,** 415–422. [Dept. Pharmacol., Seth G.S. Med. Coll., Parel, Bombay 12.]

Groups of students were given by mouth 50 mg. terramycin, 50 mg. tetracycline, 100 mg. erythromycin or a placebo for 2 months and blood albumin and globulin were estimated before, during and after treatment. Tetracycline and terramycin both produced a rise in albumin and a fall in globulin. Erythromycin had no effect except in one student showing a sprue-like syndrome. Improvement in his condition was noted as well as a rise in albumin and a fall in globulin. The results confirm the beneficial effect of antibiotics in human diets deficient in protein.—J. S. Thomson.

1881

CARRERAS PICÓ, J. Disproteinemias y neoplasias. [**Disturbances of serum protein and neoplasias.**] *Rev. clín. española*, 1955, **58,** 169–172. [Clín. Méd., Hosp. Civil, Vitoria.] English, German and French summaries.

Abnormal serum protein pictures are described in 4 patients, with bone carcinosis, cancer of the prostate with pelvic metastases, abdominal lymphogranuloma and thrombophlebitis with a suspected neoplasm.—D. Duncan.

1882

RICE, C. E. and DUHAMEL, L. **The effect of prolonged injection of ethionine on rabbits and guinea pigs fed a high cholesterol diet. 4. On serum proteins in rabbits.** *Canadian J. Comp. Med.*, 1955, **19,** 299–304. [Div. Animal Pathol., Animal Dis. Res. Inst., Canada Dept. Agric., Hull, Que.]

Two groups of 6 rabbits were injected 5 times weekly with 25, 50 or 100 mg. ethionine ; 2 similar groups were left untreated. One treated and one

untreated group were given a stock pellet diet, the other 2 groups the same diet supplemented with cholesterol in cottonseed oil. One rabbit from each group was bled after from 7 weeks to 6 months and killed immediately; the serum was analysed for total protein, globulin and albumin.

The total protein and globulin of the serum of rabbits given the high-cholesterol diet were higher than in rabbits on stock diet; the mean albumin : globulin ratios were 0·99 and 1·36, respectively. In the ethionine-treated group on the stock diet total serum protein fell below the level for the controls, but in the treated group on the high-cholesterol diet the level was maintained. In sera of both these groups an increase in globulin and a decrease in albumin occurred after 7 weeks or 3 months of treatment with ethionine, but after 4 to 6 months' treatment the values for both were normal.—G. F. Garton.

1883

FALASCHINI, A., BIONDO, G. and LEONTI, F. Sulle modificazioni della protidemia nei caprini in rapporto all'età ed al regime alimentare. 2. **[Changes in the blood proteins of goats in relation to age and diet. 2.]** *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 306–307. [Ist. Zootec., Univ. Messina.]

1884

VANSTONE, W. E., MAW, W. A. and COMMON, R. H. **Levels and partition of the fowl's serum proteins in relation to age and egg production.** *Canad. J. Biochem. Physiol.*, 1955, **33,** 891–903. [Fac. Agric., McGill Univ., Macdonald Coll., Que.]

In poultry, total serum protein, estimated by the biuret reaction (see Abst. 4055, Vol. 24) and fractions, by zone electrophoresis on paper (methods described), were studied from the 14th day of incubation to the 13th week of laying. The eggs were from New Hampshire hens mated with a cock of the Barred Plymouth Rock breed. The birds were fed on a commercial chick starter and then on broiler pellets, finally supplemented with grain and oyster shell; from 4 weeks they were caged individually. The results are given in tables and diagrams.

Total serum protein amounted to 0·9 g. per 100 ml. in the 14-day embryo and rose to 2·1 g. at hatching and then more gradually. For the first 5 weeks there was no sex difference. Most of the subsequent analyses were for pullet chicks, in which there was a slow rise to about 4 g. per 100 ml. and then a more rapid rise to 5·4 g. just before the first egg was laid, followed by a rapid fall and later a return to the pre-laying value of 4 g. per 100 ml. The peak is ascribed to oestrogen activity.

Albumin and α_2- and β-globulin were present in embryo blood. At hatching α_1- and γ-globulin had appeared and by 7 days α_3-globulin. A week or two before laying began, 2 other fractions appeared, as reported earlier (Abst. 4055, Vol. 24). These largely accounted for the rise in total serum protein. Similar fractions were previously found in egg yolk (Abst. 3199, Vol. 24). They are thought to be phosphoproteins.—W. M. Deans.

1885

SOHAR, E., BOSSAK, E. T. and ADLERSBERG, D. **Species differences in serum glycoproteins of man, dog and rabbit, by paper electrophoresis.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 305–308. [Dept. Med., Mount Sinai Hosp., New York.]

1886

MACDONALD, M. A. and WHITE, R. R. **Levels of non-protein and amino-acid nitrogen in blood of pasture-grazing beef calves.** *N.Z. J. Sci. Technol.* [*A*], 1955, **37,** 259–266. [Ruakura Animal Res. Stat., Dept. Agric., Hamilton.]

Blood samples were taken weekly from 3 heifer and 3 bull, and monthly from 2 heifer and 7 bull Aberdeen-Angus weaned calves during a grazing season of 12 weeks. N.P.N. and amino-acid N were estimated. The average N.P.N. content was 41·0 mg. per 100 ml., range 30·2 to 50·1, and that of amino-acid N 9·33 mg. per 100 ml., range 7·7 to 11·2. There was no pattern in the wide variations found in individual calves, and there was also wide variation between calves. In the literature, which is briefly reviewed, growth hormones have been reported to show a homeostatic effect on blood constituents, but this was not apparent in the present trial. Reasons for this are discussed.—T. D. Bell.

1887

KIDWELL, J. F., WADE, M. A. and HUNTER, J. E. **The relation of blood glutathione level to growth and body size in beef cattle.** *Growth*, 1955, **19,** 177–185. [Dept. Animal Husb., Univ. Nevada, Reno.]

Blood glutathione, Hb, total cell count, heart girth and bodyweight of 47 Hereford bullocks aged from 15 to 21 months were estimated at the beginning and end of an 84-day feeding period. Efficiency of feed conversion was calculated.

No relation was found between blood glutathione and liveweight or rate of gain, but there was a small correlation between glutathione and feed efficiency and heart girth. Glutathione was related to Hb and cell count. The level of glutathione was significantly higher at the end of the feeding period. The correlation between these values was smaller than that found by other workers, and this was thought to emphasise the importance of the plane of nutrition. The data

indicate that blood glutathione would not be of real value in selection of beef cattle for rate of gain and efficiency. On the other hand, the small correlations found suggest that there may be some metabolite which would be suitable.—T. D. Bell.

1888

HAVEL, R. J., EDER, H. A. and BRAGDON, J. H. **The distribution of chemical composition of ultracentrifugally separated lipoproteins in human serum.** *J. Clin. Invest.*, 1955, **34,** 1345–1353. [Lab. Metabol., Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

Lipoproteins were separated from serum by repeated ultracentrifuging after the solvent density had been increased progressively by the addition of a solution of NaCl and KBr. The main fractions separated at densities below 1·019, 1·019 to 1·063 and above 1·063 were analysed for total cholesterol, lipoid P and protein. In young adults about two-thirds of the cholesterol and half the lipoid P were in the middle fraction. In disorders with high serum lipoproteins, one or both of the 2 lower density fractions were affected. The fraction of highest density was sometimes affected. Serum from rabbit, rat, pig, hamster, dog and monkey had wider variations in distribution and composition of lipoproteins than that of man. More lipid was associated with the fraction of highest density than in man.—A. Hepburn.

1889

MANN, G. V., NICOL, B. M. and STARE, F. J. **The beta-lipoprotein and cholesterol concentrations in sera of Nigerians.** *Brit. Med. J.*, 1955, ii. 1008–1010. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Blood samples from 46 African men living in 3 different areas of Nigeria were analysed in Boston, U.S. Though their dietary habits differed there was little difference in the content of total cholesterol and β-lipoproteins in their sera. For all subjects the mean values were for total cholesterol $122{\cdot}5 \pm 40{\cdot}6$ and for lipoproteins S_f 12–20, $24{\cdot}1 \pm 12{\cdot}5$ and S_f 20–100, $40{\cdot}6 \pm 28{\cdot}5$ mg. per 100 ml. For 30 of these men a group of American (U.S.) men comparable for age and weight were chosen. The difference in total cholesterol content of their blood, 83 mg. per 100 ml. greater in the Americans, was highly significant; that in S_f 12–20 β-lipoproteins, 9 mg. per 100 ml. greater in the Americans, was also significant, but the difference for S_f 20–100 lipoproteins was not so. Diet studies (see Absts. 5374, Vol. 19 and 2795, Vol. 22 and Title 3397, Vol. 23) indicated energy intake low in relation to activity, and low intake of fat. Clinical work in Nigeria and post-mortem studies in the Gold Coast, where conditions are similar (Edington, *Trans. Roy. Soc. Trop. Med.*, 1954, **48,** 419), showed that atherosclerosis and its complications are rare.

The findings are discussed in opposition to the view of Keys (see especially Abst. 5096, Vol. 24) that such differences result from differences in intake of fat. The low level of lipids in these Africans is thought to support the hypothesis, already advanced from work on Guatemalans (Mann *et al.*, in the press), that a high rate of muscular activity is the controlling agent.

D. Harvey.

1890

WILGRAM, G. F., LEWIS, L. A. and BLUMENSTEIN, J. **Lipoproteins in choline deficiency.** *Circulation Res.*, 1955, **3,** 549–552. [Banting and Best Dept. Med. Res., Univ. Toronto.]

Fifty-five male rats were given a high-fat, choline-deficient diet; 35 were used as controls, with a choline supplement; 10 males were given a synthetic low-fat, high-protein, choline-supplemented diet and 10 females were used as choline-deficient controls to be compared with the choline-deficient males. After 4 weeks the rats were killed and the serum lipoproteins were studied by ultracentrifugal analysis.

All the choline-deficient animals showed small amounts of the low-density lipoprotein fractions; the α-lipoproteins of the - S 1–10 and - S 10–15 classes were low in choline-deficient males. The significance of the findings in connection with the production of cardiovascular disease by choline deficiency is discussed.—G. F. Garton.

1891

MOORE, N. S., FRYER, J. H., YOUNG, C. M. and MAYNARD, L. A. **Blood lipid levels as influenced by weight reduction in men.** *Amer. J. Clin. Nutrit.*, 1955, **3,** 397–402. [Sch. Nutrit., Cornell Univ., Ithaca, N.Y.]

A study of total lipids, phospholipins and cholesterol in the serum of 24 men undergoing weight reduction revealed wide fluctuations. Some regression coefficients of lipids on weight were significant, but the changes in lipid levels did not appear to be of physiological importance.

F. C. Aitken.

1892

SAARINEN, P. **Diet and plasma cholesterol in dairy cows.** *Maataloust. Aikakausk.*, 1955, **27,** 117–141. [Dept. Animal Husb., Univ. Helsinki.] Finnish summary.

Plasma cholesterol was estimated in the blood of 141 Ayrshire cows in 12 trials. Statistical analysis of the results showed no correlation between cholesterol value and age. In the first 9 trials the cows were in normal condition; in the last 3 they were fat, and cholesterol values were higher. A positive effect on cholesterol values of the proportion of fat in the ration, the energy

requirement of the cow and the digestible crude fibre in the ration was found. Digestible crude protein showed a positive correlation with cholesterol value in the normal cows, but in the fat cows and in sterile cows the correlation was negative. Temporary changes in the intake of energy did not affect plasma cholesterol.—T. D. Bell.

1893

KIBRICK, A. C. and SKUPP, S. J. **Iodine and thiocyanogen numbers of the fatty acids of blood plasma.** *Clin. Chem.*, 1955, **1,** 325–328. [Clin. Labs., Veterans Admin. Hosp., New York.]

1894

WYSOCKI, A. P., PORTMAN, O. W. and MANN, G. V. **Bile acids in blood: methods and their application to studies of experimental atherosclerosis in monkeys.** *Arch. Biochem. Biophys.*, 1955, **59,** 213–223. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

The bile acids were segregated from serum and estimated spectrophotometrically under conditions which are described; the acids separately estimated were cholic, deoxycholic and chenodeoxycholic, and recoveries of 95 to 98 per cent. were obtained.

In 6 human subjects with high serum cholesterol, mean 388 mg. per cent., and 7 normal subjects with mean serum cholesterol 234 mg. per cent., the chenodeoxycholic acid values were 13·0 and 6·5 mg. per cent., respectively, but there was no significant difference in cholic or deoxycholic acid.

High levels of serum cholesterol and α-lipoprotein were produced in monkeys given for a year diets containing 20 per cent. soya bean α-protein with or without 1 per cent. cholic acid, or 25 per cent. casein with 1 per cent. cholic acid. Such monkeys had normal cholic and deoxycholic acid levels in the serum, but high chenodeoxycholic acid. All the monkeys with high serum cholesterol, whether it was produced by diets with α-protein or with casein and cholic acid, had aortic atherosclerosis.—D. Duncan.

1895

HALLMAN, N. and SALMI, I. **Citric acid in maternal and cord blood.** *Ann. Paediat. Fenn.*, 1955, **1,** 333–337. [Child. Clin., Univ. Helsinki.]

Citric acid, total protein, Ca and inorganic P were estimated in venous blood of women either immediately before or from 10 to 55 min. after delivery and in samples from the umbilical vein and artery. The data for 12 mothers gave mean values of 6·1, 5·2 and 4·6 mg. citric acid per 100 ml. plasma in that order, which were above the range 1·7 to 4·0 mg. taken to be normal. There was no correlation between the amount of citric acid and of the other constituents studied. Signs of tetany were not seen.—D. Harvey.

1896

BALLABRIGA, A. Sobre los electrolitos en el recien nacido. [**Electrolytes in the newborn infant.**] *Rev. española Pediat.*, 1955, **11,** 309–315. [Centro Estud. Crecimiento Nutric. Infant., Barcelona.] French, English and German summaries.

The subjects were 20 normal term infants from normal births, except 1 born by caesarean section, all in the University Obstetrical Clinic of Barcelona. Blood samples were taken in the first 24 hr. and 4 times more in the first 9 days of life. Samples were taken also from the mothers.

The mean serum K was 5·1 m. equiv. per litre in the mothers and 5·4 in the infants; plasma Na values, also in m. equiv. per litre, were 123·4 to 148·1, mean 136 for mothers, 128·4 to 153, mean 140·4 for infants in the first 24 hr., and 128·2 to 158, mean 138·1 for infants up to 9 days old. Equivalent values for plasma Cl were 95·1 to 110, 102·5; 97·6 to 113, 103·5; and 99·2 to 122, 107·7. Alkali reserve had a mean value of 23·02 m. equiv. per litre in the mothers and 20·3 in the newborn infants; the value for any infant was lower than that of the mother. Adult values were reached in 7 to 9 days. Inorganic P values were 1·8 to 3·4, mean 2·3 m. equiv. per litre in the mothers, 2·8 to 3, mean 3·2 [figures as printed] in infants in the first 12 hr. and 2·6 to 3·7, mean 3·3, in infants 7 to 9 days old. Plasma protein values of the mothers, who although apparently healthy were of poor social class and may have had a low protein intake, had a mean of 14·6 m. equiv. per litre; those of the infants were 13·3 at birth and 13·6 after 7 to 9 days.

The values are compared with others in the literature.—D. Duncan.

1897

VAN ZYL, A. and KERRICH, J. E. **Protein-bound iodine in the serum of the baboon (*Papio ursinus*).** *S. African J. Med. Sci.*, 1955, **20,** 9–22. [Dept. Physiol., Univ. Witwatersrand.]

An experimental colony of captive baboons housed in open-air cages and fed on a standard ration was kept under observation during the years 1952–54. The protein-bound iodine (PBI) content of the serum of 77 of these animals, ranging in age from 2 weeks to 15 years, was estimated in a total of 516 analyses.

The average serum PBI of the adult baboon was 3·99 ± 0·27 μg. per 100 ml. The average PBI of 6 human subjects in the climatic conditions of Johannesburg, 6000 ft. above sea level, was 5·70 ± 0·67. The PBI of monkeys was 3·59 ± 0·81, oxen 3·61 ± 0·44, rats 2·36 ± 0·91, fowls 1·03 ± 0·26 and *Xenopus laevis* 5·17 ± 0·94 μg. per 100 ml. The average serum PBI of the baboons fell from about 6·5 μg. per 100 ml. in infancy to

about 4·0 at 5 years and over. This gradual decrease with age conformed with that in man.

B. W. Simpson.

1898

AGARWAL, S. C. and MISRA, S. S. **Observations on the level of unsaturated iron-binding capacity, total iron-binding capacity and saturation percentage in pathologic subjects.** *Indian J. Med. Res.*, 1955, **43**, 403–409. [Dept. Med., K.G. Med. Coll., Lucknow.]

Serum Fe and unsaturated Fe-binding capacity were estimated and the degree of saturation was calculated by expressing the first as a percentage of the sum of the two. The 87 subjects were mainly patients admitted to hospital; 27 had Fe deficiency anaemia, 28 infections, 1 acute hepatitis and 13 cirrhosis of the liver, 5 nephritis, 5 leucaemia and 8 malignant disease. The individual values are tabulated.

In anaemia serum Fe and saturation were low. In infections other than acute hepatitis and kala azar each of the values was low; in the 2 exceptional conditions serum Fe was high and unsaturated Fe-binding capacity low. Values were low for Fe-binding capacity in cirrhosis and for serum Fe in malignant disease; they were variable in leucaemia, serum Fe usually being high.

D. Harvey.

1899

KONSTANTINOV, G. and RIZVANOV, K. Izsledvaniya vorhu katalazata na krovta pri mlechni kravi. **[Catalase in the blood of dairy cows.]** *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia*, 1953–54, **4/5**, 197–204. Russian summary.

1900

HIRSCHOWITZ, B. I. **Pepsinogen in the blood.** *J. Lab. Clin. Med.*, 1955, **46**, 568–579. [Dept. Int. Med., Med. Sch., Univ. Michigan, Ann Arbor.]

See also Absts. 1466, 1621, 1650, 1917, 1962, 1996, 1998, 1999, 2057, 2070, 2090, 2095, 2260, 2364, 2420, 2424, 2428, 2435.

LYMPH, CEREBROSPINAL FLUID, ETC.

1901

ODIN, L. **Sialic acid in human cervical mucus, in hog seminal gel, and in ovomucin.** *Acta chem. scand.*, 1955, **9**, 1235–1237. [Inst. Med. Chem., Univ. Upsala.]

1902

SZUMOWSKI, P. and STOEBER, M. Sur les protéines du plasma séminal du cheval. **[The proteins of seminal plasma of the horse.]** *Ann. Zootech.*, 1955, **4**, 165–171. [Lab. Recherches, Chaire Zootech., École Nat. Vét., Alfort.]

See also Absts. 1387, 1410, 2000, 2057.

TISSUES

1903

GOPALAN, C., SRIKANTIA, S. G. and VENKATACHALAM, P. S. **Body composition and basal metabolism of normal subjects.** *J. Appl. Physiol.*, 1955, **8**, 142–144. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

The body composition of 9 normal Indian subjects was ascertained by the method of McCance and Widdowson (Abst. 1425, Vol. 21), and their body fat was estimated also from sp. gr. measurements. Basal metabolic rates were estimated on the same day as body composition, with a Benedict Roth apparatus.

The values for total body water, water in fat-free mass, thiocyanate space and bone minerals agreed well with those reported in the literature. Body fat estimations by the 2 methods agreed closely.

The possibility of using cell solids as a reference for B.M.R. measurements is suggested.

D. Duncan.

1904

INGLIS, J. S. S., JENNINGS, F. W., LAUDER, I. M., MULLIGAN, W. and WEIPERS, M. **The volume distribution of intravenously injected ^{24}Na in bovines.** *Vet. Rec.*, 1955, **67**, 765–768. [Vet. Sch., Univ. Glasgow.]

A catheter was inserted into the jugular vein to facilitate serial blood sampling in cattle. Each animal received an injection of ^{24}Na containing from 30 to 300 μC. of activity, and blood samples were taken at 30-min. intervals from $2\frac{1}{2}$ to 6 hr. later. "Radio-sodium space" was calculated as an indication of extracellular fluid volume.

The ^{24}Na space ranged from 10·8 litres in a young calf to 152·0 litres in an adult cow. The ratio of extracellular space to bodyweight was highest in calves and decreased with growth. Repeat estimations on 3 steers at grass, 4 on each animal at weekly intervals, showed fair agreement.

A syringe holder to protect the operator from the relatively large doses of radio-active material needed for large animals is described.

D. Duncan.

1905

WIDDOWSON, E. M. and MCCANCE, R. A. **Physiological undernutrition in the newborn guinea-pig.** *Brit. J. Nutrition*, 1955, **9**, 316–321. [Med. Res. Counc. Dept. Exp. Med., Univ. Cambridge.]

Ten litters of guineapigs, 23 animals, were killed at birth and 7 litters, 16 animals, were killed when they were 1 week old. The mothers had been reared on a stock diet of sugar-beet pulp, bran, oats and greens and the 16 young not killed at birth were allowed free access to the same diet.

The livers were analysed apart from the remainder of the body ; serum samples were taken for estimation of chloride.

The average chemical composition of the bodies of the week-old guineapigs showed an increase in the percentage of water, a decrease in the percentage of fat and a decrease in the N : K ratio as compared with the composition of the bodies of guineapigs killed at birth. In the livers of the week-old animals there was a large loss of weight, a decrease in the size of the individual liver cells and an increase in their number, an increase in protein content, a decrease in the percentages of glycogen and fat, an increase, but not in proportion to the increase in protein, in the percentage of K, a decrease in the percentage of Na and an increase in the N : K ratio.—G. F. Garton.

1906

BABINEAU, L. M. and PAGÉ, E. **On body fat and body water in rats.** *Canad. J. Biochem. Physiol.*, 1955, **33**, 970–979. [Dept. Physiol. Nutrit., Laval Univ., Quebec.]

Four groups of 30 adult male rats had initially the same average bodyweight. One group was killed at the beginning of the experiment, the others after 20 to 21 days at room temperature or 30 to 31 or 56 to 57 days at 11° C. The diet contained, per cent., casein 20, Crisco 8, wheat germ oil 2, salts 5, cellulose 2 and sucrose 63, with vitamins. The carcases of all the rats were analysed.

The rats killed after a month in the cold had gained, compared with those killed initially, a mean of 9·4 g. non-fat dry matter and lost an identical amount of fat. The net gain of 16 g. in carcase weight was due to water. The controls killed after 3 weeks at room temperature had gained an identical amount of non-fat dry matter, but had also gained fat and water and their carcases were 20 g. heavier than those of rats exposed to cold. Rats exposed to cold for a second month gained twice as much bodyweight as in the first month, but only one-seventh of the amount of non-fat dry matter. Liveweight is thus an unreliable index of active growth.

Water in all groups comprised from 71·05 to 71·79 per cent. of fat-free bodyweight and none of the regression coefficients differed significantly from the rest. The influence of fat was negligible. The total body water could be used to predict non-fat dry matter with a high degree of accuracy. In samples of adipose tissue the ratio of water to fat-free dry matter was similar to that in the whole body.—D. Duncan.

1907

BRAUDE, R., COATES, M. E., DAVIES, M. K., HARRISON, G. F. and MITCHELL, K. G. **The effect of aureomycin on the gut of the pig.** *Brit. J. Nutrition*, 1955, **9**, 363–368. [Nat. Inst. Res. Dairying, Univ. Reading.]

Three experiments are reported, with 52 pigs fed on a practical ration from weaning to pork or bacon weight, half of which received Aurofac 2A at the rate of 20 g. per ton. At slaughter measurement was made of gut length and weight ; in one experiment liver, kidney and spleen were weighed and the gut was analysed for dry matter, crude fat and total nitrogen. Organ measurements were adjusted to a constant bodyweight.

Gut weight tended to be reduced in the group receiving aureomycin, but gut length was not affected, which indicated a thinning of the gut in the treated groups. There was no effect on weight of liver, kidney or spleen, and no chemical or histological change in the intestine.

J. S. Thomson.

1908

WOLF, R. C. and LEATHEM, J. H. **Hormonal and nutritional influences on the biochemical composition of the rat testis.** *Endocrinology*, 1955, **57**, 286–290. [Bur. Biol. Res., Rutgers Univ., New Brunswick, N.J.]

Immature male rats weighing 60 to 65 g. had their adrenals removed and were maintained with cortisone. They and unoperated rats received one of the following diets : Purina fox chow ; a 20 per cent. protein diet containing casein, groundnut flour or wheat gluten ; a 5 per cent. casein diet made isocaloric with the others by extra carbohydrate. After 20 days the rats were killed and their testes were examined. The testes were heaviest after fox chow or 20 per cent. casein diets. The dry testes contained initially 72·7 per cent. protein, and this was maintained on 20 per cent. casein diet, but fell when the diet contained 5 per cent. casein or 20 per cent. wheat gluten or groundnut protein, and was less in adrenalectomised than in normal rats. The lipid content was not significantly affected by diet or adrenal removal, nor was glycogen, except that it was low on the low-casein diet.—D. Duncan.

1909

SHETLAR, M. R. and MASTERS, Y. F. **Effect of age on polysaccharide composition of cartilage.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90**, 31–33. [Res. Lab., Veterans Admin. Hosp., Oklahoma City.]

Costal cartilage was obtained from patients who had died from different disorders, at ages from the foetus to 88 years.

The uronic acid content fell progressively from mean values of 7·8 per cent. of the dry matter in 5 foetuses to 1·3 in 4 subjects from 71 to 88 years old, giving calculated chondroitin sulphate contents of from 19·1 to 3·2 per cent. Hexosamine also declined with age, but much less strikingly, from

8·2 to 5·4 per cent. If the excess of hexosamine over that calculated to be in the chondroitin sulphate is assumed to be contained in neutral polysaccharides, the latter increased with age until maturity and were then constant.—D. Duncan.

1910

IVANOV, I. I. and BLOKHINA, V. D. Fraktzionnyi sostav belkov gladkoi muskulatury pozvonochnykh zhivotnykh. [**Fractional composition of the proteins of vertebrate smooth muscle.**] *Biokhimiya*, 1955, **20**, 292. [Moscow.]

Electrophoretic fractionation of the proteins of smooth (stomach) and striated muscle of pigeons, rabbits and dogs showed that actomyosin was not the substrate involved in maintaining smooth muscle tone.—D. W. Taylor.

1911

RAEBER, L., SCHAPIRA, G. and DREYFUS, J. C. Sur une nouvelle protéine musculaire, la "métamyosine". [**A new muscle protein, "metamyosin".**] *C.R. Acad. Sci.*, **241**, 1000–1003.

A new protein has been extracted from rabbit and lamb foetal muscle which has extraction and solubility properties similar to those of myosin, but differs from it in electrophoretic mobility. It has been given the name metamyosin.

J. S. Thomson.

1912

ROTHSCHILD, M. A., BAUMAN, A., YALOW, R. S. and BERSON, S. A. **Tissue distribution of I^{131} labeled human serum albumin following intravenous administration.** *J. Clin. Invest.*, 1955, **34**, 1354–1358. [Radioisotope Serv., Veterans Admin. Hosp., Bronx, N.Y.]

Two patients with severe heart disease were given intravenous injections of 112 and 107 μC. of human serum albumin labelled with ^{131}I. Ten drops of Lugol's solution daily inhibited the uptake of free I by the thyroid. Serial blood samples were taken and urine was collected. Plasma concentrations of labelled albumin were estimated up to the time of death, and at post-mortem examination tissues were obtained for estimations of radioactivity.

Plasma along with the extravascular spaces of skin, muscle and the large thoracic and abdominal viscera accounted for 75 to 80 per cent. of the total exchangeable albumin in the body. There was a high albumin concentration in whole skin. The extravascular space of the liver contained less than 1 per cent. of the total exchangeable albumin. Complete equilibration of albumin in viscera, skin and muscle with albumin in plasma required 4 to 5 days.—B. W. Simpson.

1913

WINNICK, T., WINNICK, R. E., ACHER, R. and FROMAGEOT, C. **Amino acids and peptides of posterior pituitary and hypothalamus tissues.** *Biochim. biophys. Acta*, 1955, **18**, 488–494. [Lab. Chim. Biol., Fac. Sci., Paris.] French and German summaries.

Bovine and pig tissues were used; the methods of preparation of the extracts are described.

In bovine posterior pituitary tissue the concentration of peptides was about 4 times that commonly attributed to known peptide hormones; the value for pig was almost twice that for bovine posterior pituitary tissue. Identification of the amino-acids in a peptide fraction adsorbed on charcoal suggested the existence of substances other than the hormones vasopressin, intermedin and oxytocin. Bovine anterior pituitary differed from posterior pituitary tissue in having no significant peptide pool. Like brain tissue, it was rich in glutamine and glutamic acid.—D. Harvey.

1914

PILGERAM, L. O. and GREENBERG, D. M. **Chromatographic identification of bound glutamic acid in the phosphatide fraction from liver.** *J. Biol. Chem.*, 1955, **216**, 465–469. [Dept. Physiol. Chem., Univ. California Sch. Med., Berkeley.]

1915

BOUCEK, R. J., NOBLE, N. L. and KAO, K. Y. T. **The conjugated lipids of connective tissue of the rat and rabbit.** *Circulation Res.*, 1955, **3**, 519–524. [Res. Lab., Miami Heart Inst., Fla.]

1916

HAWKE, J. C. **Volatile fatty acids in phospholipids.** *Nature*, 1955, **176**, 882. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

Lipids were extracted with ethanol and ether from bovine muscle which had been freed of visible fat. The lipids were separated into glycerides and crude phospholipins by acetone precipitation; the phospholipins were then purified chromatographically on silica gel. Acid hydrolysis of the phospholipins, followed by steam distillation, yielded fatty acids which were subjected to gas-liquid chromatography.

The following acids, representing a total of 0·17 per cent. by weight of the total phospholipin fatty acids, were identified: acetic, octanoic, propionic, hexanoic, butyric, *iso*valeric and valeric, in decreasing amounts on a molar basis.—G. A. Garton.

1917

VAN DER GRIFT, J. Het kopergehalte van lever en bloedserum bij het Fries-Hollandse rund.

[The copper content of liver and blood serum of Friesian cattle.] *Versl. Landbouwk. Onderzoek.*, 1955, No. 61.10, pp. 61. [Rijkslandbouwproefstat., Hoorn.] English summary.

Serum Cu was estimated in samples from 346 cattle on about 90 farms in the late summer and autumn of 1951 and 1952. The range of values was wide : 12 per cent. were below 20 μg. per litre and 17·5 per cent. were above 81 μg. While values below 40 μg. per litre indicated Cu deficiency, many values between 60 and 80 mg. could not be improved by giving Cu, and serum Cu was not a sensitive indicator of Cu nutrition. Accordingly liver biopsy was used to obtain liver samples for Cu estimation. Two methods are described. Cu values obtained from biopsy samples agreed well with those from the whole liver after slaughter.

Monthly samples were taken from 7 calves from birth to about 19 months of age, and from 3 others starting at 3 months old. During the milk-feeding period the values, high at birth, fell so that the mean declined from 339 mg. per kg. dry liver at 1 day of age to 126 at 3 months and 150 at 5 months. During the first winter on stall feeding the values were then fairly constant and the mean at 11 months was 164 mg. per kg., but when the yearling animals went to pasture the values fell steeply, reaching 24 mg. per kg. when they were 17 months old and 8 mg. at 19 months, when 4 of the 7 were pregnant. During the first 5 months serum Cu rose from a mean of 45 μg. per 100 ml. at birth to 69, so there was no connection between serum Cu and liver stores. In 3 cows liver Cu values after parturition were 3·25, 18 and 210 mg. per kg. dry matter, and those of their calves 239, 316 and 447. The liver Cu stores of the calf thus depend on those of the mother. The liver Cu of pregnant cows fell sharply, especially in the last 2 months before calving.

Blood and liver Cu values were compared in 42 adult cows on 9 farms in 1953 and 1954. When liver Cu was below 25 mg. per kg. serum Cu was low, but when liver Cu exceeded 25 mg. per kg. serum Cu fluctuated about a mean of 85·3 $\pm$ 10·5 μg. per 100 ml., with extremes of 66 μg. with a liver Cu of 56 mg. per kg. and 103 μg. with a liver Cu of 570 mg. The probability that serum Cu values below 60 μg. are related to low liver Cu reserves is 0·05.

It is suggested that 75 per cent. of adult Friesian cattle in Holland have less than optimum Cu reserves.—D. Duncan.

1918

GIACALONE, O. Ormoni e iponutrizione. **[Hormones and undernutrition.]** *Arch. Fisiol.*, 1955, **54**, 404–422. [Ist. Fisiol., Univ. Palermo.]

Adult male rats were maintained on a diet of, per cent., wheat starch 75, casein 10, butter 10 and Osborne and Mendel salt mixture 5, with vitamins. The amount was fixed and was such as to cause progressive loss of weight till death. Groups of 5 were given in addition thyroxine, adrenaline, insulin, thymus extract, extract of total adrenal cortex, extract of total anterior pituitary gland, testicular extract, ovarian extract, or no addition. Rate of loss of weight and time of survival did not differ greatly in the treated rats from those given no treatment. Decline was accelerated somewhat by thyroxine, adrenaline, thymus and testicular extract, but the other hormones had no effect.—E. M. Hume.

1919

DESMARAIS, A. Relations thyroïde-surrénales dans l'adaptation au froid. **[Thyroid-adrenal relations in adaptation to cold.]** *Canad. J. Biochem. Physiol.*, 1955, **33**, 1018–1032. [Dépt. Physiol. Exp., Laval Univ., Quebec.]

See also Absts. 1564, 1567, 1682, 1936, 1972, 2055, 2063, 2270.

DUCTLESS GLANDS AND HORMONES

1920

ASCHKENASY, A. Influence des protéines alimentaires sur la survie ainsi que sur la lymphopoièse et sur l'éosinopoièse des rats surrénalectomisés. **[Influence of dietary protein on survival and on lymphopoiesis and eosinopoiesis in adrenalectomised rats.]** *Rev. belg. Pathol. Méd. exp.*, 1955, **24**, 365–376.

1921

ASCHKENASY, A. Effets de la surrénalectomie sur les lymphocytes et sur les éosinophiles sanguins chez des rats carencés en protéines. **[Effects of adrenalectomy on blood lymphocytes and eosinophils of rats on a protein-deficient diet.]** *C.R. Soc. Biol.*, 1955, **149**, 1173–1176. [Hôp. de la Pitié.]

1922

AGRELL, I. G., LINDELL, S. E. and WESTLING, H. **The influence of the adrenal cortex on the citric acid concentration of the guinea pig's blood serum.** *Acta physiol. scand.*, 1955, **34**, 135–140. [Thunberg Lab. Inst. Physiol., Univ. Lund.]

1923

LINK, R. P. and NALBANDOV, A. V. **Effect of desoxycorticosterone acetate on young chicks.** *Amer. J. Vet. Res.*, 1955, **16**, 433–436. [Dept. Vet. Physiol., Univ. Illinois, Urbana.]

See also Absts. 1624, 1741, 1748, 1801, 1802, 1806, 1810, 1812, 1814.

1924

NÄGELE, E. Der primäre und der sekundäre Hyperparathyreoidismus. Über Beziehungen zwischen Epithelkörperchen, Nierenerkrankungen und Osteopathien. [**Primary and secondary hyperparathyroidism. Relations between the parathyroids, renal disorders and bone disorders.**] *Deutsch. med. Wochenschr.*, 1955, **80**, 1400–1405. [Med. Klin., Univ. Freiburg i. Br.]

Primary hyperparathyroidism is characterised by excessive production of parathyroid hormone, by changes in mineral metabolism and by renal calcinosis or calculi as a result of increased Ca excretion in the urine, and often by generalised skeletal demineralisation. It is usually caused by parathyroid adenoma, rarely by simple hyperplasia. There is increased excretion of P in urine and low blood P, and high serum Ca with its effects on the muscles and heart. Serum alkaline and acid phosphatases are increased. The condition affects most commonly women between 30 and 55 years old, with pain resembling rheumatism, skeletal deformation, spontaneous fractures or renal colic. It is curable by removal of the adenomatous gland. It is still uncertain whether classical von Recklinghausen's disease with low blood P and high Ca is primarily hyperparathyroidism or whether the increased parathyroid function is secondary to disturbed mineral metabolism.

Secondary hyperparathyroidism is recognisable because there is a basal disease, usually a severe chronic kidney disorder such as chronic interstitial nephritis, of long standing and with renal insufficiency. Less commonly the cause is rickets, osteomalacia or bone carcinoma, biliary fistula, general Ca deficiency due to increased requirement or insufficient intake, or multiple myeloma. In the secondary condition not only one or two, but all the parathyroids are hyperplastic. There is reduced excretion of P, high blood P, negative Ca balance and low serum Ca. There may be tubular renal calcinosis, which is, therefore, not a distinguishing characteristic of either form. Besides uniform skeletal decalcification there may be deposits of Ca in the lungs and other soft tissues. The condition is most common during the growing years; affected children are slow in growth and sexual development. They often have "late rickets". Removal of the parathyroids is seldom beneficial. A fatal case in a 16-year-old girl is described.—D. Duncan.

1925

PICARD, J. Action de la parathormone dans le métabolisme phosphocalcique. [**Role of parathormone in the metabolism of calcium and phosphorus.**] *Presse méd.*, 1955, **63**, 1320–1324. [Lab. Étude Os et Croissance, Fac. Méd., Paris.]

In a review with 86 references it is concluded that the parathyroid hormone directly influences the organic composition of bone and thus regulates calcium and phosphorus metabolism.—D. Duncan.

1926

STUART, A. E. **The functional activity of thyroid nodules in an area of endemic goitre.** *Austral. J. Exp. Biol. Med. Sci.*, 1955, **33**, 429–433. [Launceston Gen. Hosp., Tasmania.]

Endemic goitre in Northern Tasmania occurs in the form of colloidal or parenchymatous nodules. The functional activity of 19 of these nodules from 19 patients with non-toxic goitre was assessed. Each patient received about 150 μC. of ^{131}I intravenously 24 hr. before operation. After operation all glands were sectioned serially; one portion was reserved for the usual histological routine, and the radio-activity of the other portion was studied in autoradiographs.

The parenchymatous nodules had hardly any radio-activity and were said to have a low functional power. The colloid nodules were more active than the parenchymatous, but less active than normal thyroid tissue, and were generally classed as fairly inactive in non-toxic goitre. There was a fair amount of activity in one colloid nodule, and further investigation may show that such activity in a colloid nodule may be an early indication of thyrotoxicosis.—B. W. Simpson.

1927

MARTIUS, C., BIELING, H. and NITZ-LITZOW, D. Vergleich der Wirkung von Thyroxin auf den Grundumsatz und die Atmungskettenphosphorylierung. [**Comparison of the effects of thyroxine on basal metabolism and respiratory phosphorylation.**] *Biochem. Ztschr.*, 1955, **327**, 163–169. [Physiol. Chem. Inst., Univ. Würzburg.] English summary.

Adult male guineapigs were kept at 20° C. and fed to appetite on a mixed diet including hay and roots or greenstuff. The rats were kept at 22° C. and fed on stock diet. Of pairs of similar animals, the rats usually littermates, one received several injections of thyroxine or triiodothyronine, the other saline. The animals were fasted for 18 hr. before estimations of B.M.R., and then diaphragm segments and preparations of liver mitochondria were used for study of oxygen and phosphate metabolism.

The degree of increase in the B.M.R. was quite close to the value calculated from the reduction in P : O ratios in diaphragm and liver mitochondria.
D. Duncan.

1928

BIELLIER, H. V. and TURNER, C. W. **The thyroxine secretion rate of growing turkey poults.** *Poultry Sci.*, 1955, **34,** 1158–1162. [Dept. Poultry Husb., Univ. Missouri, Columbia.]

1929

GRAD, B. and HOFFMAN, M. M. **Thyroxine secretion rates and plasma cholesterol levels of young and old rats.** *Amer. J. Physiol.*, 1955, **182,** 497–502. [Gerontol. Unit, Allan Mem. Inst. Psychiat., McGill Univ., Montreal.]

1930

WISWELL, J. G. **Metabolic activity *in vitro* of some analogues of thyroxine.** *Amer. J. Physiol.*, 1955, **182,** 301–306. [Dept. Med., Johns Hopkins Univ., Baltimore, Md.]

See also Absts. 1674, 1952, 2223.

1931

PETERSEN, V. P. and LOTSPEICH, W. D. **Further aspect of the endocrine regulation of ketogenesis.** *Amer. J. Physiol.*, 1955, **182,** 273–278. [Dept. Physiol., Coll. Med., Univ. Cincinnati, Ohio.]

A ketogenic effect is attributed to pituitary thyroid-stimulating hormone.

1932

EMERSON, J. D. and EMERSON, G. M. **Failure of the rat to show continuous growth in response to a crude alkaline extract of rat pituitary glands.** *Amer. J. Physiol.*, 1955, **182,** 521–523. [Dept. Physiol., Med. Coll. Alabama, Birmingham.]

1933

CARMINATI, G. M. L'azione dell'ormone galattogeno ipofisario nel coniglio e nel piccione. [**Effect of pituitary lactogenic hormone in the rabbit and the pigeon.**] *Arch. Sci. biol., Bologna*, 1955, **39,** 512–524. [Ist. Sieroterap. "S. Belfanti", Milan.]

Experiments were made on 102 pigeons and 173 rabbits.

In 15 rabbits given by injection 2·5 mg. oestrone daily for 7 days and 1 mg. progesterone daily for the next 5 days, pseudopregnancy was produced, but no milk was formed. In such rabbits purified preparations of prolactin regularly induced lactation in 4 days. The amount of prolactin necessary was from 32 to 48 times the amount needed to produce proliferation of the crop glands in pigeons. In terms of international units, the rabbits needed 64 to 96 and the pigeons 2. Lactation was produced also in 4 male rabbits pre-treated with oestrone and progesterone.

An impure preparation of pituitary lactogenic hormone elicited a positive response in 6 out of 47 pigeons and 27 out of 48 female rabbits, but not in 10 male rabbits. Other hormones may have been present in this preparation.—D. Duncan.

See also Absts. 1741, 1828, 1913.

1934

HADLOW, W. J., GRIMES, E. F. and JAY, G. E. (Jr.) **Stilbestrol-contaminated feed and reproductive disturbances in mice.** *Science*, 1955, **122,** 643–644. [Nat. Microbiol. Inst., Rocky Mountain Lab., Hamilton, Mont.]

Reproductive disturbances in mice, including scrotal hernia and persistent oestrus, are reported as a result of the inadvertent contamination of pelleted feed prepared in a mill which had been previously used to prepare a cattle feed containing stilboestrol.—J. S. Thomson.

1935

HOMBURGER, F. and PETTENGILL, O. **The protein anabolic and other effects of testosterone propionate in mice : effects of nutrition and interrelationship of biologic activities of the hormone.** *Endocrinology*, 1955, **57,** 296–301. [Cancer Res. Unit, Tufts Univ. Sch. Med., Boston, Mass.]

Immature female mice, 3 weeks old, received 2 mg. testosterone propionate in groundnut oil by subcutaneous injection on alternate days ; controls received oil alone. The mice received either a stock diet to appetite or the same diet restricted to the lowest voluntary intake of any group in that experiment, or a high-protein diet with 46·4 per cent. casein. After 27 days the mice were fasted for 24 hr. and were then killed. Carcase, clitoris, adrenal and kidneys were weighed fresh, carcase and one kidney after drying, β-glucuronidase was estimated in kidney homogenate and the rest of the kidney was studied histologically.

Mice of the Rockland Farms strain fed to appetite grew more quickly with testosterone than without, but this difference was not shown by mice on restricted or high-protein diets or those of the Tufts University strains. On all diets testosterone increased the weights of kidneys and clitoris and the β-glucuronidase activity of the kidney and reduced the size of the adrenals. The carcase contained more water after testosterone on the normal diet, but not on the high-protein diet.
D. Duncan.

1936

DE GANDARIAS, J. M., SOLOAGA, A. and RECIO, J. M. Estudio experimental de la accion anabolica proteica de la testosterona. [**The**

protein-anabolic effect of testosterone.] *Rev. clín. española*, 1955, **58**, 211–217. [Inst. Español Fisiol. Bioquím., Valladolid.] English, German and French summaries.

Groups of adult rats of each sex were fed on a stock diet; one group of 7 of each sex received every second day an injection of testosterone propionate until 4 injections had been given. The doses differed from one rat to another. The rats were killed 2 days after the last injection. The results are given in tables.

The mean weight increases were for male controls 1·5 g., female controls 1·0 g., male injected rats 1·75 g. per mg. testosterone, female injected rats 1·10 g. per mg. testosterone. The corresponding values for serum protein were 4·69 and 4·49 g. per 100 ml. and increases of 0·25 and 0·14 g. per mg. testosterone injected. The mean increases in muscle protein were 2·49 and 1·27, in liver protein 0·44 and 1·5 and in spleen protein 1·04 and 1·90 g. per mg. testosterone.—D. Duncan.

1937

FARBER, E. and SEGALOFF, A. **Effect of androgens and growth and other hormones on ethionine fatty liver in rats.** *J. Biol. Chem.*, 1955, **216**, 471–477. [Dept. Pathol., Sch. Med., Tulane Univ., New Orleans, La.]

1938

KENNY, A. J. **Extractable glucagon of the human pancreas.** *J. Clin. Endocrinol.*, 1955, **15**, 1089–1105. [Dept. Pharmacol., Johns Hopkins Univ., Baltimore, Md.]

1939

HÖRETH, W. Über die leistungssteigernde Wirkung des embryonalen Herzextraktes (Corhormon) bei Reisebrieftauben. [**Stimulation of performance by extract of embryonic heart (corhormon) in carrier pigeons.**] *Arch. exp. Pathol. Pharmakol.*, 1955, **227**, 177–182. [Frauenklin., Med. Akad., Justus Liebig Hochsch., Giessen.]

Pairs of homing pigeons were flown on consecutive Sundays distances increasing from 142 to 415 km. The less good performer of each pair received subcutaneously injections of corhormone (Mikö and Torö, 1935, *Gyogyaszat* No. 37), beginning shortly before the first flight and increasing gradually until the last. Experiments were made in 3 consecutive years.

Out of a total of 146 flights of 40 pairs of birds the treated bird flew faster than the control on 109 occasions. The mean speeds were 1008 and 728 metres per min. for treated and untreated birds, respectively.—D. Duncan.

ENERGY EXCHANGE AND SPECIFIC DYNAMIC ACTION

1940

MCKEE, J. P. and EICHORN, D. H. **The relation between metabolism and height and weight during adolescence.** *Child Development*, 1955, **26**, 205–212. [Univ. California, Berkeley.]

The 4 physiological indices examined for their relation to rate of growth in height and weight were B.M.R., total calories produced per hr., rate of change in B.M.R. and rate of change in total calories per hr. Measurements were made every 6 months between the ages of 11·5 and 17·5 years on 52 boys and 52 girls.

For both sexes rates of growth in height and weight were positively correlated with average B.M.R. and with rate of change in total calories produced per hr. For boys there was a significant negative correlation between average total calories produced per hr. and rate of growth in height and no correlation between average total calories per hr. and rate of growth in weight. For girls the two median coefficients were positive. This sex difference is attributed to the different timing of the growth spurts in height and weight in the two sexes.—F. C. Aitken.

1941

GROSSMAN, M. I. and SLOANE, H. S. **Some relations between body weight, body fat and calorie intake.** *Amer. J. Clin. Nutrit.*, 1955, **3**, 403–408. [U.S. Army Med. Nutrit. Lab., Denver, Colo.]

Total food intake by weighing, bodyweight, body fat, calculated from skinfold measurements, and total urine nitrogen were estimated for 87 soldiers. Experiments on different levels of energy intake and at different levels of activity were mostly made in one-week periods.

There was a positive correlation between energy intake and bodyweight (r = about 0·3). When body fat was taken into account the correlation was better; for a given bodyweight energy intake decreases with increasing body fatness. The loss of bodyweight during a period of food restriction was correlated with initial bodyweight but not with fatness.

Nitrogen excretion during food restriction was positively related to bodyweight. It was negatively correlated with body fat early in the experiment, but the relation disappeared later. A

formula for energy requirement based on bodyweight was derived from the data, but it appeared to have no better predictive value than that derived theoretically by the FAO Committee.

"Perhaps the point of greatest interest is that the correlation between calorie intake and bodyweight although statistically significant, is of low order, and that accurate prediction of calorie requirement requires the consideration of parameters in addition to bodyweight."

F. E. Hytten.

1942

WACHHOLDER, K. Über die obere und untere Grenze der optimalen Kalorienzufuhr. [**Upper and lower limits of optimum energy supply.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1463–1467. [Physiol. Inst., Univ. Bonn.]

The studies on which this discussion is based were made on groups of medical student cadets in army training and soldiers convalescent from war wounds. Such groups were uniformly fed, in respect of energy supply, for weeks or months, and were without the complications of civilian rations or sharing of food within the family. The convalescents represented "normal consumers" between 20 and 30 years of age in "sedentary" occupations. All attended as required at the laboratory for metabolism studies (see Absts. 1515, Vol. 15; 2247 and 5047, Vol. 19).

In men of 170 to 175 cm. height and 65 kg. weight in equilibrium on a diet of 2400 gross, 2200 net Cal. (*i.e.*, less loss in excreta), energy expenditure during the night was less by at least 30 Cal. than B.M.R. (Ruhe-Nüchtern-Umsatz). There are economies of basal expenditure and S.D.A. during work which might amount to 100 Cal. daily. With a basal expenditure of 1700 Cal. cost of rising, dressing, 130 Cal., of walking 3 km. to and from work, 100 Cal., of S.D.A., 200 Cal., there is a surplus of only 70 Cal. for work, which is inadequate; with the economies indicated, the surplus is 200 Cal. and adequate for light work.

Reduction of intake, with loss of weight and attainment of new equilibrium, may be carried as far as 1800 Cal. daily. When B.M.R. is reduced by 15 or 16 per cent. and there is no S.D.A., with complete rest (Zimmerruhe) weight equilibrium is possible on 1550 Cal. and with bed rest on 1450 Cal. But, up and about, disturbances of blood pressure and of the psyche occur at 1900 Cal.

Energy intake up to 2700 or 2800 Cal. causes little rise in B.M.R. and little or no increase in S.D.A., about 100 Cal. daily for both. The surplus over 2500 must be expended in exercise or deposited in fat.

The optimum range for "sedentary" workers is therefore judged to be 2150 to 2500 Cal. daily. Men who work standing and moving to and fro require 100 to 200 Cal. more. The U.S. National Research Council allowance of 3200 Cal. is dangerous in an industrial, highly mechanised society.

There is scarcely any comparable information for women; their B.M.R. is 10 per cent. less than that of men of the same height, weight and age. Little is known of S.D.A. or cost of work.

The estimate of Droese *et al.* (Abst. 5041, Vol. 19) for the housewife is "erstaunlich hoch"; but women tend to get fat, and not only after the climacteric.—I. Leitch.

1943

PASSMORE, R. and DURNIN, J. V. G. A. **Human energy expenditure.** *Physiol. Rev.*, 1955, **35,** 801–840. [Dept. Physiol., Univ. Edinburgh.]

1944

DURNIN, J. V. G. A. and EDWARDS, R. G. **Pulmonary ventilation as an index of energy expenditure.** *Quart. J. Exp. Physiol.*, 1955, **40,** 370–377. [Inst. Physiol., Univ. Glasgow.]

The possibility of estimating energy expenditure from pulmonary ventilation was tested by analysis of data obtained in 2 field surveys (see Absts. 558, Vol. 23 and 943, Vol. 26). Regression equations of the type

Energy expenditure $= a \times$ Pulmonary ventilation

were calculated for 34 men. Six observations for each provided a sufficiently accurate measure of the relation if ventilation was above 15 litres per min. Below that rate the points tended to fall below the line. There is a discussion of the applicability of the technique to surveys of everyday activities in which ventilation is between 15 and 50 litres per min. and of its advantages over other methods requiring collection and analysis of expired air.—D. Harvey.

1945

MILLER, A. T. (Jr.) and BLYTH, C. S. **Influence of body type and body fat content on the metabolic cost of work.** *J. Appl. Physiol.*, 1955, **8,** 139–141. [Dept. Physiol., Sch. Med., Univ. N. Carolina, Chapel Hill.]

A gradient walking test was made on 30 healthy men, and their weight, height, fat content, chest circumference and abdominal circumference were measured. The total metabolic cost of the exercise, as measured by indirect calorimetry, was found to be linearly related to bodyweight and to be independent of the other measurements except as they were also related to bodyweight. This is in contrast with the basal metabolism, which is more closely related to lean body mass than to total bodyweight. The effect of obesity is therefore to increase energy requirement during exercise, and since the maximum oxygen intake is limited by the size of the lean body mass, tolerance of exercise is reduced.—I. McDonald.

1946

BEDFORD, T. and WARNER, C. G. **The energy expended while walking in stooping postures.** *Brit. J. Indust. Med.*, 1955, **12**, 290–295. [Med. Res. Counc. Environmental Hyg. Res. Unit, London Sch. Hyg. Trop. Med.]

Data were obtained by the Douglas and Haldane technique for 2 subjects who moved at different speeds in the half-stoop position, *i.e.*, with height reduced by 20 per cent., in the full-stoop position with 40 per cent. reduction in height, and on all fours. The costs were, at half stoop, from 30 to 50 per cent. above that of normal walking; in the full-stoop position and on all fours, respectively, 3¼ times and about 5 times that of normal walking. The work of Moss (Abst. 2890, Vol. 5) is considered to have underestimated the increase over the rate for normal walking which movement in these attitudes requires.—D. Harvey.

1947

KARVONEN, M. J. (with ALAVAINIO, K., ALLINEN, V., GRÖNROOS, I., KOKKO, J., KOSKELA, A., NUORVAARA, S., SAARIAHO, V., VILHUNEN, O. and ÖHMAN, I.] **Age and performance in athletics.** *Internat. Ztschr. angew. Physiol. Arbeitsphysiol.*, 1955, **16**, 110–119. [Inst. Occupational Health, Helsinki.]

For each of 20 track and field sports practised in Finland the ages of the 20 best sportsmen of each year from 1947 to 1953 were studied; for ball games the age data were found for 61 teams and 700 men; for skiing, for the 5 best Finnish participants in each of the 4 most important contests from 1931 to 1950; and for lumber work, for the participants in national woodcutting competitions in 1945 and 1951.

The ages are arranged in graphs and tables to show the mean age for best performance in each activity. The means range from 23·5 years for the 100-m. sprint to 34·2 years for the marathon. For running and skiing, the less speed and the more endurance is required the greater the mean age favoured. In sports where skill is essential older men are favoured, but the scatter of ages is high. No deduction should be made about changes in performance with age of the individual, since the performance of an athlete with increasing age does not deteriorate as steeply as his chances of remaining among the best 20 in his event.

D. Duncan.

1948

THEILEN, E. O., GREGG, D. E. and ROTTA, A. **Exercise and cardiac work response at high altitude.** *Circulation*, 1955, **12**, 383–390. [Dept. Cardiorespiratory Dis., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.] Interlingua summary.

1949

PADUCHEVA, A. L. Dykhanie, gazoobmen i teploregulyatziya u karakul'skikh ovetz. [**Respiration, gaseous exchange and heat regulation in Karakul sheep.**] *Karakul. Zver.*, 1955, **8**, No. 2, 38–43. [All-Union Sci. Res. Inst. Animal Husb.]

At high air temperatures both respiratory rate and ventilation are increased 10 to 15 times. With rise in temperature breathing becomes more rapid, with means of 20 respirations per min. at 3° C. to 103 at 30° C. The ventilation, *i.e.*, the volume of air expelled in 1 min., increases on the average from 8 to 32 litres, with individual variations within the limits of 4 to 45 litres. The ventilation changes with drinking. A considerable amount of water drunk by a sheep, which may be as much as 7 litres on a hot day or 15 per cent. of the weight of the sheep, reduces body temperature by 1° to 1·5° C., which brings about a change in ventilation, first reducing it and then increasing it. Sheep adapt themselves to high temperatures mainly by less movement and increased rapidity of breathing.

In organising the summer care of sheep it is advisable in hot climates to limit their activity; they should be rested during the day and pastured at night.—H. Scherbatoff.

1950

LUDVIGSEN, J. and THORBEK, G. Virkningen af aureomycin på stofskiftet hos svin og stofskiftet hos galte og sogrise. Varmeproduktionen hos svin på forskellige alderstrin med saerlig henblik på staldventilation. [**The effect of aureomycin on the metabolism of pigs and metabolic processes in barrows and gilts. Heat production of pigs at different ages, with special reference to sty ventilation.**] *Forsøgslab. København. Beretn.*, 1955, No. 283, pp. 110. English and French summaries.

The study was made on 4 gilts (non-parous females) and 4 barrows (castrated males), 2 of each from 2 litters; 2 of each from the different litters acted as controls and the others were given 20 mg. aureomycin daily. They were fed on the rations normally used, of mixed cereals with 2·5 per cent. lucerne meal, a mineral mixture of Ca, P and NaCl, soya bean oil with 2000 I.U. vitamin A and 500 I.U. vitamin D_2 daily, and the equivalent of 1 litre skimmed milk as dried skimmed milk. Techniques are described and results presented in detail.

Balances of N, C and energy were computed from the results of chemical and respiratory metabolism experiments from 20 to 90 kg. weight. Aureomycin had no effect on the digestibility of dry matter but a significant effect on apparent digestion of N, possibly as the result of reduced

endogenous N excretion. On the average N balance was not affected because excretion in the urine rose. Aureomycin showed greater deposition of C in N-free compounds and, from the respiratory quotient, probably as fat. Total heat production was reduced, which implies more economical use of feed.

When gilts and male castrates were compared, absorption of N was the same but the males excreted more N in urine, so that gilts retained 4 g. N daily more than the males, a highly significant difference. They also deposited more C, but the males deposited more in fat. The R.Q. in the last stages of fattening was 1·256 for gilts and 1·267 for males. Total heat production was similar in the earlier part of the study, but later it was higher in males, by 200 Cal. daily in the last 2 months. For the controls over the weight range 20 to 90 kg. heat production may be computed as follows: oxygen consumption in litres = 6·5 × weight + 257; CO_2 production in litres = 9·2 × weight + 177 and heat in Cal. = 38·4 × weight + 1031. From this the total heat generated in a piggery may be computed.—I. Leitch.

1951

GONZAGA, A. C. and RUBIO, P. C. **A study of the pulse and respiration rates and body temperature of Philippine pigs.** *Philippine J. Animal Indust.*, 1954, **15**, 1–10. [Coll. Vet. Med., Univ. Philippines, Quezon City.]

1952

KIBLER, H. H. and BRODY, S. **Environmental physiology and shelter engineering, with special reference to domestic animals. 31. Influence of radiation intensity on evaporative cooling, heat production, and cardiorespiratory activities in Jersey, Holstein, and Brahman cows.**

BLINCOE, C. and BRODY, S. **32. The influence of ambient temperature, air velocity, radiation intensity, and starvation on thyroid activity and iodide metabolism in cattle.**

BRODY, S., RAGSDALE, A. C., YECK, R. G. and WORSTELL, D. **33. Milk production, feed and water consumption, and body weight of Jersey and Holstein cows in relation to several diurnal temperature rhythms.**

BLINCOE, C. and BRODY, S. **34. The influence of diurnally variable temperatures on the thyroid activity and iodide metabolism of Jersey and Holstein cows.** *Missouri Agric. Exp. Stat. Res. Bull.* No. 574, December 1954, pp. 31; No. 576, February 1955, pp. 36; No. 578, February 1955, pp. 26; No. 579, February 1955, pp. 12.

For previous parts see Abst. 5185, Vol. 25.

31. The animals used in this experiment were 4 lactating Jersey, 6 lactating Holstein and 2 dry Brahman cows. The effect of weekly exposure to radiation intensities from 0 to 500 Cal. per sq. m. per hr. at environmental temperatures of 45°, 70° and 80° F. was studied.

At 45° F. in all animals respiration rate, pulmonary ventilation rate and total evaporative cooling increased slightly with increasing radiation, but rectal temperatures and heat production remained normal.

At radiation intensity of 115 Cal. per sq. m. per hr. and 70° F. air temperature, rectal temperatures in one Jersey and 2 Holsteins began to rise, and at 480 Cal. they were 3½° F. above normal. In one Jersey and 2 Holsteins they rose 1½° F. above normal, and in the rest of the animals there was no change. Heat production was unaffected in the Brahmans, but was reduced by 12 per cent. in the Jerseys and 26 per cent. in the Holsteins. At air temperature 80° F. rectal temperature increased by up to 5° F. in all the European cattle as radiation increased. The increase in most of the Jerseys was much less than in the Holsteins, indicating that the smaller breed was showing less heat strain. Respiratory vaporisation increased continuously with increasing radiation, but skin vaporisation reached a plateau at 360 Cal. per sq. m. per hr. The rate of heat production of the Brahman was only half that of the other breeds, which would partly explain the greater heat tolerance of the Brahmans. It was estimated that the heat stress of 500 Cal. per sq. m. per hr. radiation at 70° F. air temperature was equivalent to an increase of 10° F. in air temperature without radiation.

32. Thyroid activity and iodide metabolism in Jersey, Holstein, Brown Swiss and Brahman cattle was studied with ^{131}I in different conditions of environmental temperature, air velocity, radiation intensity and starvation.

When ambient temperature was above 95° F., the limit of the comfort zone, thyroid activity was decreased, most in Holsteins, least in Brahmans. When temperature was below 32° F., thyroid activity in Brahmans and Jerseys increased by 60 to 100 per cent., but Holsteins and Brown Swiss were not similarly affected.

Air velocity from 0·5 to 10 m.p.h. did not affect any cattle when environmental temperature was between 32° and 80° F. Radiation intensity of 488 Cal. per sq. m. per hr. at 70° to 80° F. air temperature increased thyroid activity in European breeds, but not in Brahmans. Starvation for 4 days reduced thyroid activity in Holsteins.

Total iodine metabolism, estimated from rate of clearance of plasma iodide, was not affected by the climatic conditions imposed. Increasing heat stress decreased the percentage of the dose of ^{131}I excreted in milk but slightly increased the concentration.

33. The effects of diurnal changes in temperature on milk yield, feed and water intake of 3 Jersey and 3 Holstein cows were studied. The temperature ranges were chosen to simulate conditions in different regions.

No effect was observed of the 40° to 70° F. range, which was therefore assumed to be optimum. In the low ranges yield was slightly depressed in Jerseys, but not in Holsteins. In both breeds yield in the 70° to 100° F. range declined, 20 per cent. in Holstein and 8 per cent. in Jerseys; a decline of not more than 6 per cent. was due to advancing lactation. Feed consumption was also reduced by 20 to 30 per cent. in Holsteins, but very little in Jerseys. After a week in this temperature range there were indications that the animals were becoming acclimatised, with consequent improvement in performance.

The effect of range 50° to 110° F. was less than that of 70° to 100° F., and no effect of range 40° to 110° F. was recorded. This supports the theory that the number of hours spent in cooling temperatures, below 70° F., and the number spent in heating temperatures, above 80° F., are as important as the maximum and minimum temperatures in physiological effect.

The range 40° to 70° F. produced the same effect as constant temperatures between 40° and 60° F. and the range 70° to 100° F. was comparable to a constant temperature of 85° F.

34. The effect of diurnal change in temperature within different ranges was studied. Variations within the range 10° to 40° F. increased thyroid activity by 20 per cent. compared to that in the range 40° to 70° F. In the range 70° to 100° F. thyroid activity was reduced 30 per cent. No effect on iodine metabolism was found.

T. D. Bell.

1953

ISAAKYAN, L. A. O sezonnykh izmeneniyakh khimicheskoi termoregulyatzii i spetzifichesk-ogo dinamicheskogo deistviya peshchi u geterotermnykh zhivotnykh. [**Seasonal changes in chemical thermoregulation and specific dynamic action of food in heterothermic animals.**] *Fiziol. Zh. SSSR Sechenova*, 1955, **41**, 210. [Inst. Eksp. Med., Akad. Med. Nauk SSSR, Leningrad.]

By measuring body temperature and gaseous metabolism, a study was made over the course of a year of changes in thermoregulation in the hedgehog and the suslik (*Spermophilus* sp., pouched marmot), and as a control in the laboratory white rat.

In the hedgehog the intensity of the processes involved in chemical heat regulation diminished in autumn, and in the winter this faculty was in total abeyance. In the suslik the processes were insufficient to maintain body temperature in autumn and winter, although metabolism did increase in response to lower environmental temperature. In both species the specific dynamic action of food, apparent in spring and summer, became much less in autumn and winter. These seasonal changes were not found in the rat. The results, it is considered, uphold the view that nervous reflex mechanisms play an important part in the determination of the response of heterothermic animals to temperature changes.

D. W. Taylor.

1954

HAMMEL, H. T. **Thermal properties of fur.** *Amer. J. Physiol.*, 1955, **182**, 369–376. [Dept. Zool., Cornell Univ., Ithaca, N.Y.]

1955

MELLEN, W. J. and HILL, F. W. **Studies of the avian respiratory quotient.** *Poultry Sci.*, 1955, **34**, 1085–1089. [Dept. Poultry Husb., Cornell Univ., Ithaca, N.Y.]

Respiratory quotients of chickens of different ages were estimated in a Haldane apparatus (*J. Physiol.*, 1892, **13**, 419). For young birds groups were studied together, so the values were means.

The range of fasting values was from 0·65 to 0·88 in the first experiment, and the largest proportion of values below 0·70 was obtained in larger birds fasted for 38 to 46 hr. A series of estimations on a group of birds when they were $2\frac{1}{2}$, $3\frac{1}{2}$, $4\frac{1}{2}$, $5\frac{1}{2}$ and $7\frac{1}{2}$ weeks old showed a slight mean fall, of doubtful significance, in R.Q. There was no difference with increased fasting times of between 24 and 54 hr.

In 1 pullet there was an increase in R.Q. from 0·74 to 0·81 one and a half hr. after ingestion of 5 g. glucose. In 3 other pullets neither casein nor olive oil significantly affected the R.Q.

D. Duncan.

See also Absts. 1903, 1964, 2057, 2165, 2181, 2215, 2270.

CARBOHYDRATES

1956

CLAYTON, M. M. and RANDALL, S. W. **Blood changes following breakfasts of different types. Blood sugar and chylomicrons in young women of different weights.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 876–882. [Dept. Home Econ., Maine Agric. Exp. Stat., Orono.]

For 2 years 24 young women aged 17 to 29 years and weighing from 114·8 to 193·5 lb. received one of 3 breakfasts providing about 450 Cal.; the high-fat breakfast contained 30·9 g. fat, 8·2 g. protein and 41·2 g. carbohydrate, the high-protein breakfast 23·2 g. protein, 19·5 g. fat and 45·8 g. carbohydrate and the high-carbohydrate breakfast 83·4 g. carbohydrate, 7·5 g. protein and 11·1 g. fat. Finger blood samples were taken before breakfast and 30 min., 2 hr., 3 hr. and 4 hr. after breakfast. Chylomicron counts and glucose estimations were made on each serum sample. Before or after the breakfast tests the subjects kept records of all food eaten for 1 week.

For the whole group of 24 subjects the highest average chylomicron counts were at the third hour after high-fat and high-protein breakfasts. After the high-protein breakfast the average blood sugar remained above the fasting level during the fourth hour; after the high-fat and high-carbohydrate breakfasts, the average fell below the fasting level at the second and third hours. The greatest average drop in blood sugar occurred at the third hour after the high-carbohydrate breakfast. The group was divided into the 12 heaviest and the 12 lightest subjects; for the heaviest subjects the average blood sugar fell below the fasting level at the third hour after the high-carbohydrate breakfast. The average values did not fall below fasting for either group after the high-protein breakfast. After the high-fat breakfast, the average values fell below fasting at the second or third hour, but did not fall as low as those of the heaviest group after the high-carbohydrate breakfast. The breakfasts ordinarily eaten by the 21 heaviest subjects provided more energy and protein than those eaten by the 12 subjects weighing the least.

Of the 3 breakfasts studied, the high-protein breakfast was the most satisfactory for preventing hunger among all 24 subjects.—G. F. Garton.

1957

CONARD, V. Mesure de l'assimilation du glucose. Bases théoriques et applications cliniques. **[Measuring the assimilation of glucose. Theoretical basis and clinical applications.]** *Acta gastro-enterol. belg.*, 1955, **18,** 655–705; 727–771; 803–845. [Clin. Méd., Hôp. Brugmann, Brussels.]

See also Abst. 4539, Vol. 23.

The chemistry of carbohydrate metabolism is discussed briefly. The work attempts to isolate, from the group of phenomena which determine the course of the blood sugar curve after an intravenous dose of glucose, the role of assimilation, defined as the active passage of glucose from the extracellular fluids into the cells. When the blood sugar is below the threshold at which sugar appears in the urine, its rate of fall depends on assimilation alone. Assimilation is regulated by the level of the blood sugar itself (Wierzuchowski, Abst. 3429, Vol. 7) and by the endocrine balance, particularly the amount of insulin available to control the transfer of glucose across the cell membrane (Stadie, *Physiol. Rev.*, 1954, **34,** 52). If the postulate be accepted that the transfer of glucose from one compartment to the other is the critical stage in its metabolism, free glucose can be considered as an extracellular substance, and for a study of the rate of assimilation it is necessary to know the volume of interstitial fluid.

Intravenous blood sugar tolerance tests with a single dose of glucose, 0·66 ml. of 50 per cent. solution per kg. bodyweight, were made on 400 subjects, mostly in hospital. Some subjects received insulin, 0·1 unit per kg. Repeated experiments of the same type were made on dogs. The middle part of the blood sugar curves, from the 10th to the 60th minute, was used for comparative purposes to avoid errors in the earlier and later values. The curves from 15 normal young subjects were studied statistically.

Simultaneous injections of glucose and thiocyanate, for estimation of extracellular fluid, were given to 97 subjects. The fall in blood sugar concentration corresponding to the slowest exponential of the curve expresses in a simple form glucose assimilation. If the amount of glucose injected is divided by the thiocyanate volume it is possible to calculate the peak which will be reached by the blood sugar if the glucose remains extracellular. Extrapolation of the middle part of the blood sugar curve to time of injection gives a value corresponding to the calculated one. Therefore assimilation can be expressed by the simple exponential equation $C = Ae^{-Kt}$ or $\log C = \log A - Kt$, where A and K are constants and C is the blood sugar concentration at time t. The determination of A and K is based on the fact that the semilogarithmic representation of this equation, with time as abscissa and log of concentration as ordinate, is a straight line, with $\log A$

as its intercept on the y axis and $-K$ as slope. The volume of diffusion calculated from A is close to other estimates of extracellular space, in man about 25 per cent. of bodyweight. K measures the rate of disappearance of injected glucose and is called the coefficient of glucose assimilation. The mean coefficient in 75 normal subjects was 1·74; in 90 diabetic subjects it was 0·54, in 21 subjects aged more than 60 years it was 0·99, and in 55 subjects with reduced assimilation 1·01. Administration of insulin raised the value of K to a mean of 5·87, and the values found in a subject with pancreatic cancer were 3·20 and 4·47. Cortisone given for several days raised the value, which was also high in 9 out of 17 pregnant women, with a mean for all 17 of 2·28.

It is concluded that the rate of disappearance of glucose measures directly the avidity of the tissues and probably the insulin status of the cell membranes. The clinical applications of the findings are discussed.—D. Duncan.

1958

MELLINKOFF, S. M., BOYLE, D. and FRANKLAND, M. **The effect of amino acid-glucose infusions upon the serum amino acid and blood sugar concentrations in viral hepatitis.** *J. Lab. Clin. Med.*, 1955, **46**, 560–567. [Dept. Med., Sch. Med., Univ. California, Los Angeles.]

1959

CREUTZFELDT, W. and TECKLENBORG, E. Experimentelle Untersuchungen zur Funktion der A-Zellen der Pankreasinseln und zur Glucagonwirkung. [**Experimental investigation of the function of the alpha cells of the pancreatic islets and on the action of glucagon.**] *Arch. exp. Pathol. Pharmakol.*, 1955, **227**, 23–61. [Med. Klin., Univ. Freiburg i. Br.]

The experimental animals were 136 guineapigs weighing 400 to 550 g., 44 rabbits of 1·5 to 2 kg. and 39 rats of about 200 g., all fed on stock diets.

In guineapigs, Synthalin (decamethylenediguanidine) at 6 mg. per kg. bodyweight caused degranulation and perhaps vacuolisation of pancreatic alpha cells, but not so clearly as daily injection of 3 mg. per kg. subcutaneously, when the animals died after about $2\frac{1}{2}$ days. The nuclei of the alpha cells were then often pale and poor in chromatin, and the cells were enlarged. Beta cells were seldom affected. There was liver damage. In liver damage produced by phosphorus, CCl_4, chloroform or ethionine there were similar effects on the pancreatic cells, but not when liver damage was due to allyl formate or to scurvy. Glucagon did not prevent damage to the pancreas caused by $CoCl_2$, Synthalin or P.

In rabbits the pancreatic damage caused by Synthalin was not related to the fall in the blood sugar. Glucogon could not counteract the effects of Synthalin. Low blood sugar produced by Synthalin cannot be explained as an effect of insulin after elimination of the alpha cells.

p-Aminobenzolesulphonamido*iso*propylthiodiazole caused damage to the alpha cells which differed from the damage due to Synthalin. Again there was no relation between cell damage and the fall in blood sugar.—D. Duncan.

1960

ENGLHARDT-GÖLKEL, A. and BETZ, B. Über das Verhalten der Blutphosphate nach Glucose- und Fructosebelastungen. [**Behaviour of blood phosphates after administration of glucose or fructose.**] *Ztschr. ges. exp. Med.*, 1955, **126**, 214–219. [Med. Poliklin., Univ. Munich.]

Total P and its fractions were estimated in the blood of 10 fasting subjects, not more than 30 years old, after injection of 0·25 g. glucose or fructose per kg. bodyweight.

In the first 15 min. after injection fructose disappeared from the blood more quickly than glucose, and after fructose the fall in P was greatest. Organic and inorganic P curves were parallel. It is concluded that the loss of P was in the poorly hydrolysable fraction, and the significance of this is discussed.—D. Duncan.

1961

PROSIEGEL, R., STUHLFAUTH, K. and ENGLHARDT-GÖLKEL, A. Die Wirkung von Kohlenhydraten auf den Kaliumstoffwechsel bei Gesunden und Leberkranken. [**Effect of carbohydrates on potassium metabolism of healthy subjects and subjects with liver diseases.**] *Klin. Wochenschr.*, 1955, **33**, 799–803. [Med. Poliklin., Univ. Munich.]

In 13 healthy subjects given by rapid intravenous injection 0·25 g. per kg. bodyweight of glucose or fructose there was no constant change in serum K after either sugar. The blood inorganic phosphate fell after both sugars, but more rapidly and to a greater degree after fructose. The rise in the blood sugar was less after fructose than after glucose. In 11 healthy subjects and 10 patients with liver disease K in both arterial and venous serum was estimated after an initial injection of 16 g. and during an infusion lasting an hour of 100 g. of either sugar. In normal subjects there was a slight but definite fall in K in both sera after glucose, but a significantly greater fall after fructose, when the arterio-venous difference was increased as the sugar in arterial serum fell by from 4 to 8 mg. per cent. and in the venous serum by only half that amount. The inorganic P also fell more rapidly after fructose than after glucose, but there was no appreciable difference between arterial and venous values. In liver disease

similar changes occurred, but the falls in K and inorganic P after fructose were much less than in normal subjects. After glucose the changes in K and inorganic P were so small that there was no significant difference between the values for normal and abnormal subjects. The blood sugar curves after fructose did not suggest disturbance of storage capacity in the liver. The results are discussed in relation to cell enzyme systems in the peripheral tissues and the liver.—L. Wills.

1962

KARYAKINA, V. A. Vzanmosvyaz glyukozy, molochnoi kisloty i fosfatov krovi ovetz v protzesse mezhutochnogo uglevodnogo obmena pri nekotorykh fiziologicheskikh sostoyaniyakh. [**Interrelations of glucose, lactic acid and phosphates of sheep's blood in intermediary metabolism of carbohydrate in some physiological conditions.**] *Biokhimiya*, 1955, **20**, 377. [Inst. Biol., Ural Filial. Akad. Nauk SSSR, Sverdlovsk.]

Blood samples from sheep with cannulae in carotid artery and portal vein were taken at short intervals before and after feeding and analysed for glucose, lactic acid and phosphate. Comparison of arterial and venous values showed that when the stomach was empty, glucose left the blood and lactic acid and phosphate were added, owing to utilisation of endogenous glucose. During the absorption of oat carbohydrate, beginning about 3 hr. after the food was given, the venous blood sugar exceeded the arterial, and venous blood phosphate and lactic acid increased also. Carotid artery and jugular vein blood samples were analysed during chloral hydrate anaesthesia. Sugar, lactate and phosphate all decreased in both arterial and venous blood, suggesting decreased glycolysis accompanying inhibition in the central nervous system.—D. W. Taylor.

1963

PAGÉ, É., BABINEAU, L. M. and LACHANGE, J. P. **Carbohydrate utilization in rats adapted to cold.** *Rev. canad. Biol.*, 1955, **14**, 144–151. [Dept. Physiol. Nutrit., Laval Univ., Quebec.] French summary.

Absorption of glucose was measured by giving known amounts by stomach tube or by intraperitoneal injection to rats after a fast of 26 hr. The animals were killed 2 hr. later and the glycogen content of the liver and carcase was estimated. In rats which had been kept at least 38 days in a cold room at 8° ± 2° C. and had received a diet containing 75 per cent. sucrose, higher values were obtained for fasting liver glycogen, intestinal absorption of glycogen and deposition of liver glycogen than in comparable animals kept at normal room temperature. Glucose was less rapidly absorbed and allowed less deposition of liver and tissue glycogen when it was given intraperitoneally than when it was given by mouth.

A. M. Copping.

1964

INGLE, D. J., MORLEY, E. H. and STETTEN, D. (Jr.) (with SCHROEDER, E. and KLYBAS, V.). **Metabolism of glucose in resting and working rats.** *Amer. J. Physiol.*, 1955, **182**, 263–266. [Res. Labs., Upjohn Company, Kalamazoo, Mich.]

Glucosuria was induced in rats by continuous intravenous infusion of ^{14}C-glucose for 12 hr. Muscle work produced by electrical stimulation of either hind leg, or both, suppressed excretion of urine and storage of glucose in the liver. Work increased the amount of labelled glucose oxidised and the amount of unlabelled CO_2 expired and decreased the respiratory quotient.—A. Hepburn.

1965

CIANCIMINO, M. C., GIACALONE, O. and RUBINO, F. L'utilizzazione del glicidi nei ratti alimentati con dieta steatogena contenente grasso di bue o grasso di maiale. [**Utilisation of carbohydrate by rats fed on a diet to produce fatty liver and containing beef fat or pig fat.**] *Arch. Fisiol.*, 1955, **54**, 396–403. [Ist. Fisiol., Univ. Palermo.]

Of 30 male rats, 12 were given a diet of, per cent., sucrose 48, lard 40, casein 5, salt mixture 5 and sawdust 2, with vitamins, and 12 were given the same diet with beef fat instead of lard. Six were given stock diet. Six rats on each experimental diet were maintained for 24 days and 6 for 42. At the end of that time the rats fasted for 6 hr., and the respiratory quotient was estimated before and after administration of glucose. The rats were then given sucrose only for 30 hr., and the R.Q. was estimated before and after glucose again.

The R.Q. of the rats fed on stock diet rose after glucose and still more when the glucose was given after sucrose. In the rats given the experimental diets for 24 days there was no increase in R.Q. after glucose, but there was an increase in both groups when sucrose had been given. In the rats having the experimental diets for 42 days there was an increase after glucose and a further increase after glucose when sucrose had been given, but the increase was not as great as with the rats on stock diet. The increase was greater with the diet containing lard than with that containing beef fat, the latter having been shown to produce the more severe fatty liver (Abst. 5295, Vol. 25).

E. M. Hume.

1966

WOOD, H. G. **Significance of alternate pathways in the metabolism of glucose.** *Physiol. Rev.*, 1955, **35**, 841–859. [Dept. Biochem., Sch. Med., Western Reserve Univ., Cleveland, Ohio.]

1967

FOURNIER, M. P. L'action ostéogène de l'acide glycolique et ses conséquences. [**Osteogenic action of glycolic acid and its effects.**] *C.R. Acad. Sci.*, 1955, **240,** 2555–2557.

In support of the suggestion that "structural" carbohydrates exert their effect on Ca metabolism because they are precursors of glycine (Abst. 5195, Vol. 25), the value of glycolic acid was tested in the same way. Glycolic acid at the 1·5 per cent. level improved the utilisation of Ca by young rats as much as 10 per cent. of lactose.

It is postulated that glycolic acid, found in plant and animal tissues, may be the di-carbon molecule from which either "structural" carbohydrates or glycine can be built up.—D. Duncan.

1968

FOURNIER, P. De l'action commune, ostéogène et lipotrope, de la choline et du lactose. [**The osteogenic and lipotropic action common to choline and lactose.**] *C.R. Acad. Sci.*, 1955, **241,** 903–905.

The method was that described in Abst. 745, Vol. 25, but the substances included in the experimental diets at the expense of starch were 12 per cent. lactose or 2 per cent. choline chloride.

The coefficients of utilisation of Ca were with starch alone 21, with lactose 37 and with choline 39 per cent.

Other work which suggests a similarity in effects of lactose and choline is mentioned (Absts. 3124, Vol. 5; 911, Vol. 18), and the relation of both substances to glycine is discussed (Abst. 5195, Vol. 25).—D. Duncan.

1969

FOURNIER, P., DUPUIS, Y. and SUSBIELLE, H. Action du sorbitol et du mannitol sur l'ossification. [**Effect of sorbitol and mannitol on ossification.**] *C.R. Soc. Biol.*, 1955, **149,** 945–948. [Lab. Physiol. Nutrit., École Hautes-Études, Paris.]

The method and basal diet resembled those used earlier (see, *e.g.*, Abst. 745, Vol. 25). The diets compared contained 6 per cent. glucose, sorbitol, mannose or mannitol, with starch to 81·5 per cent. as in the control diet.

Sorbitol, mannose and mannitol each increased the coefficient of utilisation of Ca from 18 per cent. with starch alone to about 35 per cent. No sorbitol, and only about 4 per cent. of the mannitol intake, appeared in the urine. Thus, both the derivative of the "energetic" sugar glucose and that of the "structural" sugar mannose exhibit the "structural" effect on Ca metabolism.

D. Duncan.

1970

FOURNIER, P., DUPUIS, Y. and SUSBIELLE, H. Les effets du dulcitol et de l'acide mucique sur l'utilisation du calcium. [**Effect of dulcitol and of mucic acid on calcium utilisation.**] *C.R. Soc. Biol.*, 1955, **149,** 1168–1170. [Lab. Physiol. Nutrit., École Hautes-Études, Paris.]

When tested by the method described in Abst. 745, Vol. 25, dulcitol at the rate of 6 per cent. of the diet had a favourable effect on Ca utilisation comparable to that of galactose. Mucic acid at the same level almost completely prevented the utilisation of dietary Ca, perhaps by the formation of calcium mucinate, which is nearly insoluble in water.—D. Duncan.

1971

PATTERSON, J. W. **Cataractogenic sugars.** *Arch. Biochem. Biophys.*, 1955, **58,** 24–30. [Dept. Anat., Sch. Med., Western Reserve Univ., Cleveland, Ohio.]

D-Galactose or D-xylose or L-arabinose given simultaneously or alternating with a diet containing D-galactose and dog chow accelerated the development of cataracts in rats. Their effectiveness decreased in that order and was proportional to the increase in blood sugar. Each has the same configuration at carbon atoms 2 and 3 and forms a ring through carbon atom 1, with a resulting equilibrium of α- and β-forms. D-Sorbitol, D-mannose and D-arabinose did not produce cataracts. Diabetic rats developed cataracts more quickly when they received 20 per cent. D-xylose, but D-xylose alone did not produce cataracts in normal rats.—A. Hepburn.

1972

SCHWARZ, V. and GOLBERG, L. **Galactose 1-phosphate in galactose cataract.** *Biochim. biophys. Acta*, 1955, **18,** 310–311. [Dept. Pathol., Univ. Manchester.]

Young rats weighing 50 to 60 g. received similar diets with and without 30 per cent. galactose. After from 46 to 92 days they were killed and whole lenses and lens capsules were analysed for galactose and its 1-phosphate.

Normal lenses contained no galactose. Normal capsules contained up to 0·08 μg. galactose 1-phosphate per capsule. In cataractous lenses the galactose seemed to be confined to the capsule, in which the concentration was at least 17 mg. galactose 1-phosphate per 100 g. tissue. Clear lenses from animals given galactose were comparable to normal lenses in galactose content. The amount of galactose 1-phosphate in cataractous capsules was of the same order as in red cells of infants with galactosaemia (Schwarz *et al.*, *Biochem. J.*, 1955, **59,** xxii).—D. Duncan.

1973

EL HAWARY, M. F. S. **Blood keto acid levels during intoxication with inhibitors of carbohydrate metabolism.** *Biochem. J.*, 1955, **61,** 348–352. [Dept. Chem. Pathol., Guy's Hosp. Med. Sch., London.]

Blood sugar, total keto-acids, pyruvate, α-oxoglutarate and acetone bodies were estimated in normal rats and in rats poisoned with arsenite, maleate, iodoacetate, alloxan, malonate or fluoride.

No abnormal keto-acid was found. Pyruvate and α-oxoglutarate were significantly increased in all the poisoned rats, pyruvate less so except with arsenate. Acetone bodies were slightly increased by arsenite, maleate, iodoacetate and fluoride, but were 8 times the normal value with malonate and 20 times with alloxan. In poisoned animals injected with sodium pyruvate the blood pyruvate failed to fall to normal within 30 min., as it did in intact rats.—D. Duncan.

1974

BAUMGARTEN, F. Papierchromatographische Untersuchungen über die Zusammensetzung des Blut- und Harnzuckers von Gesunden und Diabetikern. [**Paper chromatography studies of the composition of blood and urine sugar in healthy subjects and diabetics.**] *Deutsch. Ztschr. Verdaungs- u. Stoffwechselkr.*, 1955, **15,** 198–210. [2. Med. Klin., Univ. Munich.]

A method of ascending paper chromatography, suitable for the clinical laboratory, for detecting small amounts (a few micrograms) of sugars other than glucose in blood and urine is described in detail. The solvents used were a mixture of phenol and glacial acetic acid, which gives good separation of glucose and fructose, or one of ethyl acetate, pyridine and water, which is less good for separating glucose and fructose but more effective for many other sugars; and for development, ammoniacal silver nitrate, triphenyltetrazolium chloride, benzidine or naphthoresorcinol. Rough but not exact estimation of the amounts present was possible.

Fructose was generally detected in the blood of healthy persons and, in some, lactose, inositol, a substance believed to be galacturonic acid, and rapidly moving substances believed to be pentoses. All were more prominent in the blood of diabetic persons. Only traces of substances giving sugar reactions were found in normal urine. The findings tabulated for the urine of 37 diabetic persons showed that most contained fructose, inositol and the supposed glucuronic acid and pentoses, and the amounts tended to be higher in those with severer glycosuria.—W. M. Deans.

1975

ZICKEFOOSE, J., HARDIN, R. C., TUTTLE, W. W., DAUM, K. and SALZANO, J. **Effect of breakfast and source of protein on blood sugar level of patients with diabetes.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 1016–1019. [Dept. Nutrit., State Univ. Iowa Coll. Med., Iowa City.]

Twelve diabetic patients of both sexes between the ages of 29 and 81 years, who were maintained on NPH insulin and a daily intake of about 1800 Cal. from 200 g. carbohydrate, 90 g. protein and 80 g. fat, were given breakfasts containing 25 g. protein of either animal or plant origin on 3 consecutive mornings; blood sugar was estimated before the third breakfast and every ½ hr. after it for 3½ hr.

After both types of breakfast the blood sugar was significantly above the fasting level for 2½ hr. At 3 hr. the blood sugar had returned to a level not significantly different from the fasting level. It is concluded that proteins of animal and plant origin have an almost identical effect on blood sugar in diabetes.—G. F. Garton.

1976

WENDEROTH, H. Diabetes und Eiweisshaushalt. [**Diabetes and protein metabolism.**] *Deutsch. Ztschr. Verdaungs- u. Stoffwechselkr.*, 1955, **15,** 222–228. [1. Med. Klin., Univ. Hamburg-Eppendorf.]

A lecture review.

1977

ARDY, C. and MONTINI, T. Influenza del lievito sulla funzionalità epatica del diabetica. [**Effect of yeast on hepatic function in diabetes.**] *Arch. Fisiol.*, 1955, **54,** 348–355. [Ist. Fisiol., Univ. Genoa.]

Ten moderately severe diabetics stabilised with insulin were given 10 g. dried yeast twice daily for 30 days. After treatment there was lower fasting blood sugar, less sugar in the urine, and less total fat, total and esterified cholesterol and bilirubin in the blood. There was improvement in the results of the liver function tests and increase in the phospholipins in the blood. When the blood sugar curve was recorded for 3 hr. after administration of glucose, it rose less high after administration of yeast.—E. M. Hume.

1978

LUKENS, F. D. W. **Experimental diabetes and its relation to diabetes mellitus.** *Amer. J. Med.*, 1955, **19,** 790–797. [Philadelphia, Pa.]

A short review with 39 references.

1979

VARTIAINEN, I. and TELKKÄ, A. **Experiments in feeding normal rats on diets selected by diabetic**

rats. *Ann. Med. int. Fenn.*, 1955, **44**, 165–170. [2. Med. Clin., Univ. Helsinki.]

Five groups of rats were given diets containing, per cent., sucrose 80, or sucrose 10 and lactose 20, or lactose 30, or the diet high, and one of those low, in carbohydrate in alternate weeks. The high-sucrose diet was that previously selected by normal rats, and the one of lower carbohydrate content was that selected by rats with alloxan diabetes. In the present experiment the diets were given for 16 months, at the end of which no histological difference could be demonstrated in the pancreas, liver, kidneys, adrenal, thyroid and crystalline lens of the different groups. A further group which received 80 per cent. lactose in the diet developed cataract within 7 months. No sulphydryl compound could be demonstrated histochemically in the lenses of the rats on high lactose intake.—A. M. Copping.

1980

FABRYKANT, M. (with ALLEN, J. F.) **The problem of functional hyperinsulinism or functional hypoglycemia attributed to nervous causes. 1. Laboratory and clinical correlations. 2. Dietary and neurogenic factors. Diagnostic and therapeutic suggestions.** *Metabolism*, 1955, **4**, 469–479; 480–490. [Dept. Med., Post-Grad. Med. Sch., Univ. New York.]

1. Oral glucose tolerance tests were made on 50 patients who presented the clinical picture of hypoglycaemia of nervous origin. In 58 tests, low blood sugar curves were recorded in 29, that is, low or normal initial rise, normal peaks and a fall to below 60 mg. per 100 ml. Normal curves were found in 6, and initially high curves in 23. None of the subjects with initially high curves and high peaks had clinical evidence of diabetes. In 31 of the 50 patients there was clinical diagnosis of conditions which could account for the hypoglycaemic symptoms; 9 had hypothyroidism. The clinical symptoms of the patients were reproduced in 29 out of 39 tests on these 31 subjects and in only 8 out of 19 tests on subjects without other conditions thought to predispose to the symptoms. In 6 patients who had 2 tests without a change of diet, 2 complained of symptoms in one test, but had only non-specific symptoms in the other. The extent of the fall of blood sugar during the tests was not related to the clinical condition.

It is concluded that functional hypoglycaemia attributed to nervous causes is not a clinical entity.

2. Low-carbohydrate diets with high protein and adequate fat were given to 3 of the patients discussed above, and to one with grand mal epilepsy but no spontaneous hypoglycaemic symptoms. Falls of blood sugar to below 50 mg. per 100 ml. were found in 3 out of 5 tests; in one patient the fall was greater than after a carbohydrate-rich diet.

In most patients of the series of 50, diets providing 50 to 100 g. carbohydrate, 120 to 140 g. protein and enough fat to cover energy needs produced an improvement in clinical complaints, but usually other treatment, especially sedation, was needed also.

The origin of the condition is discussed. It is concluded that the terms "functional hyperinsulinism" and "functional hypoglycaemia of nervous origin" should be dropped and that patients with these symptoms should be studied until the etiology of the complaint is more clearly defined. Treatment recommended includes frequent meals, high-protein diet, sedation, treatment of associated conditions and, where necessary, psychotherapy or surgery for suspected islet tumours.—D. Duncan.

1981

CONN, J. W. and SELTZER, H. S. **Spontaneous hypoglycaemia.** *Amer. J. Med.*, 1955, **19**, 460–478. [Div. Endocrinol., Med. Sch., Univ. Michigan, Ann Arbor.]

A review with 141 references and illustrative case histories.

1982

HÖPKER, W. Das Verhalten der Blutketone in der protrahierten Hypoglykämie bei Ratten. [**Behaviour of blood ketones in prolonged hypoglycaemia in rats.**] *Ztschr. ges. exp. Med.*, 1955, **126**, 235–243. [Diabetesforschungsinst. Karlsburg, Greifswald.]

Ten rats fasted for 18 to 27 hr. received up to 1 unit insulin per 100 g. bodyweight, and 3 rats received twice this dose. When the rats died in hypoglycaemic coma, blood sugar and acetone and liver-glycogen were estimated. Other rats were killed after fasting for 15 to 30 hr. or after large doses of alloxan.

Normal rats had 1·2 to 2·0 mg. acetone per 100 ml. blood. The values rose during fasting, reaching 3 times the normal after 30 hr. Blood sugar was about normal and liver glycogen low. After insulin, acetone values were about normal, blood sugar extremely low and liver glycogen low. In rats which died in diabetic coma within 24 hr. after their last injection of alloxan, blood sugar was very high, and so was blood acetone, but in alloxan-resistant rats acetone did not rise. Acetone values were 10 or 20 times as high in diabetic coma as in hypoglycaemic coma.

It is concluded that the sugar supply of the sugar-sensitive centres is responsible for the occurrence of ketosis.—D. Duncan.

1983

PARK, C. R. and JOHNSON, L. H. **Effect of insulin on transport of glucose and galactose into cells of rat muscle and brain.** *Amer. J. Physiol.*, 1955, **182,** 17–23. [Dept. Physiol., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

Rats were eviscerated to eliminate insulin secretion and were then given a continuous infusion of glucose at rates of from 0·3 to 9·0 mg. per g. bodyweight hourly, with or without insulin. Insulin greatly accelerated the utilisation of glucose. Free glucose in the muscles was always low in proportion to blood glucose, but was higher, both absolutely and relatively, with insulin than without. Glucose accumulated similarly in the muscle of intact and of alloxan-diabetic rats given insulin.

In eviscerated rats infused for 25 min. with galactose, insulin increased the rate of disappearance of galactose from the blood; galactose concentration was increased in muscle, but not in brain. When galactose was infused for 135 min. there was still an effect of insulin in muscle; galactose reached high concentrations in the brain whether insulin was given or not.

In muscle, glucose and galactose were mainly extracellular without insulin, intracellular with it. Brain galactose was always to a large extent intracellular. It is concluded that insulin accelerates the passage of glucose and galactose across cell membranes in muscle, but not in brain.

D. Duncan.

1984

RECANT, L. **Recent developments in the field of glycogen metabolism and the diseases of glycogen storage.** *Amer. J. Med.*, 1955, **19,** 610–619. [Dept. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

A review with 50 references.

1985

NICHOLS, N. **The effect of glycogen deposition on liver phosphorus.** *J. Clin. Invest.*, 1955, **34,** 1710–1718. [Baker Clin. Res. Lab., New England Deaconess Hosp., Boston, Mass.]

There were 15 rabbits in the experiment: 4 were normal, 3 had received cortisone, 8 were alloxan-diabetic and 5 of these had also had cortisone, 7·5 mg. [*sic*] for 16 to 18 days.

The livers of cortisone-treated rabbits, normal or diabetic, were large and contained much glycogen. As the glycogen content rose the total phosphate and N fell, water and K remained relatively constant, and differences in Na and Cl were not related to glycogen. Apart from the blood sugar in diabetic rabbits, all serum values were normal. The correlation between increasing glycogen and falling total P was highly significant.

It is concluded that there is no uptake of phosphate by the liver during deposition of glycogen and that the fall in serum inorganic P during infusion of glucose is probably associated with peripheral utilisation of glucose.—D. Duncan.

See also Absts. 1793, 2006, 2121, 2122, 2169–71, 2222, 2327, 2402, 2433.

PROTEINS AND PROTEIN DERIVATIVES

1986

NAGL, F. Zum Problem der Eiweissbilanz. [**The problem of protein balance.**] *Wien. klin. Wochenschr.*, 1955, **67,** 729–730. [Med. Abt., Städt. Krankenhaus, Vienna, Floridsdorf.]

The relation between serum protein and protein metabolism in the digestive tract is discussed.

1987

NAKAMURA, T. and INOKUCHI, T. **On the relation between N in foods and N in urine. (On the sense of protein requirement.)** *Wakayama Med. Rep.*, 1955, **2,** 75–87. [Lab. Osaka Nat. Sanatorium.]

From balance experiments with 3 patients with pulmonary tuberculosis an equation relating intake of N to output in urine has been calculated:

$$y = 16/(e^{-(x-90)/25} + 1) + 4,$$

where y is g. N excreted in urine and x is g. N ingested in food daily.

The experiments are discussed in relation to minimum and recommended allowances of protein, 40 and 160 g., respectively.—D. Harvey.

1988

PATRICK, R. M., BEAMER, K. C. and MOSCHETTE, D. S. **Metabolic studies with pre-adolescent girls. 3. Nitrogen retention.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 1010–1015. [Dept. Home Econ., Louisiana Agric. Exp. Stat., Baton Rouge.]

For part 2 see Abst. 3747, Vol. 25.

N intake, excretion, absorption and retention were estimated for 6 healthy girls, 5 aged from 8 to 9 years and 1 aged 11 years, during a study lasting 56 days when the diet was controlled. Data were obtained for 8 periods; in 6 animal protein was excluded from the breakfast and in the other 2 fat-free milk was used. The diet was such that utilisation of carotene could be studied.

Samples of food, urine and faeces were collected and analysed for N.

Results for the 5 younger girls and the 11-year-old girl, respectively, were: mean daily total N intake 9·98 and 12 g.; protein intake 62·4 and 75 g.; protein intake per kg. bodyweight from 2·29 to 2·66 g. and 2·25 g.; N intake per sq. m. body surface 9·99 to 10·95 and 10·34 g.; total N excretion 82 and 82 per cent. of intake; urine N 7·28 and 9·79 g.; faecal N 0·77 and 0·56 g.; correlation coefficient between dry weight of faeces and faecal N, 0·807; absorption of N 92·3 and 95·3 per cent.; correlation between N intake and absorption per kg. bodyweight 0·965; N retention 1·93 and 1·64 g. or 19·4 and 13·7 per cent.; correlation between N intake and retention per kg. bodyweight 0·759. There was no significant effect of milk protein on mean retention of N.

G. F. Garton.

1989

HOLEMANS, K. and LAMBRECHTS, A. (with MARTIN, H.) **Nitrogen metabolism and fat absorption in malnutrition and in kwashiorkor.** *J. Nutrition*, 1955, **56,** 477–494. [Feshi, Belgian Congo.]

The results are tabulated for short-term balance experiments, 44 in all, on 26 children and 3 adults; 28 were on patients with kwashiorkor, 15 on others with chronic malnutrition and 1 was on a normal child. The findings for N are in 5 groups according to intake in mg. per kg. bodyweight in 24 hr. at intervals of 100 mg.; the numbers of subjects in these groups, irrespective of age or disease, and the means for intake and percentage retention were: 7, 169, 23; 14, 252, 49; 7, 346, 39; 7, 444, 60; and 9, 884, 54. On only 2 occasions was a balance negative. Two diets were used, one predominantly animal and the other vegetarian in respect of source of N; the averages for percentage N retained from these, 49 and 54, respectively, did not differ significantly. The evidence was that faeces contained about 30 mg. metabolic N per kg. daily.

Clinical steatorrhoea was thought not to be present, but from chemical analyses fat absorption was 80 per cent. on the average, which is below the usual, 95 per cent., in children.

The high N retention in these subjects is accounted for, probably, by relatively long subsistence on an intake of N insufficient to maintain the protein in their tissues at a normal level.

D. Harvey.

1990

FORSYTH, B. T., SHIPMAN, M. E. and PLOUGH, I. C. (with HACKLEY, B. and FRYAR, A.) **The relation of nitrogen retention to nitrogen intake in adults with post-traumatic malnutrition.** *J. Clin. Invest.*, 1955, **34,** 1653–1661. [Med. Div., Dept. Metabol., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington 12, D.C.]

The 13 subjects were severely injured soldiers. All except one were on liquid diet. As protein intake was varied energy intake and the carbohydrate : fat ratio in the diet were kept constant. Balance periods were sufficiently long to allow for re-equilibration of N metabolism after changes in intake. Faecal N was estimated in all studies. The losses of bodyweight, lean bodyweight and body fat after injury were estimated.

N retention was directly related to N intake. With N intakes ranging from 0·16 to 0·85 g. per kg. daily no loss of efficiency in N utilisation was evident at the higher intakes. Non-protein energy intake had little influence on N retention, and there was no relation between estimated loss of lean bodyweight and rate of N storage.—F. C. Aitken.

1991

SUBRAHMANYAN, V., NARAYANARAO, M., RAMARAO, G. and SWAMINATHAN, M. **The metabolism of nitrogen, calcium and phosphorus in human adults on a poor vegetarian diet containing ragi (*Eleusine coracana*).** *Brit. J. Nutrition*, 1955, **9,** 350–357. [Central Food Technol. Res. Inst., Mysore.]

Eight healthy men who were normally active were given a poor vegetarian diet based on ragi for 12 days; urine and faeces were collected during the last 5 days for estimation of total N, Ca and P. The composition of the diet was similar to that eaten by the poorer people in Mysore State. Food was analysed for total N, Ca and P and phytate P was estimated in food and faeces.

All the subjects maintained positive N balance; average daily N intake and retention were 10·6 and 1·1 g., respectively. Average daily excretion of N in faeces was 5·5 g.; apparent digestibility of the proteins from the diet was 50 per cent. Average daily intake and retention of Ca were 3·4 and 0·1 g., respectively; all the subjects maintained positive Ca balance. Average daily intake and retention of P were 2·3 and 0·2 g., respectively; all the subjects maintained positive P balance. Average daily intake of phytate P was 1·8 g., about 80 per cent. of the total P. Average daily excretion of phytate P in faeces was 0·3 g. About 85 per cent. of the phytate P ingested was hydrolysed during digestion.—G. F. Garton.

1992

DICKINSON, C. D. and SCOTT, P. P. **Preliminary observations on the protein requirements of kittens receiving a mixed diet.** *J. Physiol.*, 1955, **129,** 78P–79P. [Dept. Physiol., Royal Free Hosp. Sch. Med., London, W.C.1.]

1993

MILLER, D. S. and BENDER, A. E. **The determination of the net utilization of proteins by a shortened method.** *Brit. J. Nutrition*, 1955, **9**, 382–388. [Crookes Laboratories, Ltd., Park Royal, London, N.W.10.]

Of 8 groups, each of 2 male and 2 female rats, one was given a protein-free diet and each of the others a different test-protein diet for 10 days, after which the intakes of food and N were calculated. The animals were killed and body water was estimated; the N content of the bodies was calculated from the water content by the formula $\log(4{\cdot}8 - y) = 0{\cdot}437 - 0{\cdot}0123x$, in which $y = \mathrm{N}/\mathrm{H_2O}$(in g.) $\times$ 100 and x = age in days. The net protein utilisation was calculated from the expression

$$\frac{\text{Body N of test group} - \text{Body N of no-protein group} + \text{N consumed by no-protein group}}{\text{N consumed by test group}}.$$

The net protein utilisation values of 26 proteins were calculated by this method and results showed good agreement with values reported in the literature. The biological value could be calculated from the net protein utilisation value by dividing by the digestibility. A method for estimating the limiting amino-acid in a given protein is described.

G. F. Garton.

1994

CALLOWAY, D. H. and SPECTOR, H. **Nitrogen utilization during caloric restriction. 1. The effect of dietary fat content. 2. The effect of variation in nitrogen intake. 3. The effect of preceding diet.** *J. Nutrition*, 1955, **56**, 533–544; 545–554; **57**, 73–88. [Quartermaster Food and Container Inst. Armed Forces, Chicago, Ill.]

1. Male rats were given a stock diet for 2 weeks; intake was controlled to maintain bodyweight at 300 g. Eight animals were then killed for carcase and liver analysis while 13 groups, each of 6 rats, received for 4 days diets with egg albumin or milk proteins containing either 30 or 5 per cent. fat at 3 levels of energy intake, 100, 50 or 25 per cent. of the maintenance energy requirement, which, under the conditions of this study, was found to be 46 Cal. daily. The rats were then killed and livers and carcases were analysed for N and fat.

Bodyweight loss was inversely proportional to energy intake and unaffected by the composition of the diet. All the groups which had a restricted energy intake were in negative N balance; egg albumin was slightly superior to milk proteins for promoting N equilibrium, but the fat content of the diet had no effect. Qualitative changes in composition were similar in both liver and carcase, but the changes were greater in the liver. Losses of N content were least in the groups given the full diet, greater and about equal in the groups given 50 and 25 per cent. of the maintenance energy requirement and greatest in one group which was fasted. The fat content was directly proportional to energy intake. There was no consistent relation between tissue losses and the fat content of the diet or the source of protein.

2. Male rats were standardised for 2 weeks in 3 series on a stock diet, a complete 18 per cent. casein diet, or stock diet for 2 days and 18 per cent. casein diet for 12 days. Five or 6 animals from each series were killed for tissue analysis. During the next 4 days groups of 5 or 6 rats from each series were given egg albumin diets which supplied 50 per cent. of the previous energy intake and graded amounts of N which ranged from 0 to 604 mg. per day. N utilisation was measured by N balance and by alteration in liver N content.

The loss of N was inversely proportional to the N intake; positive balance was not attained by any group. N utilisation diminished as N intake increased, from 52 to 61 per cent. at 70 to 80 mg. daily to 17 per cent. at 604 mg. There was no significant correlation between liver N loss and N balance.

3. A commercial stock diet, the same diet diluted with sucrose to reduce the protein content to that of an 18 per cent. casein diet, a casein diet with the same composition as the commercial diet, and a purified diet containing 18 per cent. casein were given to weanling rats for 2 weeks, followed by 12 days when energy intake was reduced by 50 per cent. by a diet of egg albumin. Groups of 8 rats were killed after standardisation and after 4, 8 and 12 days of restricted energy intake. In the second experiment, 6 groups each of 6 rats were given diets supplying 160, 275 or 455 mg. N as egg albumin or soya bean globulin; one group received a casein diet and another a protein-free diet for 2 weeks, followed by 4 days when energy intake was reduced by 50 per cent. and all groups received the egg albumin diet. In the third experiment the rats were given the commercial diet for 10 days; groups of 6 animals were then maintained for 2 weeks on diluted commercial diet, methionine-supplemented army ration, casein diet or egg albumin diet; the diets given during the following 4-day restriction period contained either egg albumin or a mixture of casein and lactalbumin. N balance and liver composition were estimated in all groups, and plasma protein and carcase composition were estimated in the prolonged restriction study.

During restricted energy intake bodyweight loss was significantly greater in animals given the unmodified commercial diet than those given any of the other diets. Also, during restriction, the negative N balance was directly proportional to the N intake during standardisation; although

this effect was greatest where egg albumin was the previous protein source, the variation due to level was smallest. N balance was not significantly affected by protein source during restriction. Liver N losses were correlated with the initial N content of that organ. No correlation was found between loss of liver N and N balance, though changes in carcase N agreed with balance data.—G. F. Garton.

1995

HORN, E. H. **Nutritional and hormonal influences upon reproductive maturation, organ weights and histochemistry of the immature male rat.** *Endocrinology*, 1955, **57**, 399–408. [Bur. Biol. Res., Rutgers Univ., New Brunswick, N.J.]

In all 179 rats 22 to 23 days old and weighing 42 to 49 g. were caged in fours. Controls received a diet with 18 per cent. casein, and the experimental diets contained 6 per cent. or no casein, the casein being replaced by starch. All except control rats were depleted on the protein-free diet for 30 days, and groups were then continued on this diet or repleted for 10, 20 or 30 days with 6 or 18 per cent. casein diets. Three groups repleted on 18 per cent. casein received thyroxine for the first 10, the second 10 or all 20 days of repletion. Organs and tissues were weighed and studied histologically at the end.

Depleted rats lost 25 per cent. of their body-weight in 30 days. Those continued on the protein free diet lost more weight and most of them died. Repletion with 6 per cent. casein for 30 days permitted the rats to regain their initial weight, and those given 18 per cent. casein put on another 103 g. and grew as rapidly as controls.

Testes lost weight during depletion, but no permanent harm was done and the lost growth was partly made up during repletion with the full diet. At the end of repletion spermatozoa were present in only 25 per cent. of the rats given 6 per cent. casein, and in 70 per cent. of those given 18 per cent. casein. In rats given thyroxine, 88 per cent. of the testes had spermatozoa after only 20 days. Lipid was present in the tubules after depletion.

Accessory sex organs only partly recovered lost weight on the full diet, and failed to recover it with only 6 per cent. protein. Lipid was deposited in liver and adrenals during depletion and only partly disappeared during recovery.—D. Duncan.

1996

VIJAYARAGHAVAN, P. K. **The haemopoietic activity of some food proteins.** *Indian J. Med. Res.*, 1955, **43**, 569–574. [Biochem. Lab., Univ. Madras.]

Eighteen groups, each of 6 young rats, were given different experimental diets for 4 days, after which anaemia was induced by a single intraperitoneal injection of phenylhydrazine hydrochloride. The composition of the basal diet was tapioca starch 65 to 75, butterfat 8, sugar 8 and salt mixture 4 parts; 6 proteins, namely, casein, egg albumin, meat protein, liver protein, wheat gluten and rice protein, were added to the diet at different levels in the different experiments; food and water were provided to appetite. Red blood cell counts and Hb estimations were made once in 4 days, and the time taken for the recovery of initial levels of these 2 criteria from the stage of severe anaemia was used for comparison of the efficiency for blood formation of the proteins studied.

At all levels studied animal proteins gave more rapid gains in red cells and Hb than vegetable proteins. The rate of regeneration of both red cells and Hb rose with the level of protein in the diet. The results showed that abrupt increases in Hb formation occurred at certain levels of intake when casein was used as the protein supplement; when the casein in the diet was raised from 5 to 15 per cent. the increase in Hb was raised from 56 to 75 per cent., and with an increase in casein from 30 to 35 per cent. the increase in Hb was raised from 90·6 to 97·1 per cent.; but when the protein intake was increased from 15 to 20 per cent. the increase in Hb formation was not significant. The level at which N equilibrium was produced by a protein did not provide an index of its efficiency in blood formation.—G. F. Garton.

1997

FINK, H. and HEROLD, E. Über die biologische Eiweissqualität von einzelligen Algen. Zugleich ein Beitrag zur alimentären Lebernekrose der Ratte und zur Therapie tropischen Eiweissmangelkrankheiten. [**Biological value of the protein of unicellular algae. A contribution on alimentary liver necrosis of the rat and the treatment of protein deficiency in the tropics.**] Über die Eweissqualität von einzelligen Algen und von jungen Grünblatt höherer Pflanzen. Zugleich ein Beitrag zur alimentären Lebernekrose der Ratte und zur Therapie tropischen Eiweissmangelkrankheiten. [**On the protein value of unicellular algae and of young green leaves of higher plants. A contribution on alimentary liver necrosis of the rat and the treatment of protein deficiency in the tropics.**] *Naturwissenschaften*, 1955, **42**, 516; 516–517. [Inst. Gärungswiss., Univ. Cologne.]

A more stringent test than before (see Abst. 4752, Vol. 24), in which 92 per cent. of the digestible protein of the diet of growing albino rats was supplied by dried unicellular algae (*Scenedesmus obliquus*), and the remaining 8 per cent. by brewer's yeast to supply B vitamins, confirmed the previous finding that algal protein was at least as good as milk protein for growth, and liver necrosis did not occur. This is considered to dispose of the idea

that animal protein is superior to vegetable. The algal diets were readily eaten. If the material can be made palatable for man, it should prove useful in the treatment of protein deficiency disorders of the tropics.

Commercial dried alfalfa meal was not so good as algal protein, but freshly gathered spinach from different regions, cooked in the usual way and given with its juice, was comparable to egg white and milk protein, and again there was no liver necrosis.—W. M. Deans.

1998

BAUMAN, A., ROTHSCHILD, M. A., YALOW, R. S. and BERSON, S. A. **Distribution and metabolism of I^{131} labeled human serum albumin in congestive heart failure with and without proteinuria.** *J. Clin. Invest.*, 1955, **34,** 1359–1368. [Radioisotope Serv., Veterans Admin. Hosp., Bronx, N.Y.]

Ten patients with heart disease, 5 of whom had proteinuria, and 10 without heart disease, 2 of whom had proteinuria, were given radio-active albumin free of rapidly degraded components. Solutions of albumin containing 85 to 115 μC of ^{131}I and 1 to 10 mg. protein were given intravenously. The uptake of ^{131}I by the thyroid was inhibited by 10 drops of Lugol's solution daily. Blood samples were taken 15 min. and 2, 6, 24, 30 and 48 hr. after the injection and daily for the next 25 to 35 days. Daily collections of urine were made and serum albumin was estimated weekly.

In 6 of the 7 patients with proteinuria, the amount of albumin degraded was less than in patients with no proteinuria. The amount of albumin synthesised was about the same as in subjects with no proteinuria. One patient with myxoedema but no proteinuria had the highest amount of exchangeable albumin, the largest extravascular fraction of total exchangeable albumin and the lowest rate of albumin synthesis. It is concluded that there is no obvious impairment of albumin synthesis or albumin stores in patients with congestive heart failure. The fall in serum albumin which may occur in heart failure may be related to increase in plasma volume.

B. W. Simpson.

1999

BLAHD, W. H., FIELDS, M. and GOLDMAN, R. **The turnover rate of serum albumin in the nephrotic syndrome as determined by I^{131}-labeled albumin.** *J. Lab. Clin. Med.*, 1955, **46,** 747–756. [Radioisotope Unit, Wadsworth Hosp., Veterans Admin. Centre, Los Angeles, Calif.]

In 3 out of 4 men with the nephrotic syndrome there was a high rate of turnover of serum albumin. Total exchangeable albumin was low, and so was circulating albumin. Albumin production was increased by a high protein intake and declined when protein intake was low and N balance negative.—D. Duncan.

2000

BENSON, J. A. (Jr.), KIM, K. S. and BOLLMAN, J. L. (with VAN HOOK, E.). **Extravascular diffusion of protein.** *Amer. J. Physiol.*, 1955, **182,** 217–220. [Sect. Biochem., Mayo Found., Rochester, Minn.]

Cannulae were inserted for collection of intestinal and hepatic lymph from rats and of hepatic, intestinal and hind-leg muscle lymph from rabbits. Human serum albumin labelled with ^{131}I was given by vein to the rabbits.

In intestinal lymph of rats output of protein was fairly constant, mean 122·3 $\pm$ 5·7 mg. per 100 g. bodyweight daily. The concentration varied inversely with rate of flow. In hepatic lymph the concentration of protein was about twice that in intestinal lymph and again was inversely related to rate of flow. In the rabbits the time required for the specific activity of plasma albumin to become identical with that for albumin from muscle, intestinal and hepatic lymph was about 25, 13½ and 4½ hr., respectively. Analysis of plasma and lymphs for total protein, albumin and globulin showed that it was in muscle lymph, in which exchange was slowest, that concentrations of albumin and globulin were least.—D. Harvey.

2001

HEGSTED, D. M., TRULSON, M. F., WHITE, H. S., WHITE, P. L., VINAS, E., ALVISTUR, E., DIAZ, C., VASQUEZ, J., LOO, A., ROCA, A., COLLAZOS CH., C. and RUIZ, A. **Lysine and methionine supplementation of all-vegetable diets for human adults.** *J. Nutrition*, 1955, **56,** 555–576. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

N intake and excretion were studied in young women, student dietitians at a hospital in Lima, Peru, during 3 experiments in which vegetable diets were eaten. The experiments were each divided into 3 periods, 3 to 7 days of depletion, when the vegetable diet low in total protein was eaten, and two 5-day periods when the subjects were given supplements of lysine, methionine or glycine. The N balance for each subject was estimated during the last 2 periods. The essential amino-acid content of the diets was estimated microbiologically; the basal diet, which supplied 25 g. protein daily, 48 per cent. from wheat products and 62 per cent. from cereals, contained all the essential amino-acids in quantities equalling or exceeding estimated minimum requirements.

Supplementation of the basal diet with lysine improved N retention and methionine plus lysine improved it further. It is emphasised that the

proteins of fruits and vegetables may be an important supplement to cereal proteins.

G. F. Garton.

2002

ROSE, W. C., EADES, C. H. (Jr.) and COON, M. J. **The amino acid requirements of man. 12. The leucine and isoleucine requirements.** *J. Biol. Chem.*, 1955, **216,** 225–234. [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

For part 11 see Abst. 695, Vol. 26.

N balance experiments with 5 normal young men showed that their minimum daily requirements of L-leucine were 0·50, 0·50, 0·70, 0·70 and 1·10 g. There was no correlation between minimum needs and bodyweight, body surface or creatinine output. Little, if any, D-leucine was utilised. The minimum daily requirements of DL-*iso*leucine of 4 young men were 1·40, 1·40, 1·40 and 1·30 g. As the D-isomer was not utilised, the minimum daily requirements of L-*iso*leucine were taken as half these values. The highest values, 1·10 g. L-leucine and 0·70 g. L-*iso*leucine, were tentatively designated as the minimum daily requirements of man, and twice these quantities were considered a safe daily intake.—A. Hepburn.

2003

ROSE, W. C. and WIXOM, R. L. **The amino acid requirements of man. 13. The sparing effect of cystine on the methionine requirement.** *J. Biol. Chem.*, 1955, **216,** 763–773. [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

The daily methionine requirement of 3 healthy young men in the absence of dietary L-cystine was shown by N balance experiments to be 0·9, 1·0 and 0·8 g. With an intake of 0·81 g. cystine the methionine requirement was reduced to 0·1, 0·2 and 0·1 g. When methionine was completely excluded from the diet there was negative N balance and one man suffered from loss of appetite, nervous strain and vomiting. Another had similar symptoms when both cystine and methionine were omitted.—A. Hepburn.

2004

ROSE, W. C. and WIXOM, R. L. **The amino acid requirements of man. 14. The sparing effect of tyrosine on the phenylalanine requirement.** *J. Biol. Chem.*, 1955, **217,** 95–101. [Noyes Lab. Chem., Div. Biochem., Univ. Illinois, Urbana.]

See also Abst. 5243, Vol. 25.

Two young men were maintained in positive N balance by 0·8 and 1·0 g. L-phenylalanine, respectively. This could be reduced to 0·2 and 0·3 g. when 0·88 and 1·1 g. L-tyrosine was given also.

A. Hepburn.

2005

DALGLIESH, C. E. **Excretion of conjugated 2-amino-3-hydroxyacetophenone by man, and its significance in tryptophan metabolism.** *Biochem. J.*, 1955, **61,** 334–337. [Postgrad. Med. Sch., Ducane Rd., London, W.12.]

A substance with a strong blue fluorescence, found in a study of aromatic metabolites in the urine of patients with leucaemia or anaemia, was identified by chromatography and subsequent synthesis as 2-amino-3-hydroxyacetophenone. The possible derivation of the substance from tryptophan is discussed and theoretical evidence is presented to show that it could be formed by hydrolytic scission of the side-chain of hydroxykynurenine.—A. M. Copping.

2006

WOMACK, M. and MARSHALL, M. W. **Starches, sugars and related factors affecting liver fat and nitrogen balances in adult rats fed low levels of amino acids.** *J. Nutrition,* 1955, **57,** 193–202. [Human Nutrit. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Washington, D.C.]

In 7 experiments N balance was studied on male rats which had been maintained on a stock ration to appetite from weaning until 91 to 105 days old. In one experiment, 7 groups of rats were depleted of protein on N-free diets containing either sucrose, maize, dextrin, raw maize starch or one of 4 cooked starches, namely, maize, potato, rice and wheat starches, then given corresponding diets with an amino-acid mixture added; all the rats in the remaining 6 experiments, except 2 groups, were depleted of protein on N-free diets containing sucrose and then given different diets with added amino-acids; the 2 exceptional groups were depleted on N-free diets containing wheat starch or maize dextrin. After the N balance studies, which were made during the last 7 days of an 18-day protein-depletion period, and, after a week of adjustment, during 2 consecutive 7-day periods of amino-acid diets, the livers of the animals were removed for estimation of fat, protein and moisture.

Liver fat was less and negative N balances were smaller in the protein-depleted rats which received extra threonine, maize, rice or wheat starch or maize dextrin than in the rats given diets containing sucrose and low levels of amino-acids. The type of carbohydrate given during depletion had no effect on the results. Substitution of potato starch or glucose for sucrose reduced liver fat but did not improve N balance. The addition of nicotinic acid, methionine, cellu flour or sulphasuccidine or substitution of fructose for sucrose did not change the liver fat contents or N balances from those of the rats given sucrose. When the essential amino-acid intake of rats receiving

sucrose, glucose or fructose was doubled the liver fat content was reduced to normal or nearly normal.
G. F. Garton.

2007

GULLINO, P., WINITZ, M., BIRNBAUM, S. M., CORNFIELD, J., OTEY, M. C. and GREENSTEIN, J. P. **The toxicity of individual essential amino acids and their diastereomers in rats and the effect on blood sugar levels.** *Arch. Biochem. Biophys.*, 1955, **58,** 253–255. [Lab. Biochem., Nat. Cancer Inst., Bethesda, Md.]

The 10 amino-acids essential to the rat, L-*alloiso*-leucine and L-*allo*threonine were given separately to rats by intraperitoneal injection and their toxicity was studied. The D-isomers were less toxic than the L-isomers, except that both isomers of arginine were about the same. All the rats developed dyspnoea and hypothermia. Threonine, *allo*threonine and valine produced severe spastic muscular contractions; lysine and arginine produced coma and muscular relaxation. Degenerative lesions were not peculiar to any organ, but liver and kidneys were most damaged. All the rats had high blood sugar initially, but they died with conditions ranging from very high blood sugar after lysine to low blood sugar after valine, the leucines, phenylalanine, methionine or tryptophan.—A. Hepburn.

2008

GULLINO, P., WINITZ, M., BIRNBAUM, S. M., OTEY, M. C., CORNFIELD, J. and GREENSTEIN, J. P. **The toxicity of essential amino acid mixtures with special reference to the protective effect of L-arginine.** *Arch. Biochem. Biophys.*, 1955, **58,** 255–257. [Lab. Biochem., Nat. Cancer Inst., Bethesda, Md.]

The intraperitoneal administration to rats of a mixture of 9 of the essential amino-acids killed almost all of them, but mortality was reduced to 24 per cent. when the other amino-acid, arginine, was included in the mixture.—A. Hepburn.

2009

GREENSTEIN, J. P., WINITZ, M., GULLINO, P. and BIRNBAUM, S. M. **The prevention of ammonia toxicity by L-arginine and related compounds.** *Arch. Biochem. Biophys.*, 1955, **59,** 302–303. [Lab. Biochem., Nat. Cancer Inst., Nat. Inst. Health, Bethesda, Md.]

When L-arginine was administered to rats 60 to 90 min. before a usually lethal dose of ammonium acetate they all survived. Arginine given 4 hr. before the ammonium salt had negligible effect. D-Arginine and L-ornithine were protective, but less so than L-arginine. Acetyl-L-arginine, L-histidine, L-lysine and L-threonine were not protective.
A. Hepburn.

2010

HARADA, M. and HORIGUCHI, G. **Bone and nutrition (secondary report): experimental studies on the effect of essential amino acid to bony tissue with special reference to the effect of tryptophan.** *Wakayama Med. Rep.*, 1955, **2,** 103–114. [Dept. Orthopaed. Surg., Wakayama Med. Coll.]

Rats weighing 50 to 70 g. were given a basal diet of 9 parts on dry basis of boiled potato and 1 part boiled sardine, or synthetic diets containing casein as the only protein (tryptophan-deficient) or with 0·1 or 0·5 per cent. added tryptophan.

The rats deprived of tryptophan showed in the bones thin epiphyseal plates with flattened undifferentiated cartilage cells and early calcification of hypertrophic cartilage cells, not seen in rats on a restricted intake of basal diet. Those given excess tryptophan showed delayed calcification of hypertrophic cells and also dense, thick spicules in the cartilage matrix.—D. Duncan.

2011

KOTAKE, Y., SHIBATA, Y., INOUYE, K. and HOTTA, Y. **On the excretion of xanthurenic acid caused by administration of tryptophan to albino rats with the hypophysis or suprarenal glands extirpated.** *Wakayama Med. Rep.*, 1955, **2,** 133–137. [Dept. Biochem., Wakayama Med. Coll.]

In rats with adrenals removed, tryptophan given by mouth decreased the output of xanthurenic acid in urine, but did not affect anthranilic acid or kynurenine. In rats with the pituitary removed, tryptophan decreased the output of all 3 substances. After either operation spots corresponding to N^1-formylkynurenine and 3-hydroxykynurenine were found on chromatograms of urine; they were not found in normal urine.
D. Duncan.

2012

SHOSH, I. Narusheniya funktzii organov pri nedostatke metionina i lizina v pitanii. [**Disturbance in the function of organs caused by deficiency of methionine and lysine in the food.**] *Vop. Pitan.*, 1955, **14,** No. 5, 16–20. [Inst. Patol., Budapest Med. Univ.]

The methionine-free diet given to 215 rats contained, per cent., gelatine 15, dried yeast 3, fat 10, cod liver oil 1, salts 4, starch 66 and tryptophan 1. Another 75 rats had similar diets, but with $\frac{2}{3}$, $\frac{1}{3}$ or $\frac{1}{2}$ as much methionine as was provided by the control diets. The lysine-deficient diet given to 38 rats contained, per cent., wheat gliadin 18, fat 10, cod liver oil 1, starch 67, salt mixture 4 and vitamins. The control diets were a stock ration and a synthetic ration containing 16 per cent. casein and 3 per cent. dried yeast, which gave good growth and no sign of disturbance.

Rats on the experimental rations failed to thrive. Pathological changes in the organs were examined. The low methionine intake produced portal, perilobular fatty infiltration in the liver and sometimes necrosis and cirrhosis. Fat infiltration was also present in lysine deficiency, but there was no cirrhosis.

The pancreas in methionine deficiency soon showed vacuolisation and damaged cells and then cystic fibrosis. This did not occur in lysine deficiency. The lungs in methionine deficiency often showed bronchiectasis and emphysema, and the elastic layer of the bronchi was found to be destroyed.

The curve of muscular contraction showed a loss of amplitude and slow reaction in deficiencies of either lysine or methionine, but no change was found histologically. The kidney in either deficiency showed hyperaemia, often degeneration and even necrosis. Changes in the ductless glands were found.—D. Duncan.

2013

McCLURE, F. J. and FOLK, J. E. **Lysine and cariogenicity of two experimental rat diets.** *Science*, 1955, **122,** 557–558. [Nat. Inst. Dent. Res., Nat. Inst. Health, Bethesda, Md.]

Work with diets containing skimmed milk powders (see Absts. 2112, Vol. 23 ; 958, Vol. 24 and 5477, Vol. 25) was continued by more intensive study of the role of lysine in the diets described in the first 2 papers. Paired rats were fed for 60 or 90 days. With the first diet DL-lysine, 2·5 g. per 100 g., greatly reduced the incidence and severity of caries. In the rest of the work, which was with the diet described in the second paper, additions of L-lysine at rates between 0·25 and 2·5 per cent. of the diet were studied ; on the average the incidence was reduced by 59 per cent. and the severity score by 83 per cent. The effects were not reproduced if other acids, L-arginine or L-histidine, or the compounds with similar structure, D-lysine, ornithine or cadaverine, were added instead of L-lysine.

The studies are being continued.—D. Harvey.

2014

CAVALLINI, D., MONDOVÌ, B. and DE MARCO, C. **The isolation of pure hypotaurine from the urine of rats fed cystine.** *J. Biol. Chem.*, 1955, **216,** 577–582. [Inst. Biochem., Univ. Rome.]

2015

MELVILLE, D. B., OTKEN, C. C. and KOVALENKO, V. **On the origin of animal ergothioneine.** *J. Biol. Chem.*, 1955, **216,** 325–331. [Dept. Biochem., Cornell Univ. Med. Coll., New York.]

In an attempt to duplicate the experiment of Heath *et al.* (Abst. 738, Vol. 24) the subject was an 8-week-old boar pig, fed since weaning on a diet of cracked maize 200, bran 100, middlings 100, meat scraps 50, bonemeal 50, oilmeal 50, NaCl 5, charcoal 5 and dried skimmed milk 25 parts. Initially the blood contained 14·5 mg. ergothioneine per 100 ml. The pig was given in the feed methionine labelled with 1 mC. ^{35}S, and 3 weeks later was anaesthetised and bled.

No radio-activity could be detected in ergothioneine obtained in crystalline form from the blood, or in the ergothioneine-containing fractions of tissue from the seminal vesicles.

In a similar experiment with a rat, no ^{35}S was detected in blood ergothioneine 17 days after 1 mC. ^{35}S had been given as methionine.

Six rats received for 3 to 5 weeks a diet containing 20 per cent. casein as the only protein, after which ergothioneine was not detectable in blood. Pairs of rats were then given 0·01, 0·05 and 0·001 per cent. pure ergothioneine in the diet. Blood ergothioneine rose to 4 mg. per 100 ml. in 2 weeks and 8 mg. per 100 ml. in 4 weeks in the rats given 0·01 per cent., and to 1 mg. per 100 ml. in 8 weeks in those on the lowest intake.

In 10 rats given a diet in which casein was replaced by zein, lysine, histidine, tryptophan, threonine, methionine and valine no ergothioneine was found in blood until ergothioneine was added to the diet. A diet containing 20 per cent. of this mixture of zein and amino-acids and 45 per cent. maize produced levels of about 1 mg. ergothioneine per 100 ml. blood after 12 weeks. An aqueous acetone extract of maize also permitted rats to maintain blood ergothioneine levels.—D. Duncan.

2016

LIU, C. H., HAYS, V. W., SVEC, H. J., CATRON, D. V., ASHTON, G. C. and SPEER, V. C. **The fate of urea in growing pigs.** *J. Nutrition*, 1955, **57,** 241–247. [Iowa Agric. Exp. Stat., Ames.]

Growing pigs were fed on a ration containing 13·3 per cent. protein. Four received by mouth urea labelled with ^{15}N for 3 days and 2 received unlabelled urea. Estimation of ^{15}N in the protein and N.P.N. fractions of liver, kidneys, plasma, muscle protein, urine and faeces showed that a small amount of urea N was incorporated into body protein.

A. Hepburn.

2017

RICCERI, G. Sul problema della biosintesi delle purine. 1. L'influenza delle diete prive di alcuni aminoacidi sul metabolismo purinico del ratto. [**The biosynthesis of purines. 1. Influence of diets without certain amino-acids on the purine metabolism of the rat.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 283–286. [Ist. Fisiol., Univ. Catania.]

Allantoin is the ultimate product of purine metabolism in the rat. To test whether arginine and histidine are essential for synthesis of purines, 3 experiments were made, each with 2 male rats from 4 to 6 months old, maintained for from 40 to 80 days on a protein-free diet, which led to rapid decrease in the amount of allantoin in the urine. Different L-amino-acids, including arginine and histidine, were then added cumulatively, but the amount of allantoin in the urine continued to decrease until all the essential amino-acids were being given, when it rose sharply to the normal value.—E. M. Hume.

2018

DINO, S. and VITTORIO, C. Dei composti indossilici. [**Indoxyl compounds.**] *Zootec. Vet.*, 1955, **10,** 408–418. [Ist. Anat., Univ. Cattol. Sacro Cuore, Milan.] English summary.

There is a review of the literature on the physiology of indoxyl compounds.

Indican was estimated in the blood of 5 heifers and 7 mares after 10 days on a ration of lucerne and oat hay. The values for heifers were 1·0 to 4·2 mg. per 100 ml. plasma, mean 2·2, and for mares 2·1 to 4·1, mean 3·3.

Indican values in the urine of mares fed on pasture with 85 per cent. ladino clover were from 0·14 to 0·29 per cent., on pasture with 60 per cent. lucerne 0·29 to 0·35 and on lucerne and oat hay 0·08 to 0·17. Corresponding values for heifers were 0·08 to 0·21, 0·28 to 0·33 and 0·16 to 0·22 per cent.

Rabbits given indole by mouth in increasing quantities up to 0·8 g. daily showed no ill effect on the thyroid or parathyroids.

In chickens no indican was found in the urine, but it was present in small quantities in the intestine and there was a mean value of 1·5 mg. per 100 ml. in the blood.—D. Duncan.

See also Absts. 1690, 1729, 1736, 1739, 1840, 1859, 1912, 1967, 1976, 2057, 2080, 2110, 2128, 2189, 2205, 2235, 2285, 2306, 2429, 2437, 2525.

FATS AND OTHER LIPIDS

2019

GUILBERT, P., BAKER, D. and BARNESS, L. A. **Fat retention in infants fed breast milk and humanized cow's milk.** *J. Pediat.*, 1955, **47,** 683–689. [Dept. Paediat., Hosp. Univ. Pennsylvania, Philadelphia.]

Five healthy male babies aged from 12 to 45 days were fed for alternate periods of average length 15 days on modified cow's milk mixtures and breast milk. The cow's milk was sterilised by heat and modified to an unstated composition by the addition of water, lactose and vegetable fat. The breast milk was frozen unsterilised pooled milk modified in the same way so that each infant received feeds of the same energy and protein content. The babies were fed every 4 hr. to appetite and were given vitamin supplements.

Fat balances over 3-day periods indicated that the percentage of fat retained, ranging from 85 to 98, was the same for both types of feeding. There was a small increase in fat retention as the infants became older.

The stool *p*H was the same on both types of diet and the stool flora was also similar, except that *L. bifidus* var. *pennsylvanicus* was present only during or just after a period of breast milk feeding.

F. Hytten.

2020

JOCHIMS, J. and DOERKS, G. Zur Methodik der Chylomikrographie und zur Physiologie der Fettresorption beim Säugling. [**Technique of chylomicrography and the physiology of fat absorption in the infant.**] *Ztschr. Kinderheilk.*, 1955, **77,** 278–292. [Kinderklin., Städt. Krankenhaus Süd, Lübeck.]

The technique of chylomicron counts is discussed. Fasting counts from 66 estimations on infants 5 to 14 months old ranged from 1750 to 22,500 chylomicrons per c.mm. serum, but the latter value is probably too high. Curves were made for 4 hr. after a milk meal in 66 infants ; the peak was almost always much later than the usual time of 2 hr. reported by Frazer and Stewart (*J. Physiol.*, 1939, **95,** 23P) in adults, and in 35 tests the count was still rising at 4 hr. In individual infants the curves on successive days in similar conditions were sometimes, but not always, identical. It is concluded that there are physiological variations.

In 30 studies on 7 infants the chylomicrograph was studied in relation to emptying of the stomach as shown by X-ray. The more food there was in the stomach 3 to 4 hr. after the meal the less was the fat absorption as shown by the chylomicrograph. When several children after identical meals had different chylomicron counts, these reflected the size of the stomach at that time.—D. Duncan.

2021

REDETZKI, H. and GRONOW, R. T. Untersuchungen über die Fettresorption und die alimentäre Lipämie nach Fettbelastung. [**Absorption of fat and blood fat after administration of fat.**] *Klin. Wochenschr.*, 1955, **33,** 701–705.

[1. Med. Abt., Allg. Krankenhaus St. Georg, Hamburg.]

Total fat, total cholesterol, lipoid phosphorus and turbidity of serum were estimated in 36 men while fasting from normal diets, at intervals after ingestion of 1 g. olive oil per kg. bodyweight. Half the subjects attained their maximum values for serum lipids after 195 min. or more. Sixteen showed the maximum after 135 min. and 2 after 90 min. A second test 4 days later confirmed the results.

Commercial lipase preparations were given to 22 subjects 20 min. before the oil. Some from pancreas hastened absorption of fat, but other preparations had little or no effect. Bile preparations hastened absorption of fat in some and inhibited it in others. The turbidity of the serum was related to the total lipid and neutral fat contents.

A. M. Copping.

2022

MESTER, A., SZIGETHY, J. and RADEK, M. Störung der Fettverdauung bei Erythrodermia desquamativa Leiner. [**Disturbance of digestion of fat in Leiner's *erythrodermia desquamativa*.**] *Ann. paediat.*, 1955, **185,** 303–309. [Kinderklin., Univ. Pécs.] English and French summaries.

Two types of disturbance in Leiner's disease have been found. In one, bile acids are absent as the result of liver damage; in the other pancreatic lipase, as the result of fibrocystic changes in the pancreas. The latter type is that which causes the more severe disorder.—I. Leitch.

2023

THOMASSON, H. J. **The biological value of oils and fats. 1. Growth and food intake on feeding with natural oils and fats.**

THOMASSON, H. J. and BOLDINGH, J. **2. The growth-retarding substance in rapeseed oil.**

THOMASSON, H. J. **3. The longevity of rats fed rapeseed oil- or butterfat-containing diets.** *J. Nutrition*, 1955, **56,** 455–468; 469–475; **57,** 17–27. [Unilever Res. Lab., Zwijndrecht, Netherlands.]

1. The growth-promoting effect of 20 different oils and fats was investigated. For each fat, 8 groups of 8 to 12 male 12-day-old rats were fed for 6 weeks on diets in which the test fat was incorporated at 10, 20, 30, 40, 50, 60 and 73 per cent. of the energy value. The reference diet contained summer butterfat as 20 per cent. of its energy value. Food and water were provided to appetite. The fats were lard, olive oil, cottonseed oil, beef fat, shea butter [*Butyrospermum parkii*], maize oil, soya bean oil, groundnut oil, palm fat, sunflower seed oil, poppyseed oil, coconut fat, sesame oil, owalanut oil, whale oil, herring oil, rapeseed oil, kapok seed oil and winter butterfat.

With summer butterfat the rate of growth remained almost unchanged as the fat content of the diet was increased; with the other fats, except lard, there was a decrease of growth rate with increasing dietary fat. The increase in weight per food calorie was independent of the type of fat or the level at which it was administered, except for shea butter and palm oil.

It is suggested, in opposition to earlier claims that butterfat contains a growth-promoting substance, that many other fats contain growth-retarding substances.

2. In experiments similar to those described above the effect on growth of nasturtium seed oil, containing 80 to 90 per cent. of erucic acid, was compared with that of rapeseed oil, containing 40 to 57 per cent. erucic acid. The effect on growth of mixtures containing erucic acid or trierucin was compared with the effect of rapeseed oil. The results indicated that the unfavourable effect of rapeseed oil on growth must be ascribed to its erucic acid.

3. In similar experiments it was shown that male rats fed to appetite on a diet containing rapeseed oil as 50 per cent. of its energy value lived 20 to 25 per cent. longer than animals given a similar diet containing butterfat, though both growth rate and daily food intake of the animals fed on rapeseed oil were lower than those of the rats given butterfat. Rats in both groups showed pathological changes, especially necrotic and inflamed lesions of the soles of the hind feet and kidney degeneration, which were more pronounced after butterfat; slight liver degeneration was found only after rapeseed oil.—G. A. Garton.

2024

HOPKINS, C. Y., MURRAY, T. K. and CAMPBELL, J. A. **Optimum ratio of saturated to mono-unsaturated fatty acids in rat diets.** *Canad. J. Biochem. Physiol.*, 1955, **33,** 1047–1054. [Div. Pure Chem., Nat. Res. Counc., Ottawa.]

Groups of male or female weanling and immature rats were fed for 9 weeks on a diet composed of 80 parts fox chow of low fat content and 20 parts of different fat mixtures. The fat mixtures all contained linoleic acid as about 10 per cent. of the total fatty acids and the ratio of saturated to mono-unsaturated fatty acids was varied from 3·5 : 1 to 1 : 8 by including differing proportions of maize oil, coconut oil and olive oil.

Both weanling and immature male rats showed significant differences in weight gain on the different diets; the greatest gain was made on the diet with a ratio of saturated to mono-unsaturated fatty acids of 1 : 2; this ratio was similar to that in normal rat depot fat. Female rats did not show significant differences in weight gain on the different diets.—G. A. Garton.

2025

PELTIER, L. F. **Fat embolism: failure of lipemia to potentiate the degree of fat embolism accompanying fractures of the femur in rabbits.** *Surgery*, 1955, **38**, 720–722. [Div. Orthopaed. Surg., Univ. Minnesota Hosps., Minneapolis.]

2026

MAYER, J. and ZIGHERA, C. Y. **Fat metabolism in various forms of experimental obesity. 6. Instantaneous lipogenesis in hypothalamic obese mice.** *Experientia*, 1955, **11**, 358–359. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

For preceding paper see Abst. 824, Vol. 26.

Groups of fasted and non-fasted mice, rendered obese by surgical lesions in the hypothalamus, were injected with acetate-carboxyl-^{14}C; suitable unoperated animals were similarly treated. The mice were killed after 30 min. and liver and carcase fatty acids were isolated for estimation of their radio-activity.

The non-fasted obese mice incorporated about 4 times as much acetate into fatty acid as did the controls; fat formation was 3 times as great in the carcase and more than 7 times in liver. In the fasted mice total incorporation of ^{14}C into liver and carcase lipids was similar in obese and non-obese animals.—G. A. Garton.

2027

BYERS, S. O., ROSENMAN, R. H. and FRIEDMAN, M. **Intestinal excretion of cholesterol and total lipids by the nephrotic rat.** *Amer. J. Physiol.*, 1955, **182**, 73–74. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

2028

ROSSI, C. S. Meccanismo dell'azione lipotropa della colina confrontato con quello della betaina. [**Mechanism of lipotropic action of choline compared with that of betaine.**] *Arch. Sci. biol., Bologna*, 1955, **39**, 450–455. [Ist. Chim. Biol., Univ. Padua.]

Of 4 groups of 4 guineapigs the first were untreated controls and the animals of the other 3 received carbon tetrachloride intramuscularly daily for 5 days; the third and fourth groups had at the same time 7 mg. per 100 g. bodyweight daily of betaine or choline, also intramuscularly. The total lipid content of the liver was then estimated, and the values in mg. per g. dry tissue were examined statistically.

In the guineapigs given CCl_4 alone the liver lipids increased by 100 per cent. over the control values, a statistically significant difference. The increases with CCl_4, plus betaine or choline, 29 and 21 per cent. [there is a discrepancy between the means as given in the table and these values taken from the following page], were not statistically significant and therefore the difference between the effects of betaine and choline was not significant.

The guineapig has no choline oxidase (Bernheim and Bernheim, *Amer. J. Physiol.*, 1933, **104**, 438), so the effect of choline is thought to be direct and that of betaine is probably also direct.

D. Duncan.

2029

VENTURI, V. M. Contributo alla conoscenza dell'azione di fattori lipotropi sulla steatosi epatica in ipossia sperimentale. [**The action of lipotropic substances on fatty liver in experimental hypoxia.**] *Arch. internat. Pharmacodyn.*, 1955, **103**, 238–241. [Ist. Farmacol., Univ. Pavia.] English summary.

Groups of mice, 301 animals in all, were exposed to hypoxia after some had received intraperitoneal injections of methionine or choline.

Both lipotropic substances, especially choline, reduced the severity of histologically visible fat deposition in the liver, but there was no effect on time of survival.—D. Duncan.

2030

KARTHA, A. R. S. **The glyceride structure of natural fats. 3. Factors governing the content of fully saturated glycerides.** *J. Amer. Oil Chem. Soc.*, 1954, **31**, 85–88. [Maharaja's Coll., Ernakulam, India.]

The hypothesis that fully saturated triglycerides cannot be present in natural fats in excess of the quantity which can exist in the fluid state *in vivo* is discussed in relation to the known glyceride structure of many fats. It is suggested that the enzyme systems involved in the synthesis of glycerides are not able to produce solid-phase molecules, since these cannot be adsorbed as a film on the enzyme surface.—G. A. Garton.

2031

DEUEL, H. J. (Jr.) and REISER, R. **The physiology and biochemistry of the essential fatty acids.** *Vitamins and Hormones*, 1955, **13**, 29–70. [Dept. Biochem., Sch. Med., Univ. S. California, Los Angeles.]

2032

DEUEL, H. J. (Jr.), MARTIN, C. R. and ALFIN-SLATER, R. B. **The effect of fat level of the diet on general nutrition. 16. A comparison of linoleate and linolenate in satisfying the essential fatty acid requirement for pregnancy and lactation.** *J. Nutrition*, 1955, **57**, 297–302. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California, Los Angeles.]

With procedures similar to those described earlier (Deuel *et al.*, Abst. 5287, Vol. 25), the

relative effects of linoleate and linolenate separately and in combination were investigated in experiments on reproductive performance in rats.

Linolenate was found to be less effective than linoleate at all intakes studied. In every group, except controls given a fat-free, unsupplemented diet, all the rats produced young and almost the same number of young, but when reproductive capacity was judged by percentage surviving at 3 days, mortality was much greater in the animals given linolenate except at the highest intake studied, 100 mg. daily.

When mixtures of linoleate and linolenate were given, the effect of linolenate was equal to, if not greater than, that of an equal amount of linoleate.

G. A. Garton.

2033

BLOMSTRAND, R. **Transport form of decanoic acid-1-^{14}C in the lymph during intestinal absorption in the rat.** *Acta. physiol. scand.*, 1955, **34,** 67–70. [Dept. Physiol. Chem., Univ. Lund.]

Decanoic acid-1-^{14}C was administered, in solution in olive oil, to adult male rats with thoracic duct cannulae. Lymph was collected for 24 hr. and extracted with ethanol and ether to yield the lipids, which were fractionated by chromatography. Each fraction was assayed for ^{14}C activity. Fatty acids were also extracted from the intestinal tract at the end of 24 hr. and pooled with those isolated from faeces; ^{14}C activity gave a measure of the extent of absorption of the labelled acid.

The decanoic acid was almost quantitatively absorbed in 24 hr. and 3 to 16 per cent. of the absorbed ^{14}C activity was found in lymph lipids; most of this activity was located in triglycerides and the rest in phospholipins. No significant amount of the labelled acid appeared free in the lymph.—G. A. Garton.

2034

BORGSTRÖM, B. **Transport form of ^{14}C-decanoic acid in porta and inferior vena cava during absorption in the rat.** *Acta physiol. scand.*, 1955, **34,** 71–74. [Dept. Physiol. Chem., Univ. Lund.]

Two fasting adult rats were given 1 ml. olive oil containing 28·1 per cent. free decanoic acid labelled with ^{14}C; 1·5 hr. later they were anaesthetised and blood was collected simultaneously from the inferior vena cava and the portal vein. Lipids were extracted from the blood samples and separated by chromatography on silicic acid columns, after which ^{14}C was estimated. Similar experiments were made on 4 other rats, each of which received olive oil containing 10 per cent. of labelled decanoic acid; blood samples were taken 1·5 to 3·0 hr. later.

The largest part of lipid ^{14}C activity recovered from both portal and vena cava blood was in the form of free decanoic acid, showing that free acid absorbed into the portal blood, 4 to 5 mg. per cent., was not quickly removed from the circulation. These findings contrast with those of other workers for the long-chain acids C_{15} to C_{18}, which are transported almost quantitatively via the lymphatic pathway whether they are given as esters or as free acids.—G. A. Garton.

2035

SHAPIRO, S. L. and FREEDMAN, L. **Effect of essential unsaturated fatty acids and methionine on hypercholesteremia.** *Amer. J. Physiol.*, 1955, **181,** 441–445. [Res. Labs., U.S. Vitamin Corp., Yonkers, N.Y.]

Groups of 16 rats were fed on sulphur-deficient diets containing 3 per cent. cholesterol with 5 per cent. hydrogenated fat and 0·6 per cent. methionine; 2·5 per cent. hydrogenated fat, 2·5 per cent. safflower oil and 0·6 per cent. methionine; 5 per cent. safflower oil and 0·6 per cent. methionine; 5 per cent. safflower oil; or 5 per cent. hydrogenated fat. Serum cholesterol was estimated after the diets had been given for 22 days, and plasma cholesterol after 40 days.

The high blood cholesterol found in rats given cholesterol in an S-deficient ration was almost prevented by the inclusion of safflower oil, which contained 80 per cent. linoleic acid, and methionine in the diet. Under the same conditions, replacement of the unsaturated oil by hydrogenated fat did not effectively prevent the development of high blood cholesterol.

The results are discussed with reference to the role of unsaturated fatty acids in the prophylaxis of atherosclerosis.—G. A. Garton.

2036

SIPERSTEIN, M. D. and MURRAY, A. W. **Cholesterol metabolism in man.** *J. Clin. Invest.*, 1955, **34,** 1449–1453. [Lab. Chem. Pharmacol., Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

Cholesterol-4-^{14}C was injected intravenously into a patient whose common bile duct had been cannulated during cholecystectomy. After the injection bile was collected for 50 hr. and during this time, and subsequently, faeces and urine were collected for ^{14}C assay; a sample of expired air was taken 29 hr. after the injection.

By all routes of elimination 39·6 per cent. of the ^{14}C administered was excreted within 50 hr.; more than 98 per cent. of the activity was in the bile, 1·3 per cent. in the faeces and 0·2 per cent. in the urine; no $^{14}CO_2$ was found in the expired air. The main excretory product of cholesterol in bile was identified as glycocholic acid.—G. A. Garton.

2037

GOULD, R. G., LEROY, G. V., OKITA, G. T., KABARA, J. J., KEEGAN, P. and BERGENSTAL, D. M. **The use of C^{14}-labeled acetate to study cholesterol metabolism in man.** *J. Lab. Clin. Med.*, 1955, **46**, 372–384. [Univ. California Los Alamos Sci. Lab., N. Mex.]

Acetate-1-^{14}C providing 100 or 200 μC. was given either by mouth or intravenously once or oftener to each of 34 patients in a cancer research hospital. With either route of administration, the peak of the specific activity time curve for the free cholesterol of plasma was reached 2 to 4 hr. after the acetate was given. The rate of interchange of free cholesterol between liver and plasma in each direction was estimated to be at least 0·87 g. per hr. Equilibrium between cholesterol-^{14}C in plasma and red cells was reached in 8 to 12 hr., and that between free and esterified cholesterol in plasma took 24 to 48 hr. to become established ; in some subjects the specific radio-activity of plasma cholesterol was followed for 7 weeks after the dose of ^{14}C-acetate.

The fraction of the amount of labelled acetate which was used to form cholesterol was 1·04 per cent. in normal subjects, 0·23 per cent. in patients with myxoedema, 4·0 per cent. in patients with cancer and 4·75 in subjects treated with cortisone, which shows that the metabolic state of the subject conditions the rate of formation of cholesterol in the liver.—G. A. Garton.

2038

LIN, T. M., KARVINEN, E. and IVY, A. C. **Relation of dietary fat to the absorption and elimination of exogenous and endogenous cholesterol.** *Amer. J. Physiol.*, 1955, **183**, 86–90. [Dept. Clin. Sci., Univ. Illinois Coll. Med., Chicago.]

Cholesterol balance was studied on groups of individually-caged rats fed for 6 days on a fat-free diet to which was added 50 mg. cholesterol daily and 7 per cent. maize oil, beef tallow, triolein, trielaidin, tripalmitin, oleic acid or palmitic acid. Faeces were collected for analysis during the fifth and sixth days of the experiment.

Oleic acid improved intestinal absorption of dietary cholesterol more than did tallow, maize oil and (unexpectedly) triolein ; the last had no effect. Trielaidin, tripalmitin and palmitic acid partly inhibited absorption of cholesterol.

G. A. Garton.

2039

BYERS, S. O. and FRIEDMAN, M. (with OMOTO, C.) **Observations concerning the production and excretion of cholesterol in mammals. 15. Role of the pancreas in intestinal absorption of cholesterol.** *Amer. J. Physiol.*, 1955, **182**, 69–72. [Harold Brunn Inst. Cardiovascular Res., Mount Zion Hosp., San Francisco, Calif.]

For part 14 see Abst. 5304, Vol. 25.

Cholesterol absorption was found to be impaired in male adult rats given cholesterol in olive oil 2 days after ligation of the pancreatic ducts. Little change in absorption was noted 7 and 28 days after ligation. Total removal of the pancreas resulted in reduction of cholesterol absorption by about 50 and 35 per cent. after 7 and 28 days, respectively. After an 18-hr. fast, rats given cholesterol in olive oil with pancreatic extract showed no increase in cholesterol absorption compared with controls. Total lipid absorption was found in all experiments to be roughly parallel to cholesterol absorption. It is suggested that absorption of cholesterol is to some extent independent of pancreatic secretion.—A. K. Lough.

2040

PIHL, A. **The effect of dietary fat on the intestinal cholesterol absorption and on the cholesterol metabolism in the liver of rats. Cholesterol studies 3. On the mode of action of fatty acids in cholesterol absorption. Cholesterol studies 4. The effect of bile acids on cholesterol absorption, deposition and synthesis in the rat. Cholesterol studies 5.** *Acta physiol. scand.*, 1955, **34**, 183–196 ; 197–205 ; 207–217. [Nutrit. Res. Inst., Univ. Oslo.]

3. Groups of adult rats were used in balance studies in which cholesterol was 0·25, 0·5 or 1·0 per cent. of diets containing 5, 10 or 15 per cent. arachis oil or none. Cholesterol was absorbed when diets containing no fat were given, though dietary fat increased the absorption of the sterol when the ratio of fat to cholesterol in the diet was at least 15 : 1.

Considerable deposits of cholesterol esters were found in the livers of animals fed for 7 weeks on a fat-free diet containing cholesterol. Further studies were designed in which equal amounts of cholesterol were absorbed by groups of rats given a fat-free diet or one containing 15 per cent. fat for 7 weeks. About twice as much cholesterol was found in the livers of rats given fat as in the livers of those given none.

The effect of dietary fat on cholesterol metabolism in liver was studied in rats given for 34 days a stock diet containing 1 per cent. cholesterol and then for 8 days a cholesterol-free diet containing either 2 or 30 per cent. arachis oil. The cholesterol content of the livers of the rats given 30 per cent. arachis oil was less than that in the group given 2 per cent. oil. Liver slices from rats given the high-fat diet showed the greater capacity to convert ^{14}C-labelled acetate into cholesterol.

4. Balance experiments were made for 7 days on groups of young rats given diets containing 1 per cent. cholesterol with 9 per cent. oleic or stearic acid or diets containing cholesterol oleate or stearate corresponding to 1 per cent. cholesterol; in one experiment cholesterol acetate corresponding to 0·25 per cent. free cholesterol was administered.

Absorption of cholesterol increased in animals given oleic acid, but stearic acid had no effect. Cholesterol oleate and stearate were not absorbed better than the free sterol. The acetate was readily absorbed.

Esterified cholesterol was found in faeces when stearic acid was given with free cholesterol, but not when oleic acid was given; the addition of bile acids to the diets did not affect the result. The cholesterol esters, including the acetate, were hydrolysed in the intestine. When free fatty acids, especially oleic acid, were given in the diet the faecal excretion of phospholipins was increased.

5. In similar balance experiments the intestinal absorption and liver deposition of cholesterol was studied when cholic, deoxycholic or dehydrocholic acid was added as 0·5 per cent. of the diet.

The addition of bile acid to a fat-free diet did not increase the absorption of cholesterol. No conclusive evidence was obtained of an effect of bile acids on the absorption of cholesterol from diets containing fat or fatty acids. Deposition of cholesterol in liver was increased by the presence of bile acid in the diet; these increases were accompanied by high serum cholesterol. As judged by the incorporation of ^{14}C-acetate into cholesterol in liver slices, cholic acid did not promote formation of cholesterol in the liver. It is concluded that bile acids probably interfere with the catabolism of cholesterol in the liver.

G. A. Garton.

2041

KARVINEN, E., LIN, T. M. and IVY, A. C. **Effect of mineral oil in intestinal absorption of cholesterol in the rat.** *Amer. J. Physiol.*, 1955, **181,** 439–440. [Dept. Clin. Sci., Univ. Illinois Coll. Med., Chicago.]

Groups of rats were fed for 6 days on a basal cholesterol-free diet to which was added 40 mg. cholesterol daily or 6 per cent. light mineral oil or both. During the last 2 days of the study faeces were collected and analysed for cholesterol.

The addition of light mineral oil alone to the diet was accompanied by an increase of 39 per cent. in excretion of endogenous cholesterol, and when cholesterol also was given, the total faecal cholesterol was increased by 30 per cent. It is considered that most of the increased excretion is due to the solubility of cholesterol in mineral oil.

G. A. Garton.

2042

DASKALAKIS, E. G. and CHAIKOFF, I. L. **The significance of esterification in the absorption of cholesterol from the intestine.** *Arch. Biochem. Biophys.*, 1955, **58,** 373–380. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Doses of ^{14}C-cholesterol ranging between 1 and 48 mg. were given by stomach tube to rats with thoracic duct cannulae; lymph was collected for 24 hr. and analysed for free and total cholesterol and total ^{14}C content.

Although the amount of cholesterol recovered from the lymph increased with the amount of cholesterol given, the percentage of cholesterol absorbed decreased. Whatever the amount of cholesterol given, about 70 per cent. appeared in the lymph in esterified form.

In similar experiments other sterols, 3 mg. of each, were given with 3 mg. cholesterol and the effect on absorption of cholesterol was studied. Dihydrocholesterol and ergosterol inhibited absorption of cholesterol to the extent of 80 and 50 per cent., respectively, though they did not affect the percentage of sterol found in esterified form in the plasma. The following compounds had no effect on either absorption of cholesterol or extent of its esterification: *allo*cholesterol, cholestenone, dehydro*iso*androsterone, 7-dehydrocholesterol, epicholesterol, brassicasterol and stigmasterol.

G. A. Garton.

2043

RIDDELL, C. and COOK, R. P. **Cholesterol metabolism. 4. The neutral fraction of the faecal lipid of rats fed diets with low and high cholesterol contents.**

EDWARDS, D. C. and COOK, R. P. **5. The excretion of acids after cholesterol ingestion in rats.**

COOK, R. P., EDWARDS, D. C., RIDDELL, C. and THOMSON, R. O. **6. The fate of ingested cholesterol in the intact rat.** *Biochem. J.*, 1955, **61,** 657–671; 671–676; 676–681. [Dept. Biochem., Queen's Coll., Dundee (Univ. St. Andrews).]

For part 3 see Abst. 2300, Vol. 21.

4. Male rats were fed on diets with or without olive oil, and with or without added cholesterol. Faecal unsaponifiable matter, which consisted largely of digitonin-precipitable sterols, was excreted in greatest amount in proportion to sterol ingested by the rats on low-fat diet. Fractionation of faecal unsaponifiable matter from rats on the low-fat diet showed that when supplements of cholesterol were given much of the increase in unsaponifiable matter could be accounted for by cholesterol and saturated sterols. The fraction of unsaponifiable matter not precipitable with digitonin apparently includes hydrocarbons, ketones and 3α-stanols. The method of fractionation, which included adsorption chromatography on alumina,

revealed a complex mixture of sterols, sterol metabolites and, possibly, steroid metabolites.

5. The faecal excretion of ether-extractable acids and esterified sterol was higher in rats fed on a diet containing added cholesterol. "Solid" and "liquid" acids separated from the ether-extractable acids by treatment of the matter soluble in light petroleum with lead salts were increased in the sterol-fed rat. The increases in the "solid" acid fractions were shown, by ester fractional distillation, to be accounted for mainly by palmitic acid. Esterification of the matter insoluble in light petroleum with methanol and chromatography of the esters on alumina resulted in the separation of fractions which might consist of bile acids with or without keto groups.

Only a part of the large increase in acids soluble in light petroleum can be accounted for as esterified to cholesterol. It is suggested that cholesterol is, in part, converted into acids which appear in the fraction soluble in light petroleum.

6. Results of balance experiments on rats given cholesterol are summarised and discussed. The effect of cholesterol supplements on the faecal excretion of volatile fatty acids in rats given diets with or without fibre is described also.

A. K. Lough.

2044

ECKLES, N. E., TAYLOR, C. B., CAMPBELL, D. J. and GOULD, R. G. (with KEEGAN, P., KELLY, F. B. (Jr.), DAVIS, C. B. (Jr.) and LATENSER, J.) **The origin of plasma cholesterol and the rates of equilibration of liver, plasma, and erythrocyte cholesterol.** *J. Lab. Clin. Med.*, 1955, **46,** 359–372. [Univ. California Los Alamos Sci. Lab., N. Mex.]

Acetate labelled with ^{14}C was injected intravenously into dogs with the liver removed and control, sham-operated dogs. The hepatectomised animals metabolised the acetate to $^{14}CO_2$ at the same rate as did the controls and, though cholesterol was formed from ^{14}C-acetate in intestine, kidney, lung and skin, almost no ^{14}C-cholesterol was found in the plasma.

When serial liver biopsies were made after injection of ^{14}C-acetate the maximum concentration of ^{14}C in the free cholesterol of liver was found after 40 min.; the specific activity of the free sterol was greater than that in ester combination.

Labelled acetate given by mouth appeared in the cholesterol of the blood of intact dogs first in the plasma free sterol, then in the red cells and last in the esterified cholesterol of plasma. The rates of equilibration, expressed as half-times, were estimated to be about 20 min. between free cholesterol in liver and plasma, 1·4 hr. for the plasma free cholesterol and red cell cholesterol system and about 7 hr. for the whole blood free cholesterol and plasma esterified cholesterol system.—G. A. Garton.

2045

DAM, H., PRANGE, I. and SØNDERGAARD, E. **Influence of various levels of dietary cholesterol on the cholesterol content of certain organs and of bile of chicks fed fat-free and peanut oil containing diets.** *Acta physiol. scand.*, 1955, **34,** 141–146. [Dept. Biochem. Nutrit., Polytec. Inst., Copenhagen.]

Groups of 13-day-old chicks were fed on diets containing different amounts of cholesterol; the diets to which the cholesterol was added were either fat-free or contained 10 per cent. groundnut oil. At the end of 4 weeks liver, spleen, aorta and the bile were taken for estimation of total cholesterol.

With diets containing groundnut oil, accumulation of cholesterol was found in all tissues examined when the diet contained from 0·1 to 0·33 per cent. cholesterol. This limit also obtained for fat-free diets for liver, spleen and probably aorta, but in bile only slight accumulation of cholesterol was found when dietary cholesterol ranged from 0 to 1 per cent.—G. A. Garton.

2046

KRÜSKEMPER, H. L. and SCHULZE, G. Über das Verhalten von Lipiden und Fermenten in der Leber bei langdauernder Cholesterinfütterung. [**Lipids and enzymes in the liver after long-continued feeding with cholesterol.**] *Arch. exp. Pathol. Pharmakol.*, 1955, **227,** 161–168. [Med. Klin., Univ. Göttingen.]

For previous work see Abst. 620, Vol. 25.

The 14 rabbits were given cholesterol as described in the earlier paper, and 8 controls received stock diet. After up to 89 days studies were made on the liver.

In the rabbits given cholesterol there was a high total liver lipid content, due mainly to increases in neutral fat and ester cholesterol. There was little change in free cholesterol, free fatty acids or phosphatides.

Respiratory activity of liver tissue was depressed. Acid phosphatase was increased and lipase reduced, but cholinesterase was unchanged. It was concluded that there was no general interference with liver function, but a shift in the fat metabolism in favour of increased fatty acid formation.—D. Duncan.

2047

DURY, A. **The effects of high cholesterol diet alone and plus cortisone administration on phospholipid turnover and lipid partition in plasma, liver, and aorta of rabbits.** *Amer. J. Med. Sci.*, 1955, **230,** 427–435. [Dorn Lab. Med. Res., Bradford Hosp., Bradford, Pa.] Interlingua summary.

Intravenous injection of cortisone acetate into rabbits on a diet rich in cholesterol did not affect the high plasma cholesterol, plasma phospholipin and liver cholesterol or the low liver phospholipin. The normal concentration of neutral fat in plasma and liver of the rabbits on the high-cholesterol diet was increased by treatment with cortisone. Aortic cholesterol concentration in rabbits on the high-cholesterol diet was of the same order whether they received cortisone or not, and slightly higher than in rabbits on control diet.

The specific activities of phospholipin in the aorta were similar in the groups on control diet, high-cholesterol diet and high-cholesterol diet plus cortisone. Cortisone did not affect the specific activity of liver phospholipin in the rabbits on the high-cholesterol diet, although it increased the specific activity of plasma phospholipin.—A. K. Lough.

2048

DURY, A. and DI LUZIO, N. R. **Effects of cortisone and epinephrine exhibition on lipid components and phospholipid turnover in plasma, liver and aorta of rabbits.** *Amer. J. Physiol.*, 1955, **182,** 45–50. [Dorn Lab. Med. Res., Bradford Hosp., Pa.]

2049

BEHER, W. T. and ANTHONY, W. L. **Effects of β-sitosterol and ferric chloride on accumulation of cholesterol in mouse liver.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 223–225. [Edsel B. Ford Inst. Med. Res., Henry Ford Hosp., Detroit, Mich.]

Groups of female mice were fed to appetite on a basal fat-free diet to which were added 1 per cent. cholesterol and 0·25, 0·5 or 1·0 per cent. cholic acid, with or without 2·5 per cent. β-sitosterol. After 3 weeks the livers were removed for estimation of cholesterol.

Total liver cholesterol increased with increasing amounts of dietary cholic acid; the addition of β-sitosterol to the diets containing cholic acid and cholesterol reduced total liver cholesterol.

In similar experiments groups of mice were fed on a diet containing 1 per cent. or 0·5 per cent. cholesterol to which was added 0·05, 0·5, 1·0 or 2·0 per cent. $FeCl_3$. The addition of $FeCl_3$ to the diet did not prevent accumulation of dietary cholesterol in the liver.—G. A. Garton.

2050

HAROLD, F. M., JAYKO, M. E. and CHAIKOFF, I. L. **Metabolism of epicholesterol-4-C^{14} in the rat.** *J. Biol. Chem.*, 1955, **216,** 439–447. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Epicholesterol-4-^{14}C was administered intravenously to adult rats. Within 8 hr. about half the ^{14}C injected was recovered from the bile and about 0·6 per cent. from the faeces and most of the rest was found in the liver. Some 90 per cent. of the bile ^{14}C was in bile acids, which closely resembled, but were not identical with, those resulting from the metabolism of cholesterol-4-^{14}C. Over 80 per cent. of the ^{14}C in the liver was accounted for as dihydrocholesterol. No ^{14}C was found in cholesterol from the bile, faeces or liver.

It is concluded that epicholesterol is not an intermediate in the conversion of cholesterol to bile acids.—A. K. Lough.

2051

LEMAIRE, A. and COTTET, J. Le syndrome biochimique de l'athérosclérose animale. [**The biochemical syndrome of atherosclerosis in animals.**] *Presse méd.*, 1955, **63,** 1339–1341. [Paris.]

A comparative review, including a table of values, mainly from the literature, for blood lipid fractions and cholesterol in man, squirrel, dog, rabbit, rat, chicken and rhesus monkey. Animals fall into 3 classes: those in which atherosclerosis occurs spontaneously and in which it is easily produced experimentally, *e.g.*, chicken; those in which it does not occur spontaneously, but in which it is readily produced experimentally, *e.g.*, rabbit, the natural resistance of which may be due to its vegetable diet; and those resistant to both, *e.g.*, rat and dog. The electrophoretic pattern of blood lipids in man is that of a herbivore.

W. M. Deans.

2052

BRAGDON, J. H. and MICKELSEN, O. **Experimental atherosclerosis in the rat.** *Amer. J. Pathol.*, 1955, **31,** 965–973. [Lab. Metabol., Nat. Heart Inst., Bethesda, Md.]

Serum from rabbits fed on cholesterol was injected intravenously or intraperitoneally into rats. The injections gave rise to focal atheroma-like lesions characterised by groups of foam cells in the endocardium and intima and masses of anisotropic crystals embedded in fibrous tissue.

G. A. Garton.

2053

NICHOLS, C. W. (Jr.), LINDSAY, S. and CHAIKOFF, I. L. **Production of arteriosclerosis in birds by the prolonged feeding of dihydrocholesterol.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89,** 609–613. [Dept. Physiol., Univ. California Sch. Med., Berkeley.]

Twelve White Leghorn cockerels were fed for 6 months on Purina Broiler Chow to which was added 0·5 per cent. dihydrocholesterol and 2·5 per cent. cottonseed oil; 12 control birds were given

Chow alone. At the end of the feeding period all the birds were killed and their thoracic and abdominal aortas were removed for histological examination.

Severe arteriosclerosis developed in the aortas of the birds given dihydrocholesterol. The lesions resembled those caused by cholesterol and appeared to have resulted from the deposition of dihydrocholesterol in the vascular wall.

G. A. Garton.

2054

GAMBASSI, G. and MAGGI, V. Glutatione e aterosclerosi sperimentale colesterolica: rapporti tra il tripeptide e l'azione antiateromasica dell'acido adenosintrifosforico. [**Glutathione and experimental cholesterol atherosclerosis: relation between the tripeptide and the effect of adenosine triphosphoric acid against atheroma.**] *Acta gerontol.*, 1955, **5**, 235–240. [Ist. Clin. Med., Univ. Ferrara.] French and English summaries.

For earlier work see Title 4683, Vol. 23.

Four groups of 8 rabbits received a stock diet with 0·5 g. cholesterol in olive oil daily for 140 days. The first group were controls, the other groups received adenosine triphosphate (ATP) daily, 2·5 or 1 mg. intravenously or 2·5 mg. subcutaneously. The effects on glutathione in liver and kidney were compared with those found in the earlier experiment, when 2 groups of 8 rabbits had received 1 g. cholesterol daily for 50 days and 1 group had 2·5 mg. ATP subcutaneously daily.

After 50 days the rabbits given ATP subcutaneously had significantly higher glutathione values in liver and kidney then those without ATP. After 140 days the liver glutathione was significantly increased by ATP given subcutaneously, but differences with ATP by vein were not significant, nor were those in kidney glutathione values. Further analyses (Title 5317, Vol. 25; *Arch. Maragliano*, 1954, **9**, 1061) showed the greatest increase in liver fat to be in the rabbits given intravenous ATP and the least in controls, and the only group without atherosclerosis to be those given ATP subcutaneously.—D. Duncan.

2055

MIANI, N., MARINI, I. and AMADUCCI, L. Metabolismo dei fosfolipidi nell'apparato nervoso centrale durante l'accrescimento organico. Ricerche *in vivo* con P^{32}. [**Phospholipin metabolism in the central nervous system during organic growth. Studies *in vivo* with ^{32}P.**] *Arch. Sci. biol., Bologna*, 1955, **39**, 498–511. [Ist. Anat. Umana, Univ. Padua.]

The 8 groups of 8 rats had mean bodyweights, in g., of 5, 16, 28, 36, 50, 100, 175 and 250; the youngest were 3 hr. old. Each animal received an intraperitoneal injection of Na_2HPO_4 in isotonic salt solution, containing ^{32}P to provide 0·05 μC. per g. bodyweight. Half the animals of each group were killed 24 hr. and half 48 hr. after the injection. The distribution of ^{32}P in the phospholipins of the central nervous system was studied.

The greatest incorporation of ^{32}P into phospholipins occurred in the youngest rats. In the first 2 days of life it was greatest in the spinal cord and least in the mesencephalon and proencephalon. The rate of incorporation fell steeply as the bodyweight rose to 50 g., at which time phospholipin formation was greatest in the cerebellum and again least in the mesencephalon and proencephalon. The rate then declined slowly as body growth continued, in all parts except the mesencephalon and proencephalon, where it increased between the bodyweights of 50 and 100 g.

The changes in phospholipin formation in the different parts of the central nervous system appear to be closely related to the time of myelination.—D. Duncan.

2056

MURCHAKOVA, A. F. Lipoidnyi fosfor v pecheni krolika pri obychnom pitanii i pri golodanii. [**Lipoid phosphorus in the liver of the rabbit on an adequate diet and in starvation.**] *Fiziol. Zh. SSSR Sechenova*, 1955, **41**, 265. [Inst. Fiziol. I.P. Pavlova, Akad. Nauk SSSR, Leningrad.]

Lipoid P, acid-insoluble P and total P were estimated in small pieces of liver from rabbits fed on a standard diet and again after starvation for 7 and for 12 or 13 days. There was an increase in all the components during starvation, depending on the nutritional status and period of starvation of the animals. Total P increased by 8 to 41 per cent., falling slightly just before death. This increase was proportional to loss of weight and utilisation of tissue reserves. Acid-insoluble P increased by 16 to 86 per cent. and was derived from both lipoid- and protein-bound P, but just before death it was derived almost entirely from protein-bound P. Lipoid P rose by 26 to 50 per cent., but fell somewhat before death. These changes are held to imply formation of phosphatides in the course of the breakdown and utilisation of fat stores of the body.—D. W. Taylor.

See also Absts. 1752, 1777, 1778, 1794, 1840, 1847, 1848, 1894, 1956, 1965, 1989, 2086, 2110, 2113, 2118, 2136–38, 2184, 2209, 2210, 2411–13, 2435.

MINERALS

GENERAL

2057

BASS, D. E., KLEEMAN, C. R., QUINN, M., HENSCHEL, A. and HEGNAUER, A. H. **Mechanisms of acclimatization to heat in man.** *Medicine, Baltimore,* 1955, **34,** 323–380. [Quartermasters Res. and Development Command, Natick, Mass.]

Five young soldiers were the subjects in an experiment divided into 3 periods, a control of 21, an experimental of 14 and a recovery period of 12 days. During these times the men lived in a constant-temperature chamber at 75° to 77° F. in the control and recovery periods; in the middle period day temperature was 120° and night temperature 100° F., days and nights being of equal duration. The standard task was walking on a treadmill for 60 min. at 4 m.p.h. each forenoon and afternoon. Physiological and biochemical studies were of antipyrine and thiocyanate spaces, blood volume, composition of sweat, electrolyte balances, adrenocortical activity, pulse rate and rectal temperature.

The results for pulse rate during walking, rectal temperature and rate of sweating showed by decreases in the first 2 measurements and an increase in the third that the men became acclimatised during the first week. Concentrations of Na, Cl, K, N and creatinine in sweat collected under conditions of both rest and exercise fell during the first 4 days; the last 2 of these differed from the others in being lower in exercise than in resting specimens.

Thiocyanate space, plasma volume and blood volume reached their highest levels on the 5th day of treatment; the increase was relatively greater for plasma volume than for thiocyanate space. By the end of the hot period both were about 16 per cent. above the level in the control period. Values for electrolytes in urine showed that, by reduction in losses of Na and Cl, the losses in sweat were more than balanced and, in this way, the kidney maintained the osmotic pressure of the increased extracellular fluid. Balances of water, N, P, K, Na and Cl were measured but, because of practical difficulties, the data for Na and Cl were concluded to be erroneous. The negative balances of N, P and K ran parallel and suggested that heat stress gave rise to some breakdown of tissue. Plasma Mg did not change significantly. The only evidence of alteration in adrenocortical activity was a reduction of the Na : K ratio in urine during the early days of exposure to heat; during that period 17-ketosteroids were present in equal or slightly smaller amounts than during the control period.

The results are fully discussed and the literature is reviewed in detail.—D. Harvey.

2058

PARMEGGIANI, L. and SASSI, C. Il lavoro faticoso nei cantieri minerari a clima caldo-umido. **[Exhausting work in mines with a hot humid climate.]** 1. Adattamento funzionale, termoregolazione e bilancio idrico. **[1. Functional adaptation, heat regulation and water balance.]** 2. Il bilancio dei cloruri. **[2. Balance of chlorides.]**

PARMEGGIANI, L., SASSI, C. and CROCE, C. 3. Il comportamento degli elettroliti fondamentali: sodio, potassio e cloro. **[3. Behaviour of the fundamental electrolytes, sodium, potassium and chlorine.]** *Med. del Lavoro,* 1955, **46,** 295–324; 369–385; 386–403. [Clin. Lavoro L. Devoto, Univ. Milan.] English and German summaries.

2059

LIND, A. R., HELLON, R. F., WEINER, J. S. and JONES, R. M. **Tolerance of men to work in hot, saturated environments with reference to mines rescue operations.**

HELLON, R. F. **Details of the rectal thermocouple used in the experiments.** *Brit. J. Indust. Med.,* 1955, **12,** 296–303; 303. [Med. Res. Counc. Unit Res. Climate, Dept. Human Anat., Oxford.]

2060

KING, J. T., LEE, Y. C. P. and VISSCHER, M. B. **Heart failure in mice related to minerals in diet.** *J. Nutrition,* 1955, **57,** 111–120. [Dept. Physiol., Univ. Minnesota, Minneapolis.]

Heart failure is reported in mice of strain C_3H fed on a diet of glucose 33, casein 28, lard 17, dried brewer's yeast 8, alfalfa leaf 4, cod liver oil 2, wheat germ oil 1 and salts 4 parts. The salt mixture was that of Jones and Foster (Abst. 2417, Vol. 12), with iodised table salt. The heart lesions suggested vitamin E deficiency.

When the modified Jones and Foster salts were replaced by a modification of the salt mixture of Hubbell *et al.* (Abst. 3505, Vol. 7) from which the elements Mn, F, Al and Cu had been omitted there was no heart failure. Multiplying the trace element content of the modified Jones and Foster salts by 10 and decreasing the vitamin E content of the diet by the omission of wheat germ oil increased the incidence of heart failure and reduced the time of survival.—C. F. Mills.

CALCIUM AND PHOSPHORUS

2061

BRINE, C. L. and JOHNSTON, F. A. **Factors affecting calcium absorption by adults.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 883–888. [New York State Coll. Home Econ.]

From a review of the literature, protein and vitamin D in the diet are shown to improve Ca absorption; Ca absorption is reduced by phytates if the diet is rich in phytates and low in Ca and, to a less extent, by oxalates. Less Ca is absorbed when energy intake is reduced and during inactivity. When Ca intake is increased more Ca is absorbed, but the percentage absorbed is less. The amounts of phosphate and of fat in the diet have no effect on Ca absorption.—G. F. Garton.

2062

LENKEIT, W. Regulierung des Mineralstoffwechsels und die Calcium-Phosphor-Bilanz während der Laktation (mit Versuchen an säugenden Sauen). **Regulation of mineral metabolism and calcium and phosphorus balance during lactation, with studies on suckling sows.**] *Wiss. Abh. Deutsch. Akad. Landwirtsch.*, 1954, **5,** No. 2, 407–426. [Inst. Tierphysiol. Tierernähr., Univ. Göttingen.]

The part played in mineral regulation by base or acid excess is discussed. In balance studies with pigs an acid diet led to much ammonia formation, but had little effect during 20 days on the Ca balance. In ruminants, adapted to diets with a large base excess, there is limited ability for regulation against acid excess. The importance of neutralisation of fermentation products in the rumen by saliva is discussed.

Long-term Ca and P balances were made on 4 sows during lactation. Only one had negative balances until the sixth week of lactation; in all 4 the balances rose steadily throughout lactation although intakes were constant. The Ca and P output in milk fell only slowly, and there was no relation between the output in milk and the balance, which rose as excretion in the faeces fell. It is concluded that this could be due only to a changing rate of bone metabolism; milk formation and bone metabolism are independently affected by endocrine control. Negative or low positive Ca and P balances early in lactation may be ascribed to the increase in bone resorption.

D. Duncan.

2063

BENZIE, D., BOYNE, A. W., DALGARNO, A. C., DUCKWORTH, J., HILL, R. and WALKER, D. M. **Studies of the skeleton of the sheep. 1. The effect of different levels of dietary calcium during pregnancy and lactation on individual bones.** *J. Agric. Sci.*, 1955, **46,** 425–440. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Groups of ewes were given rations which supplied 1·4, 4·5 or 7·4 g. Ca daily, during pregnancy and lactation. No effect was observed on number of lambs born, birthweight or growth to weaning. Blood Ca and inorganic P were estimated monthly. In the group getting only 1·4 g. Ca daily, serum Ca fell lower at parturition than in the other groups, and during lactation it remained lower. During the final stages of lactation, while in this group serum Ca continued to fall, there was a rise of serum Ca in ewes getting 4·5 or 7·4 g. Ca daily. Resorption of bone was estimated from the ash of the skeleton, as absolute weight and as percentage of fat-free bone, and by X-ray studies. Resorption was greatest in the group getting least Ca daily. In a skeleton there was variation in the degree of resorption of different bones and different regions of the long bones. The greatest resorption was in vertebrae and pelvis, the least in the metacarpal, the metatarsal and the shafts of the long bones. This was indicated by the weight of ash of the bones, and, less clearly, by the percentage of ash, and was confirmed by X-ray studies of flesh-free bones.—T. D. Bell.

2064

MOORE, J. H. and TYLER, C. **Studies on the intestinal absorption and excretion of calcium and phosphorus in the pig. 3. The effect of beryllium carbonate on the absorption of phosphorus.** *Brit. J. Nutrition*, 1955, **9,** 389–397. [Dept. Agric. Chem., Univ. Reading.]

Two pigs 9 to 10 weeks old were fed on the diet used in previous experiments (Abst. 3872, Vol. 25), except that beryllium carbonate was introduced gradually until the diet contained 2·4 per cent. The animals were fed on this diet for 10 days and were killed 4 hr. after the morning feed on the eleventh day. The results of analyses of the contents of the digestive tracts of these pigs were compared with those obtained from pigs which received no Be.

In the animals given Be low solubility of total P in the second section of the stomach, little hydrolysis of phytate in the first sections of the tract, and high total P content of the large intestine indicated reduced absorption of P in the presence of Be. This effect was caused chiefly by a reduction in phytate hydrolysis, but partly by the precipitation of phosphate as the Be salt. Be reduced phytate hydrolysis by precipitating phytate, but it also apparently exerted a direct inhibitory effect on phytase.—R. Hill.

2065

SAGER, R. H. and SPARGO, B. **The effects of a low phosphorus ration on calcium metabolism in**

the rat with the production of calcium citrate urinary calculi. *Metabolism*, 1955, **4**, 519–530. [Zoller Dent. Clin., Univ. Chicago, Ill.]

Studies were made on 77 rats aged 3 months; 2 groups each of 5 were not depleted and 10 groups of 5, 6 or 10 animals were depleted of 25 per cent. of their original bodyweight on a diet with 3 per cent. fibrin as the only protein. The protein-depleted rats developed calcium citrate calculi after 6 days on a normal-Ca low-P ration. From skeletal X-ray films, parathyroid measurement and balance studies it was found that the low P ration increased the amount of Ca absorbed from the intestine and hence the non-protein-bound blood Ca. This effect was intensified by the low blood protein resulting from simultaneous protein deficiency. The Ca and citrate in urine were high, with resulting formation of calcium citrate calculi.

G. F. Garton.

2066

BASSIR, O. **The effect of low-calcium diet on tissue metabolism.** *J. Trop. Med. Hyg.*, 1955, **58**, 210–216. [Human Nutrit. Unit, Med. Res. Counc. Labs., London, N.W.3.]

One group of 6 rats 5 weeks old was given a diet (1) of egg white 13·5, sugar 9, potato starch 64·8 and margarine 10 parts; a similar group received diet (2) of similar composition, but containing, in addition, $Na_2HPO_4 . 12H_2O$ 1·11 and Ca- and P-free salts 2·7 parts; 3 similar rats received a diet (3) of lard 12, sugar 50, Solka Floc 6, casein 22, yeasts 5 and salt mixture 5 per cent. All the diets were given for 3 weeks. Parallel experiments with rats 6 to 9 months old were made with diets (2), (3) and also (4), which contained egg white 21, sugar 10, potato starch 48·68, margarine 13, $Na_2HPO_4 . 12H_2O$ 3 and $CaHPO_4 . 2H_2O$ 3 parts. Each animal received every third day vitamin B_1 60 μg., riboflavin 240 μg., pyridoxine 60 μg., Ca pantothenate 1·8 mg., inositol 6 mg., nicotinic acid 6 mg., choline hydrochloride 18 mg., *p*-aminobenzoic acid 18 mg. and cod liver oil 0·5 ml. Distilled water was given throughout the experiment. Rats on diet (3) were controls. Two hr. before the end of the experiment each rat was injected intraperitoneally with about 50 μC. of ^{32}P as phosphate; after death the livers were removed for fractionation of total acid-soluble, ribonucleic acid, deoxyribonucleic acid, adenylic acid and total acid-insoluble P components, and each was tested for ^{32}P activity.

The young rats on diet (1) did not achieve positive Ca or P balance during the experiment; those on diet (2) remained in positive balance. The mature rats on diet (2) were unable to remain in positive Ca and P balance; diet (4) was the best for maintaining Ca and P balance. The amounts of Ca and P in the diet did not affect the rate of renewal of either the acid-soluble or the nucleoprotein cell components in the liver when other dietary constituents were present in adequate amounts. In the skeleton a slowing down of turnover occurred in both young and old rats, although the levels of metabolism differed. Blood P values were significantly different in young rats, higher on diet (2) than on diet (1); mature rats on diet (4) did not show a blood P content significantly higher than that of those on diet (2). The liver size remained constant throughout all the experiments. The reduction in Ca and P intake, as well as unsuitable Ca : P ratios, produced widening of the layer of uncalcified cells between the cartilage and bone of the rib.—G. F. Garton.

2067

VALETTE, G. and CALDERON, C. E. Effet de la teneur du régime alimentaire en calcium sur la sensibilité du cobaye à l'histamine. [**Effect of the calcium content of the ration on histamine sensitivity in the guineapig.**] *C.R. Acad. Sci.*, 1955, **241**, 1620–1621.

Four guineapigs weighing 150 to 200 g. and previously shown to be resistant to the effects of histamine aerosol on the bronchi received a stock diet and 8 a diet low in Ca. After 5 days the 4 controls were still resistant to histamine, but the low-Ca group showed bronchospasm after from 80 to 200 sec. When the 4 controls were given the low-Ca diet 2 became sensitive to histamine after 5 days and the other 2 had become slightly sensitive after 9 days. The 8 which had received the low-Ca diet first were given the stock diet with the addition of condensed milk; 4 were resistant to histamine after 5 days, the other 4 showed bronchospasm after an increased time of exposure.

In a second experiment, calcium gluconate produced histamine resistance both in animals previously on a low-Ca diet and in normally resistant guineapigs newly arrived at the laboratory.

D. Duncan.

2068

BAUER, G. C. H., CARLSON, A. and LINDQUIST, B. **Bone salt formation measured in infants by means of P^{32}.** *Acta paediat.* 1955, **44**, 477–486. [Dept. Pharmacol., Univ. Lund.] French, German and Spanish summaries.

Computations of the rate of accretion of bone salt from the equation

$$A = \frac{^{32}P_{obs.}}{T \times S_M},$$

where A = rate of accretion, T = interval of time between administration of ^{32}P and observation, S_M = average specific activity of serum P during this interval, and $^{32}P_{obs.}$ = total amount of ^{32}P in inorganic portion of a calcified tissue, had been shown to be valid in rats.

The subjects were 4 infants aged from 5 to 15 months, 2 healthy and 2 with mongolism. Each received a single intramuscular injection of inorganic phosphates providing 2 μC. ^{32}P per kg. bodyweight. Capillary blood samples were taken $\frac{1}{4}$, $\frac{1}{2}$, 2, 3, 4, 8, 12 and 24 hr. later and urine was collected for 16 to 18 days. Bone specimens were taken from the tibiae 7 and 16 days after administration of ^{32}P.

The equation given above was valid for the infants. The rate of accretion was higher in spongy than in compact bone, so spongy bone should be carefully removed from samples. The mean values for A, expressed as mg. P per mg. P of bone specimen daily, were 0·016 and 0·011 for the 2 healthy infants, 0·02 for one mongoloid who was the youngest and smallest of the series, and 0·0057 for the other, who had a serum inorganic P value of only 4·1 mg. per 100 ml. and may have been deficient in vitamin D.

The values for the healthy infants corresponded to about 0·05 per cent. per hour, or 5 times the net increase in P.—D. Duncan.

2069

CARTIER, P. L'affinité du squelette du rat en croissance pour le radiophosphore. [**The affinity of the rat skeleton during growth for radioactive phosphorus.**] *C.R. Acad. Sci.*, 1955, **241,** 1632–1634.

Littermate rats received at different ages a single injection of 50 to 100 μC. carrier-free $NaH_2{}^{32}PO_4$ and were killed 24 hr. later. The P content and radio-activity of the centrodiaphyseal parts of both femurs were estimated.

The ^{32}P uptake of the bone depended on the degree of mineralisation; it was high during growth and had a low and constant value in adult rats. There was a sharp break in the curve shortly after puberty. The uptake of ^{32}P was inversely related to the degree of saturation of the protein matrix with minerals, for which it can provide a test.—D. Duncan.

2070

BACHRA, B. N. and WÖSTMANN, B. S. J. **Phosphate and radiophosphate clearance in the white rat after intraperitoneal administration of P^{32}.** *Arch. internat. Physiol.*, 1955, **63,** 273–290. [Lab. Physiol. Chem., Municipal Univ., Amsterdam.]

The subjects were rats weighing about 200 g., which had been kept for at least 3 months on stock diet. For the experiment the rat received by tube water equal to 5 per cent. of the bodyweight, the bladder was catheterised under light ether narcosis and then pentobarbital was given at 40 mg. per kg. bodyweight. Heparin was injected, then 1·5 ml. of 10 per cent. inulin solution, 40 min. before the collection period began, and 100 μC. almost carrier-free ^{32}P as Na_2HPO_4, 15 min. before collection. Urine was collected for 30 min. In one series of experiments the ^{32}P was given 24 hr. before the collection period. Blood was sampled every 10 min. during urine collection, after which the rat was decapitated and total blood was centrifuged for plasma.

Urine collected 15 min. after injection of ^{32}P showed more specific activity than did acid-soluble plasma phosphate; the average ratio was 2·3 : 1. At 24 hr. after injection there was no such difference; the ratio was unity.

Leakage of ^{32}P from the intraperitoneal space into the renal pelvis, ureters or bladder was considered improbable, because excretion of ^{32}P by rachitic animals in similar experiments was so slight and if leakage occurred it would be expected equally in normal and rachitic rats. When other possible sources of error are considered it is concluded that readily filtrable ionic phosphate comprises a fraction much less than 43 per cent. of the total inorganic P fraction in plasma, the rest being apparently in slowly filtrable complexes. The normal clearance values for phosphate reported in the literature are thought to be too small to represent the ionic phosphate.—D. Duncan.

2071

MONEY, W. L. and RAWSON, R. W. **Uptake of P^{32} by chick thyroid and testes following pituitary administration, iodine deficiency and thiouracil.** *Amer. J. Physiol.*, 1955, **182,** 1–4. [Sloan-Kettering Inst., Mem. Centre, New York.]

Twenty cockerels, 1 to 11 days old, were injected subcutaneously with a single dose of 1 ml. of a pituitary preparation containing thyroid-stimulating hormone and gonadotropic hormones; 2 hr. later the chicks and 20 controls received 10 μC. carrier-free ^{32}P injected in the same manner. After 1, 2, 4, and 24 hr., 5 treated and 5 control chicks were killed and the ^{32}P of thyroids and testes was estimated. Within 1 hr. the thyroids and testes of the chicks treated with the pituitary preparation had collected about twice as much radio-activity as those of the controls.

Another similar group of chicks was maintained on a low-iodine diet for a week and then given injections of the pituitary preparation and ^{32}P as before, and all were killed 24 hr. later. The concentration of ^{32}P in the thyroids and testes was not so consistently high as in the previous experiment, but it had increased more than in similarly treated chicks maintained on a stock Purina diet. A group of chicks on the low-iodine diet without injections of pituitary preparation concentrated more ^{32}P in the thyroids and testes than comparable chicks on the Purina diet. When chicks were

given a diet containing 0·1 per cent. thiouracil for 4 days and were then injected with the pituitary preparation and ^{32}P there was again an increase in ^{32}P in the thyroids and testes, but without the pituitary preparation the testes did not concentrate ^{32}P, although the thyroids did.

It is suggested that the greater concentration of ^{32}P by the thyroids of chicks on a low-iodine diet deserves further investigation.—B. W. Simpson.

2072

LANG, K., SCHACHINGER, L., KARGES, O., BLUMENBERG, F. K., ROSSMÜLLER, G. and SCHMUTTE, I. Der Stoffwechsel von Polyphosphaten. [**Metabolism of polyphosphates.**] *Biochem. Ztschr.*, 1955, **327,** 118–125. [Physiol. Chem. Inst., Johannes Gutenberg Univ., Mainz.]

Rats received a basal diet of two parts wheat flour to one of whole dried milk, with 1 per cent. torula yeast. After daily output of inorganic and total P in urine and faeces had been studied, the rats received for 8 days a diet containing 10 per cent. potassium metapolyphosphate and then for 11 days a similar diet with 5 per cent. sodium hexametaphosphate.

From 44 to 59 per cent. of the metapolyphosphate and 37 to 66 per cent. of the hexametaphosphate eaten appeared as such in the faeces, and excretion of orthophosphate in the faeces increased. The slight increase in orthophosphate output in the urine suggested that little of the polyphosphate was absorbed, whether as such or as orthophosphate. There was little or no polyphosphate in urine when hexametaphosphate was given, but 4 to 10 per cent. after metapolyphosphate, though it appeared in the forms of tetrametaphosphate, trimetaphosphate and pyrophosphate.

When polyphosphate was incubated with homogenate of mucosa from rat small intestine there was no evidence of enzymic breakdown.

Hexametaphosphate labelled with ^{32}P was given by stomach tube to 4 rabbits, which were killed after 12 and 24 hr. Only 9·7 per cent. of the ^{32}P was recovered in the tissues, 8·4 per cent. in the skeleton.—D. Duncan.

See also Absts. 1925, 1960, 1967-70, 1991, 2055, 2056, 2140, 2319, 2320, 2440, 2487.

MAGNESIUM

See Abst. 2487.

SODIUM, POTASSIUM, AND SODIUM CHLORIDE

2073

DANOWSKI, T. S., FERGUS, E. B. and MATEER, F. M. **The low salt syndromes.** *Ann. Int. Med.*, 1955, **43,** 643–657. [Dept. Res. Med., Child. Hosp., Pittsburg, Pa.] Interlingua summary.

2074

ROBINSON, S., NICHOLAS, J. R., SMITH, J. H., DALY, W. J. and PEARCY, M. **Time relation of renal and sweat gland adjustments to salt deficiency in men.** *J. Appl. Physiol.*, 1955, **8,** 159–165. [Dept. Physiol., Indiana Univ., Bloomington.]

The subjects, 7 men aged from 19 to 25 years and 1 aged 50, were trained and acclimatised to work in heat. In 6-hr. experiments they walked on a treadmill at 46° C. dry bulb, 26° C. wet bulb. In some experiments they were first depleted of salt by 5 days of low salt intake, 50 m. equiv. daily. They took glucose and water during work in the heat. Other experiments included work in heat and rest in a cooler room for alternate 2-hr. periods for 10 hr. on one day and 4 hr. after a night's rest, or intermittent work for 25 hr. in heat.

Estimated salt deficiencies of from 113 to 407 m. equiv. were produced. The response of the kidney to salt depletion began in 1 to 2 hr. and was in full operation after 5 to 14 hr. On the other hand, reduced output of Na and Cl in sweat did not begin for 8 hr. even in the intermittent experiments, and was delayed for 20 hr. when salt depletion was combined with steady exposure to heat with periods of work. When work and rest alternated in the hot environment, loss of salt in urine was less during work than at rest, but sweat concentration and salt output in sweat were much greater during work.—D. Duncan.

2075

GOLDMAN, R. and BASSETT, S. H. **The relationship of sodium retention and venous pressures to edema formation.** *Circulation*, 1955, **12,** 630–634. [Res. Serv., Veterans Admin. Centre, Los Angeles, Calif.] Interlingua summary.

An estimated water retention of 3 kg. and clinical oedema were induced in 2 patients by Na supplementation. The oedema was not preceded by increase in brachial venous pressure.

F. C. Aitken.

2076

MOORE, F. D., BOLING, E. A., DITMORE, H. B. (Jr.), SICULAR, A., TETERICK, J. E., ELLISON, A. E., HOYE, S. J. and BALL, M. R. **Body sodium and potassium. 5. The relationship of alkalosis, potassium deficiency and surgical stress to acute hypokalemia in man. Experiments and review of the literature.** *Metabolism*, 1955, **4,** 379–402. [Dept. Surg., Peter Bent Brigham Hosp., Boston, Mass.]

For previous parts see Absts. 202, 865, 2337, Vol. 25.

Experimental data show that in normal men restricted in K intake, losses of up to 200 m. equiv. K in 5 days may occur without change in serum K.

Metabolic alkalosis, produced by loss of Cl by gastric suction, and the renal Na blockade produced by stress or ACTH favour a fall of serum K and these combined with rapid loss of K produce severe alkalosis with clinical signs and symptoms and electrocardiographic changes.—F. C. Aitken.

2077

MARTIN, U. and GRATZL, K. Der muskuläre Zwerchfellkrampf, ein Kaliummangel-Symptom. [**Cramp of the diaphragm muscles, a sign of potassium deficiency.**] *Münch. med. Wochenschr.*, 1955, **97**, 1384–1387. [Ottostrasse 11, Munich 2.]

2078

FULLER, G. R., MACLEOD, M. B. and PITTS, R. F. (with PARKS, M. E.) **Influence of administration of potassium salts on the renal tubular reabsorption of bicarbonate.** *Amer. J. Physiol.*, 1955, **182**, 111–118. [Dept. Physiol., Cornell Univ. Med. Coll., New York.]

2079

FIELD, H. (Jr.), SWELL, L., DAILEY, R. E., TROUT, E. C. and BOYD, R. S. **Electrolyte changes in ileal contents and in feces during restriction of dietary sodium with and without the administration of cation-exchange resin.** *Circulation*, 1955, **12**, 625–629. [Veterans Admin. Centre, Martinsburg, W. Va.] Interlingua summary.

In 4 dogs with fistulae in the terminal ileum, stepwise reduction of Na intake caused stepwise decrease of Na concentration and increase of K concentration in terminal ileum. When Na restriction was accompanied by administration of resin, stepwise decrease of free and bound Na and increase of free K were found, but the Na and K concentrations for each level of intake exceeded those when resin was not given. Bound K increased with moderate Na restriction, but more severe restriction caused no further change.

With each Na intake the amount of bound Na in the terminal ileum exceeded Na intake. The resin retained Na in the faeces of the dogs no matter what the Na intake. The relative retention of Na in the faeces during administration of resin became progressively greater as Na intake was reduced.—F. C. Aitken.

2080

MEYER, J. H. **Influence of dietary levels of sodium chloride and protein on growth, nitrogen balance and body composition of the growing rat.** *Amer. J. Physiol.*, 1955, **182**, 83–88. [Dept. Animal Husb., Univ. California, Davis.]

For previous work see Abst. 3307, Vol. 24.

Weanling rats were fed to appetite on a basal diet containing 10, 25 or 40 per cent. casein or similar diets containing 15 per cent. NaCl or on the amount of basal diet consumed by the second group, but without NaCl.

NaCl depressed growth equally with all levels of casein in the rats fed to appetite, and the gains of fat, water, N, ash, Na and K in the eviscerated rat were less than in controls. The gains of the rats receiving NaCl were greater than those of the pair-fed controls, owing to the increased weight of the digestive tract and its contents. After evisceration total weight, gains of water, Na and K were the same, but gains of N, ash and fat, particularly with the higher casein levels, were higher in the controls.

NaCl produced a small increase in the water and Na content of the carcase, but fat decreased at the higher levels of casein, and N and K were unaffected. The N content of the carcase increased slightly and the ash content decreased when the casein was raised from 10 to 25 per cent. Protein content did not affect the contents of water, Na and K.

Balance studies showed that NaCl increased the digestibility but decreased the retention of N.

A. Hepburn.

2081

FREGLY, M. J. **Hypertension, NaCl aversion and polydipsia in rats. Time course and relation to age.** *Amer. J. Physiol.*, 1955, **182**, 139–144. [Dept. Physiol., Harvard Med. Sch., Boston, Mass.]

When the experiment began 21 rats were aged 10 weeks and weighed about 250 g. and 9 were 20 weeks old and weighed about 360 g. After 2 weeks when food and fluid intakes, bodyweight and blood pressure were measured, both kidneys were encapsulated with latex in 12 rats from the younger and 6 from the older group. Observations were continued weekly for 9 weeks and thereafter for 20 more weeks at intervals of 2 or 3 weeks.

A rise in blood pressure occurred in both groups at about the same time, from 2 to 4 weeks, after operation. Aversion to NaCl solution appeared in the younger rats about 8 weeks after operation when blood pressure was highest; in the older group blood pressure was highest at about 9 weeks, but dislike of salt was inconsistent. Of the operated rats, 7 of the 12 younger but only 2 of the 6 older died during the experiment. There was no difference in growth rate or in food intake between operated and control animals.—D. Harvey.

2082

SCHWARTZ, R., COHEN, J. and WALLACE, W. M. **Distribution of injected potassium salts in tissues of the potassium-deficient rat.** *Amer. J. Physiol.*, 1955, **182**, 39–44. [Dept. Paediat., Harvard Med. Sch., Boston, Mass.]

Young rats fed for 14 days on a diet deficient in K were injected intraperitoneally with K salts during a period of 12 hr. The bodyweight immediately increased. Although the total deficit was 15 m*M* K per kg. bodyweight (see Abst. 4718, Vol. 23), 17 m*M* KCl did not restore serum or muscle composition to normal. Normal values for K in these and for whole body K were obtained after 24 hr. with 25 m*M* K per kg., and Cl increased in muscle. Water was retained and the body fat increased after 4 days. On the fourth day after treatment deficiency had recurred. KCl proved toxic when given more quickly.

In rats given potassium acetate serum Na and Cl and red cell K were high after 24 hr. and returned to normal by the fourth day. K as acetate appeared to be more toxic than as chloride.

A. Hepburn.

See also Absts. 1904, 1961, 2438.

HALOGENS

2083

FELTMAN, R. and KOSEL, G. **Prenatal ingestion of fluorides and their transfer to the fetus.** *Science*, 1955, **122**, 560–561. [Passaic Gen. Hosp., N.J.]

Four groups of subjects were studied: 20 women who for different lengths of time during pregnancy had had F daily in tablets containing 2 mg. CaF_2 or 2·2 mg. NaF; 146 living nearby and having no extra F; 6 who used water from a fluoridated supply, and 9 getting water from an untreated source. F was estimated in cord blood and in a sample of tissue from the periphery of the placenta. Average values for the groups in the above order were, for blood, 41, 17, 38 and 22 μg. per 100 ml. and for tissue 111, 101, 85 and 67 μg. per 100 g. In 2 placentae, one from each of the first 2 groups, the concentration of F was mapped and is shown diagrammatically. In both it was highest at the periphery.

The importance of the findings cannot yet be finally assessed.—D. Harvey.

2084

KORRODI, H., WEGMANN, T., GALLETTI, P. and HELD, H. R. Sind bei der Cariesprophylaxe mit Fluor Rückwirkungen auf die Schilddrüse zu erwarten? [**Are repercussions on the thyroid to be expected from caries prophylaxis with fluorine?**] *Schweiz. med. Wochenschr.*, 1955, **85**, 1016–1019. [Med. Poliklin., Univ. Zürich.] English summary.

The problem is discussed and literature is reviewed.

Of 30 young rats, half received a normal diet and half a diet low in iodine. For each diet 3 groups were constituted, one receiving 0·05 mg. NaF daily, one receiving 2·0 mg. daily, and one without F. After 7 weeks all the rats were given an intraperitoneal injection of ^{131}I with no further food or NaF; 24 hr. later they were killed. The weight increase of the rats was irregular and no conclusion could be drawn from it. The rats having the diet low in I showed hyperplasia of the thyroid, which absolutely and relatively weighed about 3 times as much as the glands of the rats having normal diet, but there was no clear effect of the added NaF with either diet. The uptake of ^{131}I was much greater in the group having the diet low in I, but within each group was greatest by the rats given the larger dose of NaF.

A group of 10 human subjects received 4·4 mg. NaF daily for 3 months, and another group of 6 had 11 mg. daily for from 3 to 4 weeks. The amount of I bound to protein in the blood serum, uptake of ^{131}I by the thyroid, serum cholesterol and B.M.R. were estimated before and at the end of treatment. With the smaller dose there was no consistent change, but with the larger dose the amount of protein-bound I fell and uptake of ^{131}I increased. The subjects showed no sign of toxicity, and in one of them with Graves' disease there was no effect on the illness. The amount of F given in the smaller dose was greater than the amount likely to be given for prevention of caries.

E. M. Hume.

2085

PERKINSON, J. D. (Jr.), WHITNEY, I. B., MONROE, R. A., LOTZ, W. E. and COMAR, C. L. **Metabolism of fluorine 18 in domestic animals.** *Amer. J. Physiol.*, 1955, **182**, 383–389. [Univ. Tennessee-Atomic Energy Commission Agric. Res. Programme, Oak Ridge.]

^{18}F with a half-life of 1·87 hr. allows study for up to 10 hr. with non-toxic levels of total F. In the preparation of the isotope ^{22}Na appears simultaneously; some data are given for its metabolism.

When ^{18}F was injected intravenously into 6-month-old lambs the initial rate of disappearance from the blood was 41 per cent. of the dose per minute; for a cow it was 32 per cent. When given by mouth both ^{18}F and ^{22}Na appeared in blood as early as 5 min. after administration, suggesting absorption from the rumen. The concentration of ^{18}F in blood rose to a maximum 180 min. after administration and then fell; that of ^{22}Na continued to rise during the whole 609 min. of observation.

Excretion into the digestive tract was studied in lambs killed 2 hr. after administration by one or other route. Nearly all that given by mouth was then in the rumen; 5 per cent. of that given intravenously was in the digestive tract, 4 per cent. in the rumen and reticulum and 1 per cent. in the large intestine. The distribution in tissues was

studied in another lamb given the isotope by mouth and killed 2 hr. later. In the femur deposition was heavy in the primary spongiosa below the epiphyseal plate; in the mandible it was heaviest around the enamel of the unerupted molar.

The incorporation of ^{18}F given to hens was studied in the developing eggs. Accumulation was highest in the shell, and, with one exception, the concentration in the albumin was higher than in the yolk.

In the lactating cow after ingestion the concentration in milk was parallel to, but lower than, that in blood; after injection the concentration in milk rose rapidly to a peak at about 100 min. and then fell, the curve being parallel to and below that for the concentration in blood.—D. Harvey.

2086

MILLER, R. F. and PHILLIPS, P. H. **The enhancement of the toxicity of sodium fluoride in the rat by high dietary fat.** *J. Nutrition*, 1955, **56,** 447–454. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Groups of individually caged female weanling rats were fed for 42 to 50 days on purified diets containing 0·1 per cent. NaF and from 5 to 15 per cent. cottonseed oil or butterfat.

The growth-retarding effect of NaF increased with increasing proportion of fat in the diet and was not altered by supplements of pantothenate, methionine or ascorbic acid alone or in combination. The development of fluorosis, accelerated by fat, was unaffected by subcutaneous or intraperitoneal injection of adenosine triphosphate, pantothenate or cysteine alone or in combination. Since cottonseed oil and butterfat were equally effective in promoting fluorosis, the property could not be attributed to the average chain length of the component fatty acids, which differed considerably. The retardation of growth in these experiments was accompanied by increased deposition of F in the femurs.—G. A. Garton.

2087

WRIGHT, E. and ANDREWS, E. D. **Availability of iodate iodine to sheep.** *N.Z. J. Sci. Technol.* [*A*], 1955, **37,** 83–87. [Animal Res. Stat., Dept. Agric., Wallaceville.]

^{131}I was incorporated into potassium iodide and iodate. Solutions of one or other were given by stomach tube to 6 one-year-old Romney wethers which were kept without food for 24 hr. before and 48 hr. after. Each sheep got 25 μC. per dose, corresponding to about 10 μC. per g. thyroid tissue, on the assumption that the thyroid weighed about 2·5 g. The uptake of ^{131}I by the thyroids was measured every 20 hr. for 220 hr. Three tests were made at intervals of 1 month.

For 4 of the sheep the effect of KI was similar to that of iodate; the thyroid took up about 70 per cent. of the dose at the maximum. In the other 2 sheep the uptake from iodate was only 45 per cent. of the dose. The amounts of ^{131}I concentrated in the glands were sufficient to justify the conclusion that the I of iodate was almost as available as that of iodide, and the former had the advantage of being more stable when incorporated into salt blocks and was as easily obtainable.

B. W. Simpson.

See also Absts. 1491, 2071, 2176, 2385–90, 2418.

IRON AND COPPER

2088

HOUSTON, J. C. **Iron metabolism.** *Postgrad. Med. J.*, 1955, **31,** 394–396. [Guy's Hosp. Med. Sch.]

A short review.

2089

AGARWAL, S. C. and MISRA, S. S. **Current concepts of iron metabolism with special reference to iron transport in blood.** *J. Indian Med. Assoc.*, 1955, **25,** 483–488. [Dept. Med., K.G. Med. Coll., Lucknow.]

2090

SMITH, C. A., CHERRY, R. B., MALETSKOS, C. J., GIBSON, J. G. (2nd), ROBY, C. C., CATON, W. L. and REID, D. E. **Persistence and utilization of maternal iron for blood formation during infancy.** *J. Clin. Invest.*, 1955, **34,** 1391–1402. [Dept. Paediat., Harvard Med. Sch., Boston, Mass.]

Sixteen infants from 11 mothers who had received, on 4 to 7 occasions during pregnancy, transfusions of red blood cells containing ^{55}Fe were studied. Red and white cell counts, Hb, haematocrit, total Fe and the ^{55}Fe content of red cells were estimated in maternal venous blood and cord blood samples obtained at delivery and in samples of the infants' venous blood obtained at intervals up to 32 months of age. The mothers and infants were similar in diet, hygiene and general health to the population of any obstetrical hospital or baby clinic in the Boston area. The total activity of ^{55}Fe administered to each pregnant woman ranged from 2 to 12 μC.

Results from the 16 infants as a group indicated that little or no dietary Fe was used for formation of Hb until 3 to 4 months after birth. At 1 year Fe which had been transported across the placenta formed 70 per cent. of total Hb iron and, at 2 years, 40 per cent.; these values mean that 170 mg. of Fe transported across the placenta was in circulation at birth, 200 mg. at 1 year and 160 mg. at 2 years. The increase in transported Fe which

occurred at 200 to 400 days is believed to be due to utilisation of Fe stored during foetal life; infants with relatively low total circulating Hb at birth tended to show relatively large amounts of such stored Fe in Hb later. Individual infants showed deviation from the general pattern for the group; a premature infant of 36 weeks' gestation had low total circulating Hb at birth, no evidence of any stored Fe in later Hb formation and a proportionately high utilisation of dietary Fe, which first appeared in the Hb 65 days after birth.

G. F. Garton.

2091

RECHENBERGER, J. Die Eisenversorgung des Neugeborenen und Säuglings. [**The iron supply of the newborn and suckling.**] *Deutsch. Ztschr. Verdaungs- u. Stoffwechselkr.*, 1955, **15,** 228–237. [Med. Klin., Univ. Leipzig.]

A brief resumé is given of findings in the literature (see *e.g.*, Abst. 1825, Vol. 1) on the different ways in which Fe is supplied to the young of different species. To throw further light on the problem in man, Fe, total and as Hb, was estimated by the methods of Rechenberger and Schairer (Title 3641, Vol. 20) in the bodies, liver, spleen, and blood serum of 51 deceased infants, some premature.

The results are given in a diagram, which shows that during the first 3 months of life a "wave" of Fe passes through the body. At birth Fe present as Hb amounts to 190 mg., but falls very rapidly; the store of Fe in the liver is small, only about 20 mg., but it rises rapidly as excess Hb is broken down, and then declines gradually during the first year or until suitable foods other than milk are given.

It is calculated that the Fe lost by the mother at delivery amounts to about 500 mg., about half being in the infant. Allowing for 250 mg. saved by the cessation of menstruation, the mother has to supply 250 mg., which could be more than covered by absorption of 1 mg. from the food daily during pregnancy. A warning is included against applying to women the results of experiments on animals, *e.g.* rats, with different arrangements for supplying Fe and different types of placenta. If treatment with Fe is needed, the physiologically soundest method is to give it to the mother by mouth during pregnancy, especially the second half.—W. M. Deans.

2092

ZETTERSTRÖM, R. and DELAVA, S. **Refractory sideropenic anemia in childhood due to an error of iron metabolism.** *Blood, J. Hematol.*, 1955, **10,** 1246–1255. [Paediat. Clin., Karolinska Sjukhuset, Stockholm.]

Two cases of hypochromic anemia refractory to treatment with Fe by mouth or by vein are reported. Fe metabolism was studied with radio-active Fe. Serum Fe was very low, but Fe-binding capacity was normal. Absorption of Fe was defective and utilisation of injected radio-active Fe for synthesis of Hb was slow. There was a rapid turnover of plasma Fe.—F. C. Aitken.

2093

HEILMEYER, L. Ferritinstudien. [**Studies of ferritin.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1377–1379; 1395–1396. [Med. Klin., Univ. Freiburg i. Br.]

Data are given for the ferritin content, and for the Fe content of the ferritin, of liver and spleen obtained *post mortem* from 52 persons dead from different diseases and 1 healthy victim of accident. In liver disorders ferritin was low but the Fe content of the ferritin was high, showing that the liver was unable to synthesise apoferritin. The rest of the paper is devoted to the findings in haemochromatosis.—W. M. Deans.

2094

CHAPPELLE, E., GABRIO, B. W., STEVENS, A. R. (Jr.) and FINCH, C. A. **Regulation of body iron content through excretion in the mouse.** *Amer. J. Physiol.*, 1955, **182,** 390–392. [Dept. Med., Sch. Med., Univ. Washington, Seattle.]

Groups of 20 female mice included normal animals and mice with excessive body Fe, with experimentally induced Fe deficiency, with simulated infection produced by turpentine injection and with anaemia produced by administration of acetylphenylhydrazine. Each mouse received an intraperitoneal injection of 0·22 mg. Fe as $^{59}FeCl_3$, equivalent to 0·4 μC. The total body radio-activity was then estimated every 3 to 4 weeks for 196 days by placing the animal in a Texas gamma counter.

Within 2 days after injection of ^{59}Fe a loss of 9 to 15 per cent. of the isotope was recorded; subsequently the rate of loss of ^{59}Fe ranged from 0·29 to 0·73 per cent. daily.—G. F. Garton.

2095

MARKOWITZ, H., GUBLER, C. J., MAHONEY, J. P., CARTWRIGHT, G. E. and WINTROBE, M. M. **Studies on copper metabolism. 14. Copper, ceruloplasmin and oxidase activity in sera of normal human subjects, pregnant women and patients with infection, hepatolenticular degeneration and the nephrotic syndrome.** *J. Clin. Invest.*, 1955, **34,** 1498–1508. [Dept. Med., Univ. Utah Coll. Med., Salt Lake City.]

For part 13 see Title 2366, Vol. 25.

In all groups except the subjects with hepatolenticular degeneration there was a high positive correlation between caeruloplasmin level on the one hand and total plasma Cu, indirect-reacting

fraction of plasma Cu and oxidase on the other. Values were high in infection and higher in pregnancy. Caeruloplasmin values were low in hepatolenticular degeneration, but there was no obvious correlation between the value and the duration or severity of the clinical manifestations of the disease. Low values for caeruloplasmin were found in just over half the patients with the nephrotic syndrome. In these, loss of caeruloplasmin in urine was important.

Some data on caeruloplasmin in tissues are presented.—F. C. Aitken.

2096

MAHONEY, J. P., BUSH, J. A., GUBLER, C. J., MORETZ, W. H., CARTWRIGHT, G. E. and WINTROBE, M. M. **Studies on copper metabolism. 15. The excretion of copper by animals.** *J. Lab. Clin. Med.*, 1955, **46,** 702–708. [Dept. Med. Coll. Med., Univ. Utah, Salt Lake City.]

The excretion of intravenously injected ^{64}Cu was studied in normal dogs, dogs with ligated bile ducts and dogs with the flow of bile diverted to the urinary bladder. Excretion in urine accounted for about 0·6 per cent. of administered ^{64}Cu; 7 to 10 per cent. was excreted in the bile and 1·5 per cent. through the intestinal wall. Ligation of the bile duct increased the output of Cu from kidney and intestine.

Daily intravenous injection of 0·5 mg. non-radio-active Cu per kg. bodyweight resulted in a marked increase of urinary Cu in dogs with obstruction of the bile duct. The renal excretion of Cu by a normal dog was not increased by this treatment.

Ligation of the bile duct of 6 dogs and 4 pigs did not result in high blood Cu values even when 0·5 mg. Cu per kg. bodyweight daily was given by mouth or intravenously. About 70 per cent. of the Cu given was recovered from the liver of a dog that had received 180 mg. Cu intravenously during 34 days and from the liver of a pig given 920 mg. Cu during 57 days.—C. F. Mills.

2097

MILLS, C. F. **Availability of copper in freeze-dried herbage and herbage extracts to copper-deficient rats.** *Brit. J. Nutrition*, 1955, **9,** 398–409. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Herbage supplements and $CuSO_4 . 5H_2O$ in amounts equivalent to the Cu content of the herbage were added to the diet of groups of rats depleted of Cu by a diet of fresh whole milk supplemented with vitamins A, E and those of the B group. The response to dietary Cu was assessed by the extent of blood formation, growth, melanin pigment regeneration and hepatic Cu values.

The herbage supplements gave a greater response and more deposition of Cu in the liver than the $CuSO_4$. The effect was associated with a water-soluble form of Cu which is more readily available than free Cu. No difference in the utilisation of Cu could be demonstrated between normal herbage and that from an area where swayback is common if pregnant ewes are not given a Cu supplement. Possible reasons for this are discussed.

G. F. Garton.

See also Absts. 1917, 2421, 2422.

OTHER MINERALS

2098

LEE, C. C. and WOLTERINK, L. F. **Blood and tissue partition of cobalt 60 in dogs.** *Amer. J. Physiol.*, 1955, **183,** 173–177. [Dept. Physiol. Pharmacol., Michigan State Univ., East Lansing.]

Radio-activity was measured in 34 blood samples collected from 5 dogs at intervals after intravenous injection of 20 μg. ^{60}Co as sulphate per kg. bodyweight. Within 12 hr. after injection the blood cells contained insignificant amounts of ^{60}Co. Twelve hr. after one dog had received a similar injection, a high concentration of ^{60}Co was found in the liver, digestive tract, kidney, urine and bile. When a similar amount of ^{60}Co was injected into the lumen of the second loop of the small intestine of another dog, about 50 per cent. of the injected ^{60}Co was absorbed within 12 hr. and was concentrated in the liver, digestive tract, urine, kidney and bile. The ^{60}Co in plasma was about twice as high in the dog which received the intravenous injection as in the dog which received the intra-intestinal injection; in both dogs the spleen contained a small amount of ^{60}Co.—G. F. Garton.

2099

LEE, C. C. and WOLTERINK, L. F. **Metabolism of cobalt 60 in chickens.** *Poultry Sci.*, 1955, **34,** 764–776. [Dept. Physiol., Michigan State Coll., East Lansing.]

Chickens weighing about 1 kg. were given ^{60}Co by vein or directly into the gizzard. Some birds were normal, some had one or both caeca tied off, and some had the large intestine tied off.

In normal birds 24 hr. after intravenous injection 6 per cent. of the ^{60}Co was recovered from the small intestine, 5 per cent. from the caeca, 1 per cent. from the large intestine and 5 per cent. from the extracellular fluid. In the same period at least 13 per cent. was excreted in the faeces, and a large part of the remainder in the urine. With injection into the gizzard 15 per cent. appeared in faeces and only a small amount in the urine.

When the caeca were ligated it was shown that ^{60}Co entered through the wall in large amounts,

although in normal birds the course of entry was through the gut. There were large concentrations in the caecal wall, caecal contents and small and large intestines. There was no great difference in this between the 2 methods of administration. The ^{60}Co in these locations was thought to be in a non-diffusible form. The liver did not seem to remove Co from the blood to the same extent in the chicken as in the dog (see preceding Abst.).

T. D. Bell.

2100

HOCK, A., HORN, V. and PILAR-DIETRICH, A. v. Ernährungseinflüsse auf die Bleiablagerung in den Knochen von Ratten unter chronischer Bleivergiftung. [**Effect of diet on deposition of lead in bones of rats with chronic lead poisoning.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 307–317. [Vet. Physiol. Inst., Justus Liebig Hochsch., Giessen.] English summary.

Eight groups of rats of bodyweight 100 to 120 g., of both sexes, received different diets for 36 or 84 days and twice weekly an intraperitoneal injection of 1 mg. lead as acetate per 100 g. bodyweight. At the end the Pb content of the scapula was estimated and blood and tissues were examined for signs of poisoning.

None of the groups given Pb grew as well as controls given no Pb. No sign of poisoning was found. The only rats which lost weight were those on a diet with 8 per cent. protein, all of plant origin.

The mean Pb content of the scapula in the 20 control rats was 3 mg. per cent. In all the groups given Pb for 80 days the scapulae contained from 68 to 91·6 mg. per cent. The highest mean value, 91·6 mg. per cent., was in rats given a diet containing only 9·5 per cent. crude protein, mostly as dried skimmed milk. The lowest value, 68 mg. per cent., was in rats given what was regarded as an optimum diet, with 20·8 per cent. protein in the form of a mixture of dried whole and skimmed milk, meatmeal, fishmeal, soya bean meal and cereals. With 2 diets containing 16·9 per cent. protein mostly as skimmed milk, and with the 8 per cent. plant protein diet, values were significantly less than the highest. When the diet with 9·5 per cent. protein was supplemented with 0·5 per cent. methionine there was a significant reduction in the amount of Pb deposited. There appeared to be no effect from variations in Ca content between 510 and 803 mg. per cent., in P content between 350 and 834 per cent., or in Ca : P ratio between 1 : 1·12 and 1 : 0·69.

It is concluded that SH groups, produced from methionine via cysteine or by increased breakdown of body proteins in protein deficiency, increased the excretion of Pb. A protein-rich diet may be useful in treatment of lead poisoning.—D. Duncan.

2101

PARKER, H. E., ANDREWS, F. N., CARRICK, C. W., CREEK, R. D. and HAUGE, S. M. **Effect of manganese on bone formation studied with radioactive isotopes.** *Poultry Sci.*, 1955, **34,** 1154–1158. [Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Thirty day-old chicks were divided into 6 groups; 3 groups were fed on a diet containing 10 p.p.m. of manganese, and 3 groups on a diet containing 100 p.p.m. When they were 4 weeks old one low-Mn and one high-Mn group received an injection of radio-active Mn, another pair radio-active Ca and the third pair radio-active P.

Forty-eight hours after injection the tibiae of chicks fed on the low-Mn diet contained more radio-active Mn than those of chicks fed on the high-Mn diet, but the quantities of radio-active Ca and P deposited in the bone were not affected by Mn intake.

Radio-active Mn was deposited throughout the tibiae, but autoradiographs showed greatest concentrations in regions of greatest bone formation.

R. Hill.

2102

WOLFF, H. P., RINGLEB, D. and AMANN, R. Histochemische Untersuchungen über das Inselzink. 2. Histophotometrische Messungen. [**Histochemical studies of zinc in the islets of Langerhans. 2. Histophotometric measurements.**] *Ztschr. ges. exp. Med.*, 1955, **126,** 390–416. [Med. Poliklin., Univ. Marburg a.d. Lahn.]

For part 1 see Abst. 2376, Vol. 25.

Adult rabbits and rats were given dithizone solution as before for intravital staining of Zn, but a new method of preparing the solution gave better staining results. It was confirmed that adrenaline and insulin produced a clearly visible decrease in Zn in alpha cells of the pancreas of rats, but the loss of Zn from these cells in starvation could not be confirmed. All the results obtained earlier with rabbits were confirmed.

A photometric method is fully described by which the stained Zn in beta cells of rabbits was estimated quantitatively. In 12 normal rabbits the standard deviation of the values was $\pm$ 4·07 per cent. The absorption values for these 12 rabbits served as the basis for comparison.

In starved rabbits the beta cell Zn increased in the first 4 days by as much as 70 per cent., but after from 5 to 16 days of starvation the values were extremely variable. In 30 rabbits blood sugar and beta cell Zn were studied after a single intravenous injection of 7·5 to 10 g. glucose per kg. bodyweight. There was a significant fall to 20 to 50 per cent. of the initial Zn values 3 to 5 hr. after

the injection. Adrenaline also produced significant falls to about 30 per cent. of normal values in 2 to 5 hr. Carbaminoylcholine produced in 4 rabbits a slight and in 5 a large increase, of up to 120 per cent., in Zn values.

The relation between the Zn values by the above method and the β-granules stained with aldehyde fuchsin was studied. The β-granules showed no change comparable to the changes in stainable Zn produced by starvation and other influences. The possible role of Zn in the function of the beta cells is discussed.—D. Duncan.

2103

ELCOATE, P. V., FISCHER, M. I., MAWSON, C. A. and MILLAR, M. J. **The effect of zinc deficiency on the male genital system.** *J. Physiol.*, 1955, **129,** 53P–54P. [Div. Biol., Atomic Energy of Canada, Ltd., Chalk River, Ont.]

See also Abst. 2117.

ACID BASE EQUILIBRIUM

See Abst. 1492.

METABOLISM OF WATER

2104

ANDERSSON, B. and MCCANN, S. M. **A further study of polydipsia evoked by hypothalamic stimulation in the goat.** *Acta physiol. scand.*, 1955, **33,** 333–346. [Dept. Physiol., Kgl. Vet. Högsk., Stockholm.]

The injection of 0·003 to 0·01 ml. of 2 to 3 per cent. NaCl solution into the region of the hypothalamus of goats caused them to drink excessive quantities of water. Electrical stimulation of the hypothalamus produced the same result. The beginning and end of drinking corresponded closely to the application of stimulation.

A. T. Phillipson.

2105

WESTON, R. E. **Fluids and electrolytes.** *Med. Clins. N. Amer.*, 1955, **39,** 623–642. [Cardiovascular Serv., Med. Div., Montefiore Hosp., New York.]

An article with 38 references.

2106

MONTGOMERY, A. V. and HOLMES, J. H. **Gastric inhibition of the drinking response.** *Amer. J. Physiol.*, 1955, **182,** 227–231. [Dept. Physiol., Univ. Colorado Sch. Med., Denver.]

2107

RODECK, H. and KAULEN, R. Untersuchungen zur Frage des Diureserhythmus beim Kind. 1. Tageszeitliche Unterschiede der Diurese bei Wasserbelastung. [**Rhythm of diuresis in children. 1. Diurnal differences in diuresis after water.**] *Ztschr. Kinderheilk.*, 1955, **77,** 261–270. [Kinderklin., Med. Akad., Düsseldorf.]

Thirty healthy children aged from 5 to 13 years were tested by day, beginning at 7 a.m., with a water load of 30 ml. per kg. bodyweight, by mouth. Most of them had excreted all this after 6 hr.; those who had not were not tested by night. In the night test the children had nothing to eat or drink after 4 p.m. and were roused for the start of the test at 10 p.m. It lasted till 6 a.m. Nearly all showed delayed excretion by night and the sp. gr. of urine rose more slowly than by day; excretion of NaCl showed the same trend as sp. gr. The exceptions were lively children who slept lightly. Of 5 children with prepubertal obesity, 3 showed delayed excretion both day and night. The physiological implications are discussed.

W. M. Deans.

2108

HEELEY, A. M. and TALBOT, N. B. **Insensible water losses per day by hospitalized infants and children.** *Amer. J. Dis. Child.*, 1955, **90,** 251–255. [Dept. Paediat., Harvard Med. Sch., Boston, Mass.]

Insensible water loss was measured in 569 tests on 39 subjects under the conditions of ordinary hospital life. The average for patients aged from 2 months to 16 years was 930 ml. per sq. m. per 24 hr. There was a gradual decline with age from an average of 1200 ml. per sq. m. per 24 hr. for young infants to 700 for older adolescents.—F. C. Aitken.

2109

HARDY, J. D., JABBOUR, E., LOVELACE, J. R., NEELY, W. A. and WILSON, F. C. **Thermal burns in man. 4. Body weight changes during therapy.**

HARDY, J. D., NEELY, W. A. and WILSON, F. C. **7. "Insensible fluid loss".** *Surgery*, 1955, **38,** 685–691; 692–695. [Dept. Surg., Univ. Tennessee Med. Coll., Memphis.]

2110

SCHREIBER, M. and ELVEHJEM, C. A. **Water restriction in nutrition studies. 1. Level of**

fat and protein utilization. *J. Nutrition*, 1955, **57**, 133–145. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

In the first experiment groups of 3 male weanling rats were given to appetite diets varying in composition, while water was given to appetite or at the rate of 4 ml. or 2 ml. per rat daily for 3 weeks; the effects on growth and organ : bodyweight ratios were studied. In the second and third experiments the effects on growth, water consumption, energy and food intake, protein utilisation, liver fat content and organ : bodyweight ratios of diets in which fat was progressively substituted for carbohydrate at each of 3 protein levels were studied; food and water were given to appetite.

When water was restricted, diets high in fat or protein or both produced larger weight losses and more fatalities than did high-carbohydrate diets. The progressive substitution of fat for carbohydrate in low-protein diets resulted in increased energy intake, increased efficiency of protein utilisation, increased growth and no change in total body sp. gr., although the protein : energy ratio was constant. The progressive substitution of fat for carbohydrate at optimum protein intake resulted in decreased efficiency of protein utilisation, reduced growth and no change in total body sp. gr. with the protein : energy ratio maintained constant. The study of organ : bodyweight ratios showed reduced thymus ratios and increased kidney ratios with increased restriction of water intake and larger thymus ratios with increased protein intake. Liver ratios were little affected by changes in water or protein intake; spleen ratios behaved like those of the thymus.

G. F. Garton.

2111

IAMPIETRO, P. F. **Fluid, sucrose and electrolyte distributions after intraperitoneal injections of sucrose solution in the rat.** *Amer. J. Physiol.*, 1955, **182**, 148–154. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

Rats weighing about 200 g. received an intraperitoneal injection of 1 ml. per 100 g. bodyweight of 1·5 *M* sucrose solution. Na and Cl at once diffused into the peritoneal cavity and their concentrations in plasma fell, reaching the lowest values about 30 min. after the injection. Sucrose entered the plasma and in 15 min. reached a concentration of 35 m*M* per litre, which fell as the sucrose concentration in urine rose. Na and Cl concentrations in urine fell steeply as that of sucrose increased. There was a fall of 4·5 per cent. of bodyweight in the intracellular water at the end of 30 min. and an initial increase in extracellular water followed by a fall to below the initial level. Water diffused into the peritoneal cavity.

When distilled water or hypotonic sucrose was injected, Na and Cl diffused into the peritoneal cavity, but water diffused out. Diuresis occurred after both hypertonic and hypotonic solutions. It is suggested that hypertonic sucrose solutions may be used to produce rapid dehydration in the rat; by withdrawal of the peritoneal fluid after 2 hr., about 4 per cent. of the bodyweight as water could be removed, and another 2 per cent. was lost in the same time by diuresis.

The cells lost water with all doses of sucrose above 1 per cent. bodyweight of 0·9 *M* solution and gained water with all smaller doses.

D. Duncan.

See also Absts. 1715, 1850, 2075, 2441.

METABOLISM OF OTHER SUBSTANCES

2112

MARSHALL, E. K. (Jr.) and OWENS, A. H. (Jr.) **Rate of metabolism of ethyl alcohol in the mouse.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 573 – 576. [Dept. Pharmacol., Johns Hopkins Univ., Baltimore, Md.]

2113

BAXTER, J. H. and GOODMAN, H. **Renal and hepatic lipid alterations in choline deficiency : relationship to renal necrosis.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 682–687. [Lab. Metabol., Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

Male rats were given an experimental diet containing casein 20, sucrose 56 and Crisco 19 per cent., salts and vitamins and a control diet of similar composition with 0·3 per cent. choline chloride. Groups of animals were killed daily for 7 days and the kidneys and livers were removed for estimation of moisture content, total lipid, P, choline and free and total cholesterol.

Before the onset of renal congestion and necrosis in the experimental rats, *i.e.*, during the first 4 days, there was no substantial increase in relative renal size, nor was there any increase in lipid content of the kidneys, as there was in the liver; renal and hepatic choline decreased. After the onset of renal lesions, with congestion and necrosis, there was an increase in renal size and in total lipid per kidney, but not in renal lipid concentration. It is concluded that the cause of the renal necrosis is unknown, and it is not clear whether the fatty changes are a cause or a manifestation of injury.—G. F. Garton.

2114

SJÖVALL, J. and ÅKESSON, I. **Intestinal absorption of taurocholic acid in the rat. Intestinal absorption of cholanic acid in the rat.**

EKDAHL, P. H. and SJÖVALL, J. **Metabolism of desoxycholic acid in the rabbit. Bile acids and steroids 26, 27, 28.** *Acta physiol. scand.*, 1955, **34**, 273–278; 279–286; 287–294. [Dept. Physiol. Chem., Univ. Lund.]

26. Biosynthetic taurocholic acid, labelled with ^{14}C in the cholic acid moiety, was given by mouth to 2 rats with lymph duct cannulae and bile fistulae and to a rat with only a lymph duct cannula.

Only traces of ^{14}C activity were found in the lymph which was collected, and most of the ^{14}C activity was recovered from the bile secreted within 1 hr. of ingestion of the labelled compound.

27. In similar experiments the absorption of cholanic acid-24-^{14}C was studied; this acid was selected because it has solubility similar to that of long-chain fatty acids which are transported, via the lymphatic pathway, as triglycerides. In the intact rat about 70 per cent. of cholanic acid given by mouth was absorbed. In rats with lymph duct fistulae 3 to 7 per cent. of the ^{14}C activity was recovered in the lymph. When animals with lymph duct and bile duct fistulae were used about 10 per cent. of the ^{14}C absorbed was found in lymph and 90 per cent. in the bile.

28. Deoxycholic acid-24-^{14}C was given to rabbits with bile duct fistulae. The metabolic products excreted into the bile were examined by paper and reversed phase chromatography. Most of the deoxycholic acid was eliminated as glycodeoxycholic acid; no transformation to cholic acid occurred.—G. A. Garton.

METABOLISM OF CELLS, TISSUES, ETC.

GENERAL PHYSIOLOGY

2115

MORGAN, J. F., CAMPBELL, M. E. and MORTON, H. J. **The nutrition of animal tissues cultivated *in vitro*. 1. A survey of natural materials as supplements to synthetic medium 199.** *J. Nat. Cancer Inst.*, 1955, **16**, 557–567. [Lab. Hyg., Dept. Nat. Health Welfare, Ottawa.]

Details are given of improvements in a synthetic medium for tissue culture previously described (Abst. 733, Vol. 20). With the improved medium as base, tests were made of the effects on survival of chick embryo heart muscle of graded additions of natural materials, in order to gain information about the nature of unidentified substances required for the nutrition of tissue cells. For increase in cell survival time, chick embryo extract was by far the best, followed by whole liver extract, beef extract, horse serum, yeast extract, liver fraction L and amniotic fluid of cattle. On the other hand, if the criterion was concentration required for maximum stimulation, whole liver extract was by far the most potent, followed by yeast extract, liver fraction L, beef extract, chick embryo extract, horse serum and amniotic fluid. Maize steep liquor, malt extract, distiller's dried solubles, liver coenzyme concentrate and ascitic fluid had no significant effect. The fact that liver, yeast and embryo extract are highly active suggests that the active substances may be coenzymes. That the results for liver coenzyme concentrate do not agree with those of other workers is taken to imply that a clear distinction must be made between cell proliferation and cell survival.—W. M. Deans.

2116

EAGLE, H. **Nutrition needs of mammalian cells in tissue culture.** *Science*, 1955, **122**, 501–504. [Lab. Infect. Dis., Nat. Microbiol. Inst., Nat. Insts. Health, U.S. Pub. Health Serv., Bethesda, Md.]

The requirements of a mouse fibroblast and a human carcinoma cell strain are compared (see Absts. 808, 834, 1625, Vol. 26). The requirements for 13 amino-acids are closely similar. Seven vitamins or their conjugates have proved to be essential for both types of cell. The essential ions are Na^+, K^+, Ca^{++}, Mg^{++} and $H_2PO_4^-$. Both cultures grew well with glucose as carbohydrate source, and almost as well with galactose, mannose and maltose. Both required some unidentified substance supplied by a small amount of serum protein.

The application of the findings is discussed.

D. Duncan.

2117

HARRIS, H. **The sulphur requirement of rat connective tissue cells.** *Brit. J. Exp. Pathol.*, 1955, **36**, 454–459. [Sir William Dunn Sch. Pathol., Oxford.]

Cysteine and cystine, alone of 19 L-amino-acids tested, restored the power to support cell multiplication which is lost by horse serum during storage. The optimum concentration was 0·001 *M* for cysteine and 0·0001 *M* for cystine. The capacity so restored was greater than that possessed by the serum when fresh, and the rate of multiplication in fresh serum could be increased by addition of these L-acids. The D-isomers appeared to be ineffective. The same effect was produced by thioglycollic or dithioglycollic acid or by sodium

sulphite, but not by methionine, methyl-S-cysteine, cystathionine or glutathione.

D. Harvey.

2118

LUNDSGAARD, E. Leverens rolle for den samlede organismes stofskifte. [**Role of the liver in the metabolism of the whole organism.**] *Nord. Vet.-Med.*, 1955, **7**, 869–891.

Oxidative metabolism in the liver is of such a magnitude that it accounts for from 20 to 25 per cent. of the total oxygen consumption of the resting organism in which the liver constitutes only 2·5 to 3 per cent. of weight. Alcohol, glycerol and amino-acids are not primarily oxidised by tissues other than liver, but all are partly oxidised in the liver and their products are further oxidised to CO_2 and water in extra-hepatic tissues. The procedure is not quite the same with fat and fatty acids. These can be completely oxidised in any tissue. In the liver they undergo β-oxidation to acetic acid, and 2 molecules of acetic acid may be condensed to form ketones. The fact that the liver that is actively producing ketones is also producing more than the normal output of CO_2 argues against the theory that the cause of ketone production is blocking of the tricarboxylic acid cycle. Instead it has been suggested that, in the normal liver, concurrently with partial oxidation to acetic acid, fresh synthesis of fatty acids from acetic acid goes on and it is this re-synthesis that is blocked when ketones are produced. Neither theory is satisfactory. A change in the rate of breakdown of fat, with excess production of acetic acid, excess condensation to ketones and displacement of higher fatty acids in extra-hepatic tissues is more probable. If that is so, then partial oxidation of fat in liver is not an obligatory stage in its breakdown to yield energy as is partial oxidation of ethyl alcohol, glycerol and amino-acids.

I. Leitch.

2119

BING, R. J. **Myocardial metabolism.** *Circulation*, 1955, **12**, 635–647. [Dept. Med., Med. Coll. Alabama, Birmingham.]

A review with 53 references.

2120

MATTHIES, H. Über Stoffwechselleistungen roter Blutkörperchen. 4. Substratverarmung und Stoffwechselaktivität. [**The work of the red blood cells. 4. Impoverishment of substrate and metabolic rate.**] *Arch. exp. Pathol. Pharmakol.*, 1955, **226**, 442–448. [Inst. Pharmakol., Humboldt Univ., Berlin.]

For part 1 see Abst. 4947, Vol. 24.

In washed rabbit red cells the acceleration of disappearance of methaemoglobin in the presence of glucose, fructose or glucose plus methylene blue depended on the time which elapsed between warming the cell suspension to 37° C. and adding the substrate : the later the addition, the less the effect. With lactate or formaldehyde the acceleration was independent of the time of addition.

It is concluded that the decline in ability of the cells to utilise glucose or fructose is a result of gradual dissipation of adenosine triphosphate in general cell metabolism and failure of its re-synthesis.—D. Duncan.

2121

WILSON, T. H. and VINCENT, T. N. **Absorption of sugars *in vitro* by the intestine of the golden hamster.** *J. Biol. Chem.*, 1955, **216**, 851–866. [Dept. Biochem., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

Segments of small intestine from hamsters were made into sacs with the serosal surface inside and were filled with bicarbonate saline solution and suspended in similar solutions containing the carbohydrates to be studied at the 1 per cent. level. They were incubated for 1 hr. at 37° C. under oxygen or nitrogen with 5 per cent. CO_2. The final volume of fluid inside the sac was estimated by weighing.

When the intestinal sac was suspended in fructose solution, glucose appeared on the serosal side. Fructose did not cross the wall against a concentration gradient ; its final concentration was the same on both sides, but the glucose concentration on the serosal side was high. The amount of fructose converted to glucose per mg. dry weight of tissue was constant, at about 1·7 to 2·3 μg. per hr., and the movement of free fructose was proportional to the concentration on the mucosal side. Fructose placed on the serosal side appeared on the mucosal side at much the same rate as sorbose or xylose. In anaerobic conditions the movement of fructose from mucosal to serosal side was about trebled, but there was no conversion to glucose.

Galactose was transported against a concentration gradient in the absence of glucose. Utilisation and rate of transport were similar to those of glucose. No evidence for conversion to glucose was found. Transport against a gradient did not occur anaerobically. 3-Methylglucose was transported aerobically against a gradient at about half the rate of glucose and galactose. There was no evidence that it was utilised or converted to glucose.

Fructose, mannose, sorbose, xylose, arabinose and ribose were not transported against a gradient. Glucose did not facilitate their transport. Absorption of glucose or galactose aerobically was 5 or 10 times as fast as that of most other sugars, but transport from serosal to mucosal side was much less.

Sucrose, maltose and lactose placed on the mucosal side of the intestine were hydrolysed at

different rates, lactose slowest. When sucrose was hydrolysed to glucose and fructose, only glucose appeared on the serosal side in appreciable quantity. Little lactose was hydrolysed ; similar quantities of glucose and galactose were found on the mucosal side, but more galactose on the serosal side. With soluble starch, only glucose appeared on the serosal side.—D. Duncan.

2122

BLOOM, B. **Fraction of glucose catabolized via the Embden-Meyerhof pathway: alloxan-diabetic and fasted rats.** *J. Biol. Chem.*, 1955, **215,** 467–472. [Div. Nutrit. Physiol., Pub. Health Res. Inst. City of New York, Inc.]

Glucose, gluconate and lactate labelled with ^{14}C were incubated with liver slices from fasted or diabetic rats. The proportion of glucose catabolised via the Embden Meyerhof pathway was calculated from the radio-activity of CO_2 and fatty acids. The values were greater than that of about half, found for liver slices from normal rats (see Abst. 813, Vol. 26).—A. Hepburn.

2123

WHITNEY, J. E. and ROBERTS, S. (with BEAVER, E. L.). **Influence of previous diet on hepatic glycogenesis and lipogenesis.** *Amer. J. Physiol.*, 1955, **181,** 446–450. [Dept. Physiol. Chem., Sch. Med., Univ. California Med. Centre, Los Angeles.]

Liver slices were obtained from adult male rats which had been fed for 2 to 3 months on either a stock diet or a diet high in fat or carbohydrate and killed 1 hr. or 24 hr. after the last feed. The stock diet provided about half its energy as carbohydrate and 15 per cent. as fat ; the other 2 diets had 85 per cent. of their energy as maize oil or glucose. The liver slices were minced and incubated at 37° C. for 6 hr. in a rat serum medium containing acetate-^{14}C, and the incorporation of ^{14}C into fatty acids, cholesterol, glucose and glycogen was studied.

The high-fat diet caused less incorporation of the methyl carbon of acetate into liver glycogen and fatty acids in the tissue of non-fasting animals as compared with values obtained from liver tissue of animals fed on the stock or high-carbohydrate diet ; in contrast, liver cholesterol contained more ^{14}C. Other evidence presented suggests that these findings are a reflection of depressed glycogen and fatty acid formation which accompany increased formation of cholesterol in fat-adapted animals.

G. A. Garton.

2124

WHITNEY, J. E., ROBERTS, S. and BEAVER, E. L. **Influence of previous diet on hepatic utilization of glucose *in vitro*.** *Amer. J. Physiol.*, 1955, **182,** 51–53. [Dept. Physiol. Chem., Sch. Med., Univ. California Med. Centre, Los Angeles.]

Adult rats were killed after being for from 2 to 3 months on a synthetic diet with 85 per cent. of its energy derived from either fat or carbohydrate. Some had fasted for 24 or 48 hr. before death. Carbon dioxide production and formation of glycogen in liver tissue were studied during incubation with buffer solution containing ^{14}C-glucose. In liver from rats which had not fasted production of CO_2 was less in the fat than in the carbohydrate group ; the effects of fasting did not differ in the groups. Measurements of radio-activity showed that production of CO_2 and glycogen from glucose also were less in the fat than in the carbohydrate group ; the difference was detectable in rats which had fasted for 24 or 48 hr.

It is concluded that the liver tissue in the group given fat may oxidise preferentially some compound other than the added glucose ; measurements of R.Q. in this study support the hypothesis (see Abst. 1473, Vol. 14) that this may be fat, the main constituent of the preceding diet.

D. Harvey.

2125

PARK, C. R., BORNSTEIN, J. and POST, R. L. **Effect of insulin on free glucose content of rat diaphragm *in vitro*.** *Amer. J. Physiol.*, 1955, **182,** 12–16. [Dept. Physiol., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

Diaphragms were obtained from young rats fasted for 18 to 20 hr. Insulin was found to accelerate the uptake of glucose from solutions of 500 mg. glucose per 100 ml. ; 97 per cent. of that taken up was accounted for by phosphorylation with insulin, and 95 per cent. without. With 2000 mg. glucose per 100 ml., insulin again accelerated glucose uptake, but now 66 per cent. of the increase was accounted for by increase in the free glucose content of the tissue. With 200 mg. glucose per 100 ml. medium, insulin increased free glucose and not phosphorylation at 12° C., when the hexokinase system was inhibited. Thus increased uptake of glucose in the presence of insulin is independent of phosphorylation. Studies with ^{14}C-labelled glucose showed that the increased glucose content of the tissue was indeed due to uptake and not to new formation of glucose *in situ*.

D. Duncan.

2126

MANDEL, P. and WEILL, J. D. Recherches sur le métabolisme énergétique du cerveau au cours du développement chez le rat. 3. Consommation de glucose et production d'acide lactique. **[The energy metabolism of the brain of the rat during development. 3. Consumption of glucose and production of lactic acid.]** *Bull. Soc. Chim. biol.*, 1955, **37,** 839–845. [Inst. Chim. Biol., Fac. Méd., Strasbourg.]

2127

WHALER, B. C. **The metabolism of amino acids by the small intestine.** *J. Physiol.*, 1955, **130,** 278–290. [Dept. Physiol., Univ. Sheffield.]

Isolated intestinal loops from the anterior end of the jejunum of rat and cat were prepared. Amino-acids were deaminated in such preparations. Synthesis of amino-acids occurred; in particular, when α-oxo-*iso*valeric and α-oxo-*iso*caproic acids were introduced with an ammonium salt, valine and leucine, respectively, were formed. The identity of these amino-acids, which were separated chromatographically, was established.

A. T. Phillipson.

2128

SIMPSON, M. V. and MCLEAN, J. R. **The incorporation of labeled amino acids into the cytoplasmic particles of rat muscle.** *Biochim. biophys. Acta*, 1955, **18,** 573–575. [Dept. Biochem., Yale Univ., New Haven, Conn.]

Male rats were given intravenous injections of 3 mg. DL-leucine-1-^{14}C. After 2, 3, 5, 10, 30, 90 or 180 min. animals were killed and samples of skeletal muscle and liver were removed for fractionation into mitochondria, microsomes and other particulate fractions by differential centrifuging of homogenates. The leucine content of the protein of each fraction was estimated microbiologically and was found to be about 10 per cent. of the weight of protein. When the incorporation of labelled leucine was measured the microsomal fraction was the most active and the mitochondrial fraction the least active, having less than 25 per cent. of the uptake of the microsomal fraction; the difference was greatest at short time intervals. In muscle the rate of incorporation into the mitochondrial fraction was not appreciably lower than into the microsomes; after 5 min. or less the incorporation into the mitochondrial fraction of muscle was somewhat higher than in the microsomal fraction. Similar results were obtained when phenylalanine-3-^{14}C was substituted for leucine-1-^{14}C.—G. F. Garton.

2129

LAIRD, A. K., BARTON, A. D. and NYGAARD, O. **Synthesis of protein and ribonucleic acid in rat liver during refeeding after starvation.** *Exp. Cell. Res.*, 1955, **9,** 523–540. [McArdle Mem. Lab., Univ. Wisconsin, Madison.]

Male albino rats were starved for 6 days and then permitted free access to a normal diet. Groups of 4 rats were killed at intervals up to the twelfth day of re-feeding. An injection of glycine-2-^{14}C and inorganic phosphate containing ^{32}P was given 3 hr. before death. In starved rats the livers lost about 50 per cent. of weight and of their protein and ribonucleic acid content. During the first day of re-feeding there was an immediate and rapid increase in weight of the liver, but the rise in protein and ribonucleic acid content was small. Ribonucleic acid increased first in the mitochondria, and the content of all fractions was restored to normal in 7 days. The protein and ribonucleic acid content of the nuclear fraction fluctuated during re-feeding, but the amount in the cytoplasm increased fairly steadily. The ribonucleic acid content of the liver increased only during periods of active change in the protein content of the nuclear fraction. It is suggested that in rat liver during recovery from starvation protein is synthesised by two processes, one an intermittent production of protein by the nucleus, accompanied by production of ribonucleic acid, the other a steady production of protein in the cytoplasm.

A. M. Copping.

2130

NAKADA, H. I., FRIEDMANN, B. and WEINHOUSE, S. **Pathways of glycine catabolism in rat liver.** *J. Biol. Chem.*, 1955, **216,** 583–592. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

2131

ICHIHARA, A. and GREENBERG, D. M. **Pathway of serine formation from carbohydrate in rat liver.** *Proc. Nat. Acad. Sci., Washington*, 1955, **41,** 605–609. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

2132

ROSE, G. and SHAPIRO, B. **The synthesis of fatty acids and glycogen by adipose tissue *in vitro*.** *Biochim. biophys. Acta*, 1955, **18,** 504–510. [Dept. Biochem., Hebrew Univ.-Hadassah Med. Sch., Jerusalem.] French and German summaries.

Mesenteric adipose tissue was obtained from male rats which had been fasted for 5 to 6 days and then divided into 2 groups, one of which continued to fast for 24 hr., while the other was fed. The tissue was then incubated at 37° C. for 3·5 hr. with uniformly labelled ^{14}C-glucose, 2-^{14}C-pyruvate or 1-^{14}C-acetate in a medium consisting of 5 per cent. serum albumin in Krebs Ringer phosphate buffer. Long-chain fatty acids and glycogen were then isolated for measurement of their radio-activity.

Tissue from fed rats formed much fatty acid from pyruvate and glucose and less from acetate; tissue from starved animals showed a depression of $\frac{1}{15}$ to $\frac{1}{16}$ of the values obtained from all precursors in tissue from fed animals. The addition of glucose partly restored fatty acid synthesis from acetate in the starved tissue, but was without effect on synthesis from pyruvate or glucose; the addition of succinate or α-ketoglutarate had no effect.

The incorporation of ^{14}C-glucose into glycogen was not affected by starvation.—G. A. Garton.

2133

HAREL, L. Variations de l'activité du system oxydant les acides gras (acide octanoïque) dans le foie du rat, en fonction du régime : adaptation métabolique. [**Variations in the activity of the fatty acid oxidising system (octanoic acid) in the liver of the rat as a function of diet : metabolic adaptation.**] *C.R. Acad. Sci.*, 1955, **241**, 1516–1518.

2134

TULPULE, P. G. and WILLIAMS, J. N. (Jr.) **Study of the role of essential fatty acids in liver metabolism.** *J. Biol. Chem.*, 1955, **217**, 229–234. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Groups of rats were fed for 6 weeks on a basal diet with and without the addition of methyl linoleate or vitamin B_6. Some groups were fed to appetite the whole time, others received restricted amounts of food for part of the experiment. The livers were removed and homogenised for assay of the activity of enzyme systems.

Liver tissue from animals without linoleate showed an increased titre of the antimycin-A-sensitive substance and of cytochrome oxidase ; vitamin B_6 appeared to be necessary for the maintenance of the enzymes affected by deficiency of essential fatty acids. Linoleate deficiency was accompanied by a fall in the ratio of phosphate esterified to oxygen consumed for the oxidation of reduced diphosphopyridine nucleotide and cytochrome *c*.

It is considered that the main site of action of essential fatty acids is in the phosphate esterification system, coupled with the oxidation of reduced cytochrome *c*.—G. A. Garton.

2135

FELLER, D. D. and HUFF, R. L. **Lipide synthesis by arterial and liver tissue obtained from cholesterol - fed and cholesterol - alcohol - fed rabbits.** *Amer. J. Physiol.*, 1955, **182**, 237–242. [Radioisotope Unit, Veterans Admin. Hosp., Seattle, Wash.]

Liver slices and strips of aorta were obtained from normal rabbits and others which had received diets with added cholesterol, with or without ethanol in their drinking water. Analysis of serum and tissues showed that alcohol did not affect the high blood cholesterol or the increased lipid content of tissues found when cholesterol alone was given. Strips of sclerotic aorta, when incubated with acetate labelled with ^{14}C, incorporated the same amount of ^{14}C into fatty acids, unsaponifiable matter and CO_2 as did normal aortic tissue. Similar experiments with liver slices showed that formation of fatty acid and cholesterol from acetate was reduced in animals given cholesterol ; no effect on the oxidation of acetate was found. The role of dietary cholesterol in the regulation of aortic and hepatic lipid synthesis is discussed.—G. A. Garton.

2136

HILL, R., BAUMAN, J. W. and CHAIKOFF, I. L. **Dietary repair of defective lipogenesis and cholesterogenesis (from C^{14}-acetate) in the liver of the hypophysectomized rat.** *Endocrinology*, 1955, **57**, 316–321. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Liver slices from normal and hypophysectomised rats were incubated with acetate-1-^{14}C and the extent of incorporation of ^{14}C into fatty acids and cholesterol was studied. Slices from hypophysectomised animals which had been fed on a diet containing 25 per cent. sucrose as the only source of carbohydrate showed a greatly reduced capacity for converting acetate into fatty acids and cholesterol. This capacity was normal when a diet containing 60 per cent. sucrose or starch was given to hypophysectomised rats.

It was concluded that the maintenance of normal liver synthesis of fatty acids and cholesterol is independent of anterior pituitary hormones, as long as an abundance of glucose is provided by the diet.—G. A. Garton.

2137

MIGICOVSKY, B. B. and WOOD, J. D. **Effect of starvation on cholesterol biosynthesis *in vitro*.** *Canad. J. Biochem. Physiol.*, 1955, **33**, 858–866. [Div. Chem., Sci. Serv., Canada Dept. Agric., Ottawa.]

Liver homogenates from normal rats and from rats fasted for 48 hr. were separated into 3 fractions, coarse and finer particulate matter and " clear supernate ", by centrifuging at up to 140,000 *g*. The liver preparations were incubated with adenosine triphosphate, dipyridine nucleotide and acetate-1-^{14}C at *p*H 7·2.

Incorporation of acetate-1-^{14}C into cholesterol could be demonstrated in normal rat liver preparations when either particulate residue was incubated with clear supernate. Liver preparations from fasted rats showed no such synthetic activity, although incubation of clear supernate from liver homogenate of starved rats with normal particles appeared to give some activity. Degradation of cholesterol occurred with the coarse particles from both normal and starved rats.—A. K. Lough.

2138

GARTON, G. A. **The metabolism of phospholipids in the lactating mammary gland of the rabbit.** *Biochem. J.*, 1955, **61**, 402–406. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The specific radio-activity of the phospholipins of mammary gland tissue and liver from 2 lactating rabbits injected intravenously with ^{32}P-phosphate was on the average 12·1 and 9·0 per cent. of the corresponding value for glycerophosphate. In the one rabbit which was milked the specific radio-activity of phospholipin P from mammary gland, milk and plasma was 262, 107 and 99, indicating that phospholipin was formed in the mammary gland.

In 4 lactating rabbits injected with plasma containing labelled phospholipins the specific radio-activities of phospholipin, glycerophosphate and inorganic phosphate decreased in that order in the mammary gland. The apparent breakdown of phospholipin was calculated to be 20 per cent. in 2 hr. The milk was not radio-active.

A. Hepburn.

2139

GEYER, R. P., SCHOLTZ, K. J. and BOWIE, E. J. **Influence of calcium on potassium concentration in rat liver *in vitro*.** *Amer. J. Physiol.*, 1955, **182,** 487–492. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Liver slices from fasted rats and from rats fed on a commercial stock diet were used to study the effect on liver K of varying Ca content of the suspending medium, the effect of Ca on the loss of liver K in K-free media and on the subsequent recovery of K in K-containing media in anaerobic and aerobic incubation, and the effect of replacement of Ca by Ba and Sr in the medium.

K was gained by liver slices from fed rats in aerobic or anaerobic conditions provided that sufficient Ca was present in the medium, and when such K had been gained aerobic conditions were unnecessary for its maintenance. Liver slices from fed rats regained about the normal K content from low-K media provided Ca was present ; slices from fasted rats gained about 80 per cent. of the normal K content in the presence of Ca. When such slices were placed in N they rapidly lost K. Ba could replace Ca, but Sr was less effective.

G. F. Garton.

2140

DALLEMAGNE, M. J., BODSON, P. and FABRY, C. Le calcium échangeable de la substance minérale de l'os étudié à l'aide de ^{45}Ca. [**Exchangeable calcium of the mineral substance of bone studied with ^{45}Ca.**] *Biochim. biophys. Acta*, 1955, **18,** 394–406. [Inst. Thérap. Exp., Univ. Liège.] English and German summaries.

Bone mineral was treated with solutions containing different concentrations of $^{45}CaCl_2$, allowing Ca of the bone mineral to exchange with ^{45}Ca. The solid phase containing exchanged ^{45}Ca was extracted with dilute HCl, and total Ca, ^{45}Ca and total P were estimated in each extract. The first extracts contained principally the " excess " Ca, and the quantity of Ca exchanged on treating the bone salt with dilute $CaCl_2$ was similar to the quantity of " excess " Ca. Greater quantities of Ca were exchanged when the concentration of $CaCl_2$ was increased.—R. Hill.

See also Absts. 1385, 1625.

GROWTH AND METABOLISM OF TUMOUR CELLS

2141

WATERHOUSE, C., TEREPKA, A. R. and SHERMAN, C. D. (Jr.) **The gross electrolyte composition of certain human malignant tissues.** *Cancer Res.*, 1955, **15,** 544–549. [Dept. Med., Sch. Med. Dent., Univ. Rochester, N.Y.]

Malignant tissues, lymphoma, sarcoma and carcinoma, had a much higher water content than normal tissues. N content was normal when estimated on a dry basis. K and P were higher than normal in lymphoma, but not so much so in sarcoma and carcinoma.—J. S. Thomson.

2142

HOLZER, H., HAAN, J. and PETTE, D. Zusammenhang zwischen Wachstum und aerober Gärung. 2. Wachstumshemmung des Ehrlichschen Mäuse-Ascites-Carcinoms mit Jodacetat. [**Relation between growth and aerobic fermentation. 2. Inhibition of the growth of the Ehrlich mouse-ascites carcinoma by iodoacetate.**] *Biochem. Ztschr.*, 1955, **327,** 195–201. [Physiol. Chem. Inst., Univ. Hamburg.]

For part 1 [not so numbered] see Title 836, Vol. 26.

2143

GREENBERG, D. M. and SASSENRATH, E. N. **Tumor-host relationships. 2. Tolerance to injection of amino acids.** *Cancer Res.*, 1955, **15,** 620–625. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

For part 1 see Abst. 2418, Vol. 25.

Tissues were taken as before from normal rats and others used 7 to 9 days after implantation of Walker carcinoma 256. The rats were first fasted for 16 to 18 hr., then given an intraperitoneal injection of a massive dose of amino-acid, 0·56 g. per kg. bodyweight. They were killed 1¼ to 15 hr. later, and free amino-acids were estimated in liver, muscle and plasma.

Tumour-bearing rats showed lower peak values in all tissues for glycine after glycine injection, and after injection of serine there was an indication that glycine was utilised more readily by rats with tumours, since there was no increase in liver or muscle glycine values. There was less threonine dehydrase activity in liver tissue from tumour-bearing rats, but no change in serine dehydrase.

D. Duncan.

2144

KLAVINS, J. V., KINNEY, T. D. and KAUFMAN, N. **Hepatic nodules resembling tumors in rats after administration and withdrawal of ethionine.** *Proc. Soc. Exp. Biol. Med.*, 1955, **89**, 540–543. [Dept. Pathol., Cleveland City Hosp., Ohio.]

Five groups of rats were given a synthetic diet with vitamins. Two, of 28 and 14 animals, were controls for 2 groups of 28 and 23 which received ethionine in the diet at the rate of 0·5 per cent. for 28 and 63 days. The fifth group of 8 rats had ethionine for the first 28 days and the diet without addition for the next 35.

No control animal showed lesions. In the rats given ethionine for a month changes like those already reported occurred, but nodule formation was not seen; after 2 months nodules were found in 16 of the 23 animals. In 3 they resembled hepatomas, in 10 cholangiomas and in the 3 others both types occurred. In the fifth group, given ethionine for part of the time, nodules resembling cholangiomas were found in 5 of the 8 rats, a proportion the same as in group 4, in which the animals had ethionine all the time.

D. Harvey.

See also Absts. 1718, 1881, 2116.

METABOLISM OF GROWTH, REPRODUCTION AND SENESCENCE

GROWTH

2145

STONE, F. H. **The measurement of man: an account of the origin and development of anthropometry.** *Glasgow Med. J.*, 1955, **36**, 298–309. [Royal Hosp. Sick Child., Glasgow.]

A historical article, with references.

2146

MORTON, N. E. **The inheritance of human birth weight.** *Ann. Human Genetics*, 1955, **20**, 125–134. [Dept. Genetics, Univ. Wisconsin.]

Data on birthweights were abstracted from records collected in Hiroshima and Nagasaki between 1948 and 1952. From each family included in the study, weights of 2 babies were used and were classified as twins of like or of unlike sex, adjacent sibs, sibs with one intervening sib, sibs with 2 intervening sibs, paternal half-sibs, maternal half-sibs, or adjacent sibs whose parents were first cousins.

The correlation of birthweights within pairs of maternal half-sibs, 0·58, was much greater than that for pairs of paternal half-sibs, 0·10; the latter correlation was non-significant. This suggests that maternal, not purely genetic, effects decide the birthweight.

The within pair correlations for like-sexed and unlike-sexed twins were similar, 0·56 and 0·66, although most of the like-sexed twins would have been monozygous. This is again evidence that similarity of birthweight is due more to common uterine environment than to genetic relationship.

The within pair correlation of birthweights was 0·52 for adjacent sibs, 0·42 where one sib intervened and 0·36 where 2 sibs intervened. The effect is attributed in part to maternal age and parity, and confirms that maternal effects on birthweight are not entirely determined by the genotype of the mother.

A combined analysis of the data for half-sibs, twins, and full sibs produced consistent results. Significant components of the variance of birthweight were found, corresponding to permanent and temporary maternal factors and to random environmental factors, but there was no significant genetic component.

Inbreeding would be expected to reduce the variation between sibs if birthweight were highly heritable. There was a slight drop in mean birthweight with increased inbreeding, but no effect on the variance, and the evidence is therefore consistent with the hypothesis that the genotype of the foetus accounts for only a small part of the variance of human birthweight.—I. McDonald.

2147

SCHOLZ, C. and SCHOLZ, E. Das individuelle Sollwachstum von Körpergewicht und Körperlänge im Säuglingsalter. [**Individual ideal growth in bodyweight and body length in infancy.**] *Ztschr. Kinderheilk.*, 1955, **77**, 107–127. [Berlin-Charlottenburg.]

Methods for distinguishing types of growth differing in speed with normal relations of length and weight, or with excess or deficit of either length or weight, are discussed. Tables are given for boys and girls separately, showing normal relations of bodyweight to weight-age (age for weight) and of body length to length-age (age for length).

I. Leitch.

2148

KASIUS, R. V., RANDALL, A. (IV), TOMPKINS, W. T. and WIEHL, D. G. **Maternal and newborn nutrition studies at Philadelphia Lying-in Hospital. Newborn studies. 3. Size and growth of babies during the first three months of life.** *Millbank Mem. Fund Quarterly*, 1955, **33**, 341–367.

Of 1335 non-premature infants previously studied (Abst. 959, Vol. 26), about half the whites

and 80 per cent. of the negroes were followed up monthly to 3 months of age, weight, length and chest circumference being measured. Males and negroes gained more rapidly than females and whites, respectively, in weight and chest circumference; differences in length were slight. The highest correlations were found between measurements at birth and at one month of age and the lowest between those at birth and at 3 months. [The management and feeding of the infants is not described.]—A. M. Thomson.

2149

SALBER, E. J. **The significance of birth weight as illustrated by a comparative study of South African racial groups.** *J. Trop. Pediat.*, 1955, **1,** 54–60. [Dept. Med., Univ. Cape Town.]

See Absts. 3878, Vol. 21; 974, Vol. 22; 712, 3322, Title 4807, Vol. 23.

2150

SCRAGG, R. F. R. **Birth weight, prematurity and growth rate to thirty months of the New Guinea native child.** *Med. J. Austral.*, 1955, i, 128–132. [Port Moresby.]

Data from Rabaul and Kavieng are regarded as representative of New Guinea. The mean birthweights for 393 Kavieng babies were 5·84 lb. for males and 5·87 for females; for 1107 Rabaul babies 6·64 and 6·34 lb. For English infants the mean birthweight for both sexes is given as 7·46 lb. Birthweights of Rabaul babies were significantly higher than those from Kavieng, probably because of the more constant food supplies of Rabaul natives, who have an unlimited supply of bananas; Kavieng natives eat few bananas and have as their staple food sago, which takes much more preparation. Kavieng babies regained their birthweight sooner than Rabaul babies. There was no increase in the weight of infants born to Kavieng women who were fed on National Medical Research Council balanced diets for 1 or 2 months before delivery.

The recognised international standard for prematurity is 5·50 lb., by which the percentage premature would be for Rabaul babies 15·01, and for Kavieng babies 30·05. That for English babies is 5·62. It is obvious, therefore, that the standard could not apply to New Guinea babies, so many of whom were underweight though mature. From frequency distribution of birthweights, survival at low birthweights, and mean birthweights, a new standard of 4·50 lb. was calculated for New Guinea infants. By it, 13 per cent. of Kavieng babies and 5·2 per cent. of Rabaul babies were premature.

Rate of weight increase was studied in 651 Kavieng babies, all but 12 of whom were entirely breast fed on demand. The rate of weight increase during the first 3 months exceeded that of English babies, but from 4 to 12 months it was less, probably owing to disease rather than to unsatisfactory diet, since after illness weight was rapidly regained. From 12 to 30 months the rate nearly equalled that of English babies, but always at a lower level.

Mean weights, graduated for age from 3 weeks to 2 years 6 months, with standard deviations, are presented as a guide to the normal development of New Guinea children.—M. H. Pierce.

2151

MILLIS, J. **The effect of economic background on body size of Chinese infants in the first year.** *J. Trop. Pediat.*, 1955, **1,** 156–160. [Dept. Social Med., Univ. Malaya, Singapore.]

See also Abst. 909, Vol. 24.

At birth the mean bodyweight and length of male and female infants of Chinese mothers of the upper and middle economic group were significantly greater than those of infants of the lower economic group. In both groups the boys were significantly larger than the girls. The advantage in weight persisted, and at the end of the first year the male infants had increased in weight more rapidly than the female, and the infants of the better off more rapidly than those of the poorer families; the differences were significant. The differences in weight at 1 year were not wholly accounted for by the differences in birthweight.—L. Wills.

2152

FALKNER, F. **Measurement of somatic growth and development in children.** *Courrier*, 1954, **4,** 169–181. [Inst. Child Health, Hosp. Sick Child., Gt. Ormond St., London.] French and Spanish summaries.

The longitudinal studies of growth that have been begun at the Institute of Child Health in London and the sister institute in Paris are described. A third study has just begun in Zürich and a fourth is to begin in Stockholm. The superficial measures to be recorded are: standing or lying height and weight, sitting height and occiput-coccyx distance, hip width and chest circumference; subcutaneous tissue at 4 sites; bone growth as distance between fixed points; head circumference and bi-acromial breadth. Technique requires training, especially X-ray technique for measurement of tissues. Subjects will be somatotyped, and maturity of skeleton and sexual development will be estimated. Family, social and health histories will be built up. Observations will be recorded at 4 weeks $\pm$ 2 days of age and subsequently at 13, 26, 39, 52 and 78 weeks and 2 years and then yearly to maturity. A total of 400 subjects is aimed at. In course of time it is hoped to make racial comparisons and to extend the studies to include mental and psychomotor development.—I. Leitch.

2153

HAMMOND, W. H. **Body measurements of pre-school children.** *Brit. J. Prev. Social Med.*, 1955, **9,** 152–158.

In connection with a national survey, 214 boys and 237 girls born in different areas and social groups in Leeds between September and December 1949 were weighed and standing height, sitting height and leg length and several breadth and girth measurements were ascertained by 2 workers, using techniques described, at 1 year; thereafter only those born in December 1949 were followed up and measured again by the author at yearly intervals up to 5 years of age. The means and mean increments in kg. and cm. and their standard deviations are tabulated and compared with those of Low for children of Aberdeen in the twenties (Abst. 713, Vol. 23).

The Leeds children were taller and heavier than the Scottish children, the 4-year-olds being nearly equal to Low's 5-year-olds; this difference may be partly regional but is thought to be more probably due to secular change. Variability of measurements was slightly less in the Leeds group. When the data for Leeds children of 5 were adjusted to age 5 years 6 months, they were found to be somewhat above those for council school children of that age from poor areas (Abst. 2186, Vol. 24). When log weight was plotted against height, points for the council school children and Leeds pre-school children of 3, 4 and 5, but not for the younger children, fell on the same straight line; the points for the Scottish children fell below the line, but this is probably because they were measured lying down. For chest girth relative to weight a single curve sufficed for all 3 groups. For interacromial and intertrochanteric breadth relative to height, the values for the 2 English groups were again consistent; the Scottish children were somewhat broader for a given height. It is considered that if weight and height are known, other mean measurements can be predicted from these graphs with reasonable accuracy. A table of correlations between height and other lengths and breadths and between weight and girths for different age groups, based on the present sample and those previously studied by the author, shows little change with age.

W. M. Deans.

2154

THOMSON, J. **Height, width and weight of five year old children.** *Health Bull., Dept. Health Scot.*, 1955, **13,** 62–63.

In continuation of previous work (Absts. 4966, Vol. 24; 956, 3951, 5416, Vol. 25; 849, Vol. 26) means are given for Edinburgh children aged 5 years, 109 boys and 109 girls, namely, weight $40{\cdot}23 \pm 4{\cdot}54$, $39{\cdot}43 \pm 4{\cdot}26$ lb., crown-heel length $43{\cdot}1 \pm 1{\cdot}8$, $42{\cdot}9 \pm 1{\cdot}5$ in., crown-rump length $25{\cdot}3 \pm 1{\cdot}0$, $25{\cdot}0 \pm 0{\cdot}9$ in., intercristal pelvic width $7{\cdot}02 \pm 0{\cdot}34$, $6{\cdot}90 \pm 0{\cdot}37$ in. As before, height and weight are well above those of 30 years ago. The present results are similar to those found by Acheson *et al.* (Title 5414, Vol. 25) in Oxford, except that the Oxford boys were heavier.

W. M. Deans.

2155

ROUTIL, R. Grössen-Gewichtstabellen als Kriterien individueller Entwicklungsstudien an Kärntner Schulkindern. **[Tables of height and weight as criteria in studies of the development of individual Carinthian school-children.]** *Öst. Ztschr. Kinderheilk.*, 1955, **11,** 302 – 324. [Anthropol. Abt., Naturhist. Museum, Vienna.]

In continuation of previous studies (Abst. 912, Vol. 24), analysis was made of the recorded data for height and weight for 63,167 schoolchildren aged from 6 to 15 years in Klagenfurt and 4 other regions in Carinthia. Graphic methods of representing the results are discussed. Development was more rapid in the town of Klagenfurt than in the rural districts of the province.—E. M. Hume.

2156

MEREDITH, H. V. **A longitudinal study of change in size and form of the lower limbs on North American white schoolboys.** *Growth*, 1955, **19,** 89–106. [State Univ. Iowa, Iowa City.]

A study of 70 boys. Lower limb length is stature minus stem length, girth is maximum circumference and the index is ratio of girth to length $\times$ 100. Mean increments in length for the years 5 to 7, 7 to 9 and 9 to 11 were, in cm., 8·0, 7·1 and 6·3. Girth and index also are tabulated and graphed.—I. Leitch.

2157

HEWITT, D., WESTROPP, C. K. and ACHESON, R. M. **Oxford Child Health Survey: effect of childish ailments on skeletal development.** *Brit. J. Prev. Social Med.*, 1955, **9,** 179–186. [Social Med. Unit, Univ. Oxford.]

For previous results of the Oxford Child Health Survey see Absts. 719, 3400, Vol. 23; 4970, Vol. 24; 2618, 3952, Vol. 25.

The effect of illnesses such as exanthemata, lower and upper respiratory infections, skin diseases and other infections except head colds was studied on growth (height) and skeletal maturation during the second to fifth years of life in some 650 children. X-ray studies of hands and knees were made for the appearance of transverse striations (Harris's lines) associated with arrest of growth. Skeletal maturation was assessed by the method of Acheson (Abst. 2618, Vol. 25).

Rate of growth was slightly reduced by illness, the reduction depending on the severity of the infection, and boys were slightly more affected than girls. It is calculated that a child who escaped illness between the ages of 1 and 5 years would have been on the average 1 in. taller than one who had had a severe illness each year. None of the diagnosed illnesses had any particular growth-retarding effect. Illness had no definite effect on skeletal maturity, but there were indications that maturation of the carpals was slightly more susceptible to interruption by illness than that of the epiphyses of the hand, wrist or knee. The incidence of new Harris's lines was much more affected by illness than either growth or skeletal maturation, and the effect was greater in exanthemata, particularly measles, and lower respiratory infections.—J. S. Thomson.

2158

KEEN, J. A. **Times of appearance of the epiphyseal centres in the Bantu and Indian population groups.** *S. African J. Lab. Clin. Med.*, 1955, **1**, 80–93. [Dept. Anat., Univ. Natal.]

A study was made of 2219 X-ray photographs of upper and lower limbs taken in a Durban hospital in 12 months, mostly in the casualty department. The patients were grouped as Bantu or Asiatic, by sex, and by age from birth to 22 years. The stages of epiphyseal union were divided into "entirely separate", "partially united" and "united", the last only when the "epiphyseal scar" was absent.

The appearance of bony centres in the epiphyses and in carpal and tarsal bones, and epiphyseal fusion, almost always occurred earlier in girls than in boys. The mean age for carpal ossification centres was almost exactly 9 years in 942 girls and 10 years 9 months in 1633 boys, a highly significant difference. There was no significant difference in times of appearance of ossification centres and of fusion of epiphyses between Bantu and Indian groups, or between these groups and European children studied elsewhere. There was little difference in ossification times between the 2 sides of the body.—D. Duncan.

2159

VERDUN, M. and DE TAILLE, J. Canon des proportions corporelles linéaires et volumétriques du Français moyen. **[Standards for linear and volumetric body proportions for the average Frenchman.]** *Presse méd.*, 1955, **63**, 1644–1648. [Centre Études Scientif. de l'Homme, Paris.]

Mean values are given, with an explanatory diagram, for 33 linear body measurements obtained by a method, claimed to be new and accurate, which is described elsewhere (Pende, *Traité de médecine biotypologique*, O. Doin, Paris, 1955, chapter on anthropometrical methods) from 282 French soldiers, mean age 21 years, mostly rural working-class, as well as means and standard deviations for height, weight, chest circumference and some derived ratios and indices. Measurements should be made with the subject lying relaxed, and should be related to some overall measurement, *e.g.*, length of thigh as a percentage of stature. Reference is made to Pignet's index and one or two other simple means of picking out weaklings, but the rest of the discussion deals only with establishment of racial or constitutional type.

W. M. Deans.

2160

LOWE, C. R. and GIBSON, J. R. **Changes in body weight associated with age and marital status.** *Brit. Med. J.*, 1955, ii, 1006–1008. [Dept. Social Med., Univ. Birmingham.]

An investigation into the age : weight relation of men and women and the effect of marriage and childbearing on weight of women is based on data between 1945 and 1954, supplied by 2 large Birmingham firms.

There was very little variation in weight of men with age, or with marital status. The mean weight of women increased by about 3 lb. every 5 years. At corresponding ages, married women were considerably heavier than single women, but married women with children were only a little heavier than those without children.

A. W. Boyne.

2161

HOHLS, H. W. Bemerkungen zu der Arbeit von H. Møllgaard: Analyse des Wachstums mittels Differentialgleichungen der Partialprozesse des synthetischen Stoffwechsels. **[Remarks on the paper by H. Møllgaard: Analysis of growth by differential equations of partial processes of synthetic metabolism.]** *Ztschr. Tierernährung Futtermittelk.*, 1955, **10**, 257–264. [Bundesforschungsanst. Kleintierzucht, Celle.]

See Abst. 5421, Vol. 25.

The limits of the conditions under which Møllgaard's equations can be applied in practice are discussed. It is argued that growth in weight under ordinary experimental conditions, say with groups of 20 chicks, cannot be expressed as a series of discrete equations, since the 20 chicks are not growing at identical rates. The equations can be applied only to parts of the growth curve that are straight lines and do not apply to early growth; and, further, the Møllgaard constants may be identical when the weight curves are not, and different when the weight curves are parallel but the ages of the animals are different.

I. Leitch.

2162

MØLLGAARD, H. Bemerkungen zu den Ausführungen des Herrn Dr. H.-W. Hohls hinsichtlich meiner Arbeit über rationelle Wachstumsmessungen. [**Remarks on the views of H.-W. Hohls on my paper on the rational measurement of growth.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 264–269. [Physiol. Lab., Landw. Versuchsstat., Copenhagen.]

Hohl's arguments (see above Abst.) about growth in terms of bodyweight are valid because gross increase in bodyweight, with changes in deposition of fat and water, does not represent true growth. Hence the use (Abst. 5421, Vol. 25) of metabolism data for N, Ca and P.

To extend the study, measurements have now been made on pigs from birth to the 70th day by Berge and Indrebø in Norway and by Møllgaard in Denmark. These show that for protein the rate of increase may be expressed as 2 straight lines. For Danish boars the turning point is between day 22 and day 27 ; for Danish sows about halfway between ; Norwegian boars show a turning point at the 38th day. From the 70th day a third straight line continues to the 180th day for sows and castrates ; boars have a third small inflection at 108 days.

The theory of the whole process, in terms of structural growth and cell subdivision, as derived from these metabolism studies and cytological studies is briefly summarised (see Abst. 847, Vol. 26).—I. Leitch.

2163

PIANA, G. Sulle turbe della crescenza di origine alimentare. [**Disturbances of growth of nutritional origin.**] *Riv. Zootec.*, 1955, **28,** 245–251. A review.

2164

FRASER, A. S. **Growth of horns in sheep.** *Austral. J. Agric. Res.*, 1955, **6,** 770–775. [Sect. Animal Genetics, C.S.I.R.O., Univ. Sydney.]

See also Absts. 1867, 1906, 1940.

REPRODUCTION AND LACTATION: MAMMALS

2165

ROMNEY, S. L., REID, D. E., METCALFE, J. and BURWELL, C. S. **Oxygen utilization by the human fetus in utero.** *Amer. J. Obstet. Gynecol.*, 1955, **70,** 791–797 (with discussion 797–799). [Boston Lying-in-Hosp., Mass.]

From estimates of blood flow through the uterus by the nitrous oxide technique, and the difference in oxygen tension between uterine artery and vein compared with the difference in oxygen tension between umbilical vein and artery, it appears that the rate of blood flow in the placenta must be about the same as in the uterus, 500 ml. per min., and that the oxygen consumption of the foetus at term, at 5 c.c. oxygen per kg. per min., is comparable with that of the mother. In a twin pregnancy the rate of blood flow in the uterus was twice that in single pregnancies.—I. Leitch.

2166

PAYNE, H. W. and LATOUR, J. P. A. **Quantitative estimations of endometrial glycogen, using the anthrone method.** *J. Clin. Endocrinol.*, 1955, **15,** 1106–1115. [Dept. Gynaecol. Pathol., Royal Victoria Hosp., Montreal.]

Glycogen was estimated in 90 specimens of endometrium obtained by curettage from women attending gynaecological and sterility clinics and from uteri removed at operation.

With the onset of menstrual bleeding the mean glycogen content fell sharply from about 0·9 to under 0·2 g. per cent. by the fourth day. It remained at about this level until the 14th day, when it rose steeply to about 1·4 on the 17th day, thereafter falling to about 0·4 on the 21st day and rising slowly again until the end of the cycle. The older group of women differed from the average in showing no sharp decrease of glycogen concentration after the 18th day.

It is thought that the fall after the 17th day is due to contribution in both energy and nutrients to the endometrial secretion at the time when the morula normally enters the uterus and secretion is greatest. The use of glycogen by the endometrium of older women may lead to deficient secretion and to infertility.—F. Hytten.

2167

WIDDOWSON, E. M. **Reproduction and obesity.** *Amer. J. Clin. Nutrit.*, 1955, **3,** 391–396. [Med. Res. Counc., Dept. Exp. Med., Univ. Cambridge.]

2168

WRIGHT, D. E. **Fat in liver and kidneys of pregnant sheep at different levels of nutrition and during starvation.** *Brit. J. Nutrition*, 1955, **9,** 279–286. [Dept. Physiol., Med. Sch., Newcastle upon Tyne 1.]

Liver and kidney tissue obtained from 44 pregnant ewes was examined histologically. The animals had been maintained by Ferguson (Abst. 978, Vol. 25) on a high or low plane of nutrition during pregnancy ; some animals were killed after having been starved for 1 to 6 days.

Liver fat was not greatly increased by the high-plane diet, except when the ewes had been starved ; fatty infiltration of the liver was found in ewes given the low-plane diet, especially after starvation. Kidney sections, though they contained less fat, varied in the same way as liver sections. In

general these findings paralleled the chemical analyses of Ferguson (Abst. 979, Vol. 25).

G. A. Garton.

2169

ALEXANDER, D. P., ANDREWS, R. D., HUGGETT, A. ST. G., NIXON, D. A. and WIDDAS, W. F. **The placental transfer of sugars in the sheep: studies with radioactive sugar.** *J. Physiol.*, 1955, **129,** 352–366. [Dept. Physiol., St. Mary's Hosp. Med. Sch., Univ. London.]

^{14}C-Glucose injected into pregnant ewes gave rise to both ^{14}C-glucose and ^{14}C-fructose in the foetal blood. Foetal hyperglycaemia caused transfer of ^{14}C-glucose from foetal to maternal blood. The absolute transfer of glucose from ewe to foetus was greater than 70 mg. per min., but the net transfer was less than would be expected from simple diffusion.—A. T. Phillipson.

2170

ALEXANDER, D. P., HUGGETT, A. ST. G., NIXON, D. A. and WIDDAS, W. F. **The placental transfer of sugars in the sheep : the influence of concentration gradient upon the rates of hexose formation as shown in umbilical perfusion of the placenta.** *J. Physiol.*, 1955, **129,** 367–383. [Dept. Physiol., St. Mary's Hosp. Med. Sch., Univ. London.]

The sheep's placenta was perfused to study the rate at which it makes fructose. The results suggest that production of fructose is constant and independent of the concentrations of glucose on either side of the placenta. Transfer of glucose across such perfused placentae agreed with the rate of transfer of ^{14}C-glucose in ewes with the placenta *in situ*.—A. T. Phillipson.

2171

DAVIES, J. **Permeability of the rabbit placenta to glucose and fructose.** *Amer. J. Physiol.*, 1955, **181,** 532–538. [Dept. Anat., State Univ. Iowa, Iowa City.]

Experiments with pregnant rabbits and rats are recorded in which the mother was given infusions of glucose or fructose over a 2-hr. period and the relations between the concentrations of these sugars in the maternal and foetal blood were studied. Foetal glucose concentrations followed those of the mother closely, but foetal fructose concentrations did not follow those of the mother and always remained much lower. Studies on the glucose and fructose concentrations in the foetal and placental tissues showed that fructose, but not glucose, accumulated in the placenta. Phloridzin did not alter these results, which were similar at all stages of pregnancy. The placenta therefore offers a barrier to fructose, but not to glucose.

A. T. Phillipson.

2172

PUGH, P. D. S. and SCARISBRICK, R. **Acetate uptake by the foetal sheep.** *J. Physiol.*, 1955, **129,** 67P. [Dept. Animal Pathol., Univ. Cambridge.]

2173

ALEXANDER, D. P., NIXON, D. A., WIDDAS, W. F. and WOHLZOGEN, F. X. **Changes in composition of the foetal fluids of the sheep during gestation.** *J. Physiol.*, 1955, **129,** 66P. [Dept. Physiol., St. Mary's Hosp. Med. Sch., Univ. London.]

2174

KALTER, H. **The effect of cortisone on the food consumption of pregnant mice.** *Canad. J. Biochem. Physiol.*, 1955, **33,** 767–772. [Dept. Genetics, McGill Univ., Montreal.]

The amount of food eaten daily by mice increased during pregnancy to the 16th day, then declined rapidly for the next 2 days before parturition. The weight curves followed food consumption, but did not decrease before parturition. Pregnant mice given cortisone ate more and weighed less than controls, and these effects did not cease immediately when the cortisone was withdrawn.—A. Hepburn.

2175

TALBERT, G. B. and HAMILTON, J. B. **Effect of reduced rate of growth on maturation of the male reproductive system of the albino rat.** *Anat. Rec.*, 1954, **121,** 763–773. [Dept. Anat., State Univ. New York Coll. Med., Brooklyn.]

All the litters of rats used were reduced to 7 animals within 48 hr. after birth. Rats were weaned at 20 days and only those which weighed 43 to 49 g. at 25 days were included in the experiment. The male rats from each litter were divided between the 2 groups. In the first group [numbers not stated] the faster-growing rats were slightly restricted in food intake so that all conformed to a standard curve established in a preliminary experiment, from weaning to 57 days of age. In the second group the daily increment of growth was reduced to one-third of the standard by food restriction. Rats were killed every 2 to 5 days and their reproductive organs were stripped of grossly visible fat, weighed and studied histologically.

In the severely restricted rats the absolute rate of growth of testes, seminal vesicles and ventral prostate was reduced, but relative to bodyweight these organs were larger than those of the control rats. Spermatozoa appeared in the lumen of the seminiferous tubules of both groups at 32 to 35 days of age, despite the differences in bodyweight and testis weight. The rapid maturational growth

seen in seminal vesicles and ventral prostate of control rats after 40 days of age was delayed in the restricted group until after 55 days and that of the prostate was particularly delayed, probably by failure of androgenic stimulation.—D. Duncan.

2176

MILLER, H. and WEETCH, R. S. **The excretion of radioactive iodine in human milk.** *Lancet*, 1955, **269**, 1013. [Sheffield Nat. Centre Radiotherapy.]

A patient thought to have thyrotoxicosis was given 29·5 μC. of ^{131}I by mouth. A few minutes later it was found that she was nursing a 4-month-old baby; nursing was discontinued at once. The milk was extracted and the radio-activity was estimated. Had the milk been given the child would have received 1·3 μC. of ^{131}I in 48 hr., an amount which might have had an adverse effect on the thyroid. Radio-active I should not be given to nursing mothers, or, if the isotope must be given, breast feeding should be discontinued.

B. W. Simpson.

2177

LUKTUKE, S. N. **Hormones and lactation.** *Indian J. Vet. Sci.*, 1955, **25**, 213–217. [Indian Vet. Res. Inst., Izatnagar, U.P.]

See also Absts. 1552, 1553, 1555, 1556, 1714, 1745, 1756–58, 1785, 1995, 2062, 2063, 2083, 2090, 2091, 2237, 2254.

REPRODUCTION: BIRDS

2178

BARKOVSKAYA, O. V. Opredelenie skorosti obrazovaniya zheltka v yaitze kur. [**Determination of the rate of formation of yolk in the hen's egg.**] *Fiziol. Zh. SSSR Sechenova*, 1954, **40**, 722–726. [Rostov. Gosud. Univ. V.M. Molotova.]

The rate of formation of yolk in the hen's egg was estimated from the transfer into the yolk of lipid-soluble dyes given in the feed, and the lamination of such dyes in cross-sections of eggs laid at intervals. Yolk is deposited immediately under the vitelline membrane, and rate of deposition increases with surface area and apparently depends on the growth of the follicular membrane. The mass of yolk substance is formed from material carried in the blood supplying the follicular membrane.—D. W. Taylor.

2179

RAGOZINA, M. N. Sposoby pitaniya i dykhaniya sel'skokhozyaistvennykh ptitz v razlichnye periody razvitiya vo vremya inkubatzii. [**Means of nutrition and breathing of domestic fowls in different periods of development during incubation.**] *Izv. Akad. Nauk. SSSR Ser. Biol.*, 1955, No. 4, 95–111. [Inst. Animal Morphol., Acad. Sci. SSSR.]

Embryonic organs which perform a principal function at one stage of development of the embryo are rudimentary at the previous stage. These rudiments are only supplementary at first in the function of which they will later become the principal agents. When this function is fulfilled and the embryo has developed further they do not entirely lose their use during the next stage of development. Thus a chicken which has emerged from the egg membranes continues to use the yolk in the yolk sac as food, even although 24 hr. after hatching its main source of nutrients is the food which it picks up for itself. The allantois, mainly respiratory during the early embryonic stages, still preserves a functional significance at the start of hatching, when the respiratory function has been taken over by lungs.—H. Scherbatoff.

2180

QUAGLIARIELLO, E., DELLA PIETRA, G., DE LEO, C. and CESIANO, C. Interrelazioni tra glicina, serina e treonina nell'uovo di pollo nel corso dello sviluppo embrionale. [**Interrelation between glycine, serine and threonine in the hen's egg during development of the embryo.**] *Arch. Fisiol.*, 1955, **54**, 367–372. [Ist. Chim., Fac. Med., Univ. Naples.]

Glycine, serine and threonine were estimated microbiologically in fertilised hen's eggs before incubation and on the 18th day of incubation. The amount of glycine increased; that of serine and threonine decreased.—E. M. Hume.

See also Absts. 1832, 1884.

SENESCENCE

2181

HORVATH, S. M., RADCLIFFE, C. E., HUTT, B. K. and SPURR, G. B. **Metabolic responses of old people to a cold environment.** *J. Appl. Physiol.*, 1955, **8**, 145–148. [Dept. Physiol., Coll. Med., State Univ. Iowa, Iowa City.]

Temperature and energy exchange studies were made with 8 elderly subjects, average age 64 years, and 7 young subjects, average age 25·5 years. Control measurements were taken in a room with ambient temperature 28° C., after which the subject was moved to another with temperature 10° C. For the elderly, mean values for respiratory minute volume, oxygen consumption, respiratory quotient and heat production were, under control conditions, 8·92 litres, 227 ml. per min., 0·79, 34·0 Cal. per sq. m. per hr.; in the cold 9·84, 242, 0·83 and 36·9. For the young subjects mean values were 7·27, 226, 0·86 and 35·4 in control and 11·93, 359, 0·94 and 57·5 in the cold. The differences between warm and cool conditions were statistically significant for the young but not for the old people.—D. Harvey.

EXPERIMENTAL STUDIES OF IMMUNITY AND MICRO-ORGANISMS

2182

SMITH, D. A. **Parasitic infections and nutrition.** *Vitamins and Hormones*, 1955, **13,** 239–259. [Dept. Physiol., Kitchener Sch. Med., Univ. Coll., Khartoum.]

2183

TETZNER, E. Nachweis spezifischer Proteinasen im Harn beim nutritiv-allergischen Schock mittels der Abderhaldenschen Abbauferment-reaktion. [**Demonstration of specific proteinases in urine in shock from food allergy by means of the Abderhalden reaction for hydrolysing enzymes.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1735–1736. [Kreiskrankenhaus, Soltau, Hanover.]

The author, who was allergic to peas and lentils, induced a typical allergic shock reaction by eating a small quantity of pea protein. The reactions for proteinases in the urine were studied before and for 8 days after the induction of allergy. Reactions with bean protein, human carcinoma protein and human albumin were consistently negative, but positive reactions with pea protein were present after from 2 to 6 days and especially on the fourth day.—D. Duncan.

2184

HEDGECOCK, L. W. **Effect of dietary fatty acids and protein intake on experimental tuberculosis.** *J. Bacteriol.*, 1955, **70,** 415–419. [Res. Lab., Veterans Admin. Hosp., Kansas City, Mo.]

Groups of 20 female mice were fed to appetite for 37 days on a basal diet, to which was added 5 per cent. of fatty acid methyl esters and in which the protein content was adjusted, by varying the amount of starch, to 10, 20, 30 or 40 per cent. The fatty acid methyl esters were compounded to simulate coconut oil and consisted of laurate 50, myristate 25, palmitate 20, stearate 2, oleate 2 and linoleate 1 per cent. On the tenth day the mice were injected intravenously with dilutions of a culture of *Mycobacterium tuberculosis*, and the death rate in each group was studied for the ensuing 27 days. Control animals received the Rockland mouse diet.

The mixture of fatty acid esters in the diet enhanced resistance to infection, especially when the ration contained 20 per cent. protein.

In similar experiments in which 5 per cent. lard or 0·2 per cent. methyl linoleate was substituted for the methyl esters there was no increase in resistance to *M. tuberculosis*. Possible reasons for the effect of the methyl esters are discussed.

G. A. Garton.

2185

FULTON, J. D. and SPOONER, D. F. **The biochemistry and nutrition of *Plasmodium berghei*.** *Indian J. Malariol.*, 1955, **9,** 161–176. [Nat. Inst. Med. Res., Mill Hill, London.]

The discovery of *Plasmodium berghei* by Vincke and Lips in 1948 provided a convenient organism for biochemical studies of malaria. It infects a wide variety of rodents, and enters preferentially into the reticulocytes. Knowledge about the parasite is here collected and reviewed, the subjects included being chemical composition, respiration, carbohydrate metabolism and nutritional needs.

E. M. Hume.

2186

SAUTET, J. and CAPORALI, J. Influence chez la souris blanche de divers régimes sur l'évolution de *Plasmodium berghei*. [**Influence of different diets on the development of *Plasmodium berghei* in the white mouse.**] *Méd. trop.*, 1955, **15,** 222–228. [Lab. Hyg., Marseilles.]

Three groups of 5 weanling mice were fed for 12 weeks on bread and water, or bread and raw milk, or bread and pasteurised milk. The raw milk had more fat than the pasteurised milk. All the mice were inoculated with *Plasmodium berghei*. There was little difference between the groups in survival time or proportion of red cells parasitised; the group having raw milk had slightly more resistance. In a second experiment the 2 kinds of milk had the same fat content, but the result was no more conclusive than in the first experiment. There were wide individual variations.—E. M. Hume.

2187

SEN, H. G., DUTTA, B. N. and RAY, H. N. **Milk diet in *Trypanosoma evansi* infection in rats.** *Indian J. Vet. Sci.*, 1955, **25,** 117–120. [Sch. Trop. Med., Calcutta.]

Young rats were given a stock diet with or without 100 ml. pasteurised milk daily (see Sen, *et al.*, *Bull. Sch. Trop. Med., Calcutta*, 1954, **1,** 17). When they were infected with *Trypanosoma evansi* there was no significant difference in the course of the infection or in mortality.—D. Duncan.

2188

SEN, H. G., DUTTA, B. N. and RAY, H. N. **Effect of starvation on the course of experimentally induced *Trypanosoma evansi* infection in rats.** *Indian J. Vet. Sci.*, 1955, **25,** 143–148. [Sch. Trop. Med., Calcutta.]

Rats were fed on a stock diet of bread, milk, gram, vegetables, yeast and cod liver oil. Fasting, in one experiment for 4 days before and 6 days after inoculation [the time is not clear in the other 2 experiments], did not affect the course of infection with *Trypanosoma evansi*.—D. Duncan.

2189

Ross, R. T., Holtman, D. F. and Gilfillan, R. F. **The effect of *Salmonella pullorum* infection on amino acids of the chick.** *J. Bacteriol.*, 1955, **70,** 272–275. [Dept. Bacteriol., Univ. Tennessee, Knoxville.]

The blood and liver of chickens infected with a virulent strain of *Salmonella pullorum* showed a marked decrease, compared with normal chickens or chickens inoculated with a non-virulent strain, in the concentrations of arginine, methionine, glycine and tryptophan. Since studies *in vitro* have shown that the organism has no specific need of these amino-acids, it is suggested that the host uses them in defence against the parasite.

J. S. Thomson.

2190

Ross, R. T., Holtman, D. F. and Gilfillan, R. F. **The effect of the introduction of amino acids into chicks infected with *Salmonella pullorum*.** *J. Bacteriol.*, 1955, **70,** 276–278. [Dept. Bacteriol., Univ. Tennessee, Knoxville.]

In an experiment similar to the above (see preceding Abst.), glycine, arginine, methionine and tryptophan or a mixture of these were given orally or intraperitoneally to chickens infected with the virulent strain. Only arginine lengthened the time of survival to any extent; methionine delayed death slightly. Death occurred usually within 84 hr., but with arginine after 144 hr. The addition of arginine 48 hr. before infection did not increase the time of survival.—J. S. Thomson.

2191

Cohen, S. S. and Barner, H. D. **The death of bacteria as a function of unbalanced growth.** *Pediatrics*, 1955, **16,** 704–708. [Child. Hosp., Philadelphia, Pa.]

A review of work with *Bacterium coli* 15_{T-}.

2192

Turba, F. and Esser, H. Zeitlicher Verlauf des Einbaues von C^{14} in Aminosäuren, Peptide und Proteine von Torulazellen. [**Time relations in the incorporation of ^{14}C into amino-acids, peptides and proteins of torula cells.**] *Biochem. Ztschr.*, 1955, **327,** 93–108.

Yeast cells, *Torula utilis*, were grown with acetate-1-^{14}C as their only source of C. They incorporated ^{14}C most quickly into amino-acids; peptides were labelled before proteins. Besides glutathione, some 40 acid peptides were separated and their component amino-acids were studied. Glutamic acid was the chief component, then glycine, aspartic acid, alanine and serine.

The role of peptides in protein formation is discussed.—D. Duncan.

2193

Müller, R. and Krampitz, G. Untersuchungen in vitro zur Frage der Stickstoff- und Schwefelumsetzungen im Pansen. [**Studies *in vitro* of nitrogen and sulphur metabolism in the rumen.**] *Ztschr. Tierzücht. Züchtungsbiol.*, 1955, **65,** 187–198. [Inst. Anat. Haustiere, Univ. Bonn.]

For an earlier paper see Müller and von Erichsen, *Ztschr. Tierzücht. Züchtungsbiol.*, 1952, **60,** 285.

Experiments with an artificial rumen are described in detail. When 600 ml. fresh rumen contents from slaughtered cattle were incubated with 10 or 20 g. dextrose and 20 μC. $^{35}SO_4^{--}$ for 4 hr., the rumen bacteria, but not the protozoa, took up considerable amounts of sulphate. Uptake of S was inhibited by formaldehyde or penicillin. The results are taken to confirm the finding of Block *et al.* (Abst. 5104, Vol. 21) that sulphate is reduced and built up into sulphur amino-acids.

In the remaining experiments 150 ml. rumen contents from one or other of 4 sheep with a fistula were used; when samples were withdrawn the micro-organisms were precipitated with trichloroacetic acid and total N and ammonia N were estimated in the protein-free fluid. In most, but not all, of the experiments there was evidence of protein synthesis, and in these S was taken up. Where there was protein breakdown, S was not taken up. Addition of 8 g. molasses favoured protein synthesis, in agreement with the results of others (Absts. 3909, Vol. 21; 1354, Vol. 13). The presence of readily fermentable carbohydrate is thought to provide lower fatty acids which absorb ammonia and form amino-acids. Slightly acid conditions favoured protein synthesis, although the natural *p*H of the rumen contents ranged from 7·6 to 8·0.

The results could not be related to the diet of the animals; variations are ascribed to individuality of the rumen micro-organisms.—W. M. Deans.

See also Absts. 1620, 1734, 1744, 1747, 1765, 1823, 1844, 1876, 2246.

MISCELLANEOUS FEEDING EXPERIMENTS

2194

RUOSTEENOJA, R. **Effect of food intake on the cardiovascular response to cigarette smoking.** *Ann. med. exp. Fenn.*, 1955, **33,** 320–325. [Inst. Occupat. Health, Helsinki.]

Tests made on 10 young men, 5 smokers and 5 non-smokers, showed that the rise of pulse rate and fall of skin temperature on smoking a cigarette were greater after fasting for 15 hr. than when food had been taken before smoking. Changes in diastolic and systolic blood pressure in response to smoking were much the same in the fasting state and after food.—A. M. Copping.

2195

JAMES, W. T. and GILBERT, T. F. **The effect of social facilitation on food intake of puppies fed separately and together for the first 90 days of life.** *Brit. J. Animal Behaviour*, 1955, **3,** 131–133. [Univ. Georgia.]

For 90 days from weaning 3 beagle × terrier puppies were reared together but fed separately, and 3 others, similar but from a different litter, were fed together once a day; then for the next 40 days the puppies of each group were fed separately on one day and together on the next and intake of food, Purina chow of uniform consistency, was found by weighing the puppies before and after the feed.

As was expected from earlier work by the author and others (*e.g.*, James, *J. Comp. Physiol. Psychol.*, 1953, **46,** 427), more food was eaten on the days when the puppies were fed together, but the group that were originally fed separately did not show the effect for about 14 days; in the other group the effect was immediate.—W. M. Deans.

2196

TOWBIN, E. J. **Thirst and hunger behavior in normal dogs and the effects of vagotomy and sympathectomy.** *Amer. J. Physiol.*, 1955, **182,** 377–382. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

2197

MARDONES R., J., SEGOVIA-RIQUELME, N., HEDERRA D., A. and ALCAÍNO G., F. **Effects of some self-selection conditions on the voluntary alcohol intake of rats.** *Quart. J. Studies Alcohol*, 1955, **16,** 425–437. [Inst. Invest. Alcoholismo, Univ. Chile, Santiago.]

The voluntary alcohol intake of rats was measured with purified diets given as a normal mixture, or with sucrose separated from the other components, or as mixtures high or low in sucrose. Self-selection of sucrose and other components did not significantly change the intake of alcohol. Variation in the proportion of sucrose in a ready-mixed diet did not affect alcohol intake. A third choice, of sucrose or dextrose in solution, caused a significant decrease in alcohol intake. The effect was similar with sugar solutions differing widely in concentration. When a solution of B vitamins was offered instead of a sugar solution there was no change in alcohol intake, although the rats showed a strong preference for the vitamin mixture.—A. M. Copping.

2198

VARTIAINEN, I. and PAASONEN, M. **Selection of phosphorus in alloxan diabetes.** *Endocrinology*, 1955, **57,** 513–515. [2. Med. Clin., Univ. Helsinki.]

Normal and alloxan-diabetic rats were offered a choice of several of the foods listed below with their percentage content of P: casein 0·58, meat powder 0·43, egg yolk powder 0·54, fat-free egg yolk powder 0·85, egg yolk oil 0·33, fish powder 0·54, milk powder 0·58, semolina 0·20, dibasic sodium phosphate or sodium pyrophosphate in 2 per cent. solution. They received also 50 per cent. sucrose solution and olive oil, with additional salts, trace elements and vitamins as described elsewhere (Abst. 5465, Vol. 25).

In 28 days the groups of control rats ate on the average from 1·8 to 3·8 g. P per kg. bodyweight and the diabetic groups from 7·0 to 13·2 g. P per kg. bodyweight. The latter consistently ate more phosphoric acid salts than the controls, as well as more P-containing protein foods.—D. Duncan.

2199

HARRIMAN, A. E. **The effect of a preoperative preference for sugar over salt upon compensatory salt selection by adrenalectomized rats.** *J. Nutrition*, 1955, **57,** 271–276. [Dept. Psychol., Franklin and Marshall Coll., Lancaster, Pa.]

Four groups of 24 rats aged initially 65 to 75 days and caged individually received a diet containing 0·007 per cent. Na and 0·1 per cent. K. Two groups were allowed to choose either 8 per cent. sugar solution or 1·2 per cent. salt solution instead of drinking water for 18 or 20 days, the other 2 groups had water. Rats of one group on each treatment then had their adrenals removed and those of the other group had sham operations, after which all 4 groups had the choice of sugar or salt solution for another 15 days.

Before operation the rats allowed salt or sugar solution strongly preferred sugar. After operation this preference continued in both groups. Of the rats newly introduced to choice after operation, those with adrenals removed selected salt and those given the sham operation selected sugar. The result was that the rats which had developed a taste for sugar failed to increase their salt intake when their adrenals were removed; 4 of them died and the others lost much weight. The difference was significant.—D. Duncan.

2200

McCance, R. A. and Widdowson, E. M. **Some undescribed effects of over and undernutrition.** *Internat. Ztschr. Vitaminforsch.*, 1955, **26,** 79–87. [Med. Res. Counc. Dept. Exp. Med., Univ. Cambridge.] German and French summaries.

This is a preliminary report.

Pigs were held at a weight of 10 to 15 kg. for months when they received only 250 to 350 g. of a normal diet daily. They had coarse hair and continually rubbed themselves, and 2 developed multiple staphylococcal abscesses subcutaneously. Some had gross abdominal distention from gas in the intestinal tract. The long bones were short, but wider than in normal pigs of the same weight. The brain cavity and pituitary fossa were about normal for age, but the rest of the skull and the jaw were retarded in growth. The composition of soft tissues is briefly discussed.

Three pigs given unlimited amounts of the same diet may have been overfed. They were very fat and oestrus was delayed.—F. C. Aitken.

2201

Homb, T., Husby, M. and Breirem, K. Versuche mit Weissbrot und Weizenvollkornbrot bei Schweinen. [**Experiments on pigs with white bread and whole wheat bread.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 203–211. [Norges Landbrukshøgsk., Vollebekk.]

The pig part of the experiments of Nicolaysen and Njaa (Abst. 2318, Vol. 21) on the effect of phytic acid on absorption of Ca is reported again because of its interest in other respects. Two pairs of 10-week-old pigs were fed on white bread from flour of 65 or 70 per cent. extraction or on whole wheat bread of the same moisture content, with skimmed milk, salt, cod liver oil and Ca. After a pre-period of 8 weeks, there were 7 balance periods of 2 weeks each, during the 5th and 6th of which the rations were interchanged.

When the pigs had white bread their faeces were scanty, dry and hard compared with those when they had whole wheat bread. Constipation did not seem to affect their general condition or rate of growth, which were considered good on both rations; it was prevented by adding 150 g. ground sulphite cellulose daily to the white bread ration. Before this addition, rate of daily gain over a 3-month period from 23 kg. bodyweight was 564 g. for white bread and 537 g. for whole wheat bread. Digestibility coefficients for the different nutrients, except crude fat, were significantly higher for white than whole wheat bread. Efficiency of feed utilisation did not differ. The pigs throve even although the white bread ration alone had as little as 1·5 per cent. crude fibre in the dry matter and the whole wheat ration, with 3·1 per cent., had less than is usual in pig feeding.—W. M. Deans.

2202

Heinicke, H. R. and Elvehjem, C. A. **Effect of high levels of fat, lactose, and type of bulk in guinea pig diets.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 70–72. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Three groups of guineapigs were given a normal diet which consisted, per cent., of sucrose 43, casein 30, bulk 15, salts 4, maize oil 4, potassium acetate 2·5, choline chloride 0·75, magnesium oxide 0·5 and a vitamin B group mixture 0·25, supplemented with vitamins A, D, E and K; a high-fat diet containing 24 per cent. maize oil, the addition being made at the expense of sucrose; or a diet in which lactose was the only source of carbohydrate. After adaptation to the diet each of the groups was subdivided into 3 groups of 5 guineapigs. With these 9 groups the effect of the type of bulk on growth was studied, the types used being gum acacia, spangles and Solka-Floc. The 3 normal groups were studied for 4 weeks, after which they were redistributed and given diets with 4, 8 and 12 per cent. maize oil with Solka-Floc as the bulk for 3 weeks; the 3 groups receiving high-fat diets were studied for 6 weeks, after which the livers were analysed for fat; the groups receiving lactose as the carbohydrate were studied for 2 weeks, after which 12 remaining animals were redivided into 2 groups of which one continued to receive lactose as the only carbohydrate while the other had half of the lactose replaced by sucrose, both groups receiving Solka-Floc as the bulk and being studied for 4 weeks.

The average growth rate of the groups receiving Solka-Floc was slightly better in all experiments. The animals given 12 per cent. maize oil grew at the rate of 7·7 g. and those given 24 per cent. maize oil at 4·9 g. daily when Solka-Floc was the bulk. Animals on the diets with lactose as the sole source of carbohydrate grew at the rate of about 2 g. daily. The substitution of sucrose for half the lactose more than doubled the rate of growth.—G. F. Garton.

2203

SUR, B. K. **Supplementary value of leaves to the poor rice diet.** *Bull. Central Food Technol. Res. Inst., Mysore*, 1955, **4**, 159.

In continuation of earlier work (Abst. 774, Vol. 20) the supplementary value of leaf flours of lucerne, Dub grass (*Cynodon dactylon*), drumstick (*Moringa oleifera*), pumpkin (*Cucurbita pepo*) and amaranth (*Amaranthus gangeticus*) at a 10 per cent. level was tested on rats on a poor South Indian rice diet. Lucerne, Dub grass and drumstick had high supplementary values, but amaranth had a low value, possibly because of its high oxalic acid content.—J. S. Thomson.

2204

CABELL, C. A. and ELLIS, N. R. **Feeding value of stored corn.** *J. Animal Sci.*, 1955, **14**, 1167–1173. [Animal and Poultry Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

In experiments with rats the feeding values of samples of yellow maize stored in good conditions for from 1 to 6 years at 3 centres were compared. At one centre there was a lower protein value after 5 years; otherwise protein and energy values were not affected by storage.—T. D. Bell.

2205

HOGAN, A. G., GILLESPIE, G. T., KOÇTÜRK, O., O'DELL, B. L. and FLYNN, L. M. **The percentage of protein in corn and its nutritional properties.** *J. Nutrition*, 1955, **57**, 225–239. [Dept. Agric. Chem., Coll. Agric., Univ. Missouri, Columbia.]

Groups of 6 male rats of Wistar strain were used in studies on high-protein maize and rats of Sprague Dawley strain in studies on low-protein maize. The high-protein maize contained 16·1 per cent. protein, was white and was grown in Illinois; the low-protein maize contained 7·3 per cent. protein, was yellow and was grown in central Missouri. When animals were given diets containing 94 per cent. high-protein maize plus 0·5 per cent. DL-threonine, or 94·5 per cent. low-protein maize, with salts 4, $CaCO_3$ 1·0 and soya bean oil 0·5 per cent., growth was slow; these diets contained 15 and 7 per cent. protein, respectively.

Rats which received the high-protein diet showed a slight increase in the rate of gain in bodyweight when given supplements of tryptophan and larger responses when given nicotinic acid or lysine; no response was statistically significant. When nicotinic acid and lysine were added simultaneously to the high-protein diet the response was increased further, and even more by supplements of tryptophan and lysine given simultaneously; these responses were statistically significant. Rats did not grow more rapidly on a combination of nicotinic acid and tryptophan than on nicotinic acid alone.

Rats given the low-protein diet grew more slowly than those given the high-protein diet. They gave no response to single additions of either tryptophan or nicotinic acid or to the combination of tryptophan and nicotinic acid. The response to lysine alone was not statistically significant and the response to lysine and nicotinic acid was no greater than to lysine alone. The response when lysine and tryptophan were added simultaneously was highly significant.

In the samples of maize studied, lysine was the first limiting factor and tryptophan the second; threonine was not a limiting factor in the high-protein maize. The nutritive value of the protein in the low-protein maize was superior to that of the protein in the high-protein maize; per unit of weight, the high-protein maize was superior to the low-protein maize. As a source of protein for the rat, maize protein supplemented with lysine and tryptophan was inferior to casein.

G. F. Garton.

2206

SUR, G., SWAMINATHAN, M. and SUBRAHMANYAN, V. **Studies on the nutritive value of Jowar (Kaffir corn—*Sorghum vulgare*).** *Bull. Central Food Technol. Res. Inst., Mysore*, 1955, **4**, 133–134.

Six purebred strains of sorghum showed the following range in composition: moisture 10·4 to 13·0, protein 9·7 to 10·3, fat 2·8 to 3·2, ash 1·6 to 1·9 per cent.; Ca 51·4 to 127·3, P 149·6 to 204·0, Fe 1·1 to 2·6 and vitamin B_1 0·28 to 0·33 mg. per 100 g. In growth experiments with rats sorghum was shown to be inferior to wheat as a source of protein, minerals (except Ca) and vitamin B_1. Poor vegetarian diets containing either sorghum or wheat, each supplemented with pulses, showed similar growth-promoting effects.—J. S. Thomson.

2207

FENG, P. C. and KEAN, E. A. **Influence of diet on the acute toxicity of hypoglycin-A in rats.** *Brit. J. Nutrition*, 1955, **9**, 368–373. [Div. Pharmacol., Dept. Physiol., Univ. Coll. W. Indies, Jamaica.]

Groups of rats were fed from weaning on a Jamaican diet mainly of vegetables as commonly eaten by the poorer classes of Jamaicans, a modified Jamaican diet similar to the first but with some carbohydrate replaced by casein, and a stock diet. After from 6 to 8 weeks on the diets the animals were examined by an acute toxicity test. Hypoglycin-A, the toxic polypeptide from the fruit of *Blighia sapida*, was dissolved in water and injected subcutaneously in doses of from 10 to 150 mg. per g. bodyweight. Deaths within 72 hr. after injection were recorded.

The rats fed on the unmodified Jamaican diet were more susceptible than the others, and all the rats on the diet given 40 μg. hypoglycin-A per g. bodyweight succumbed, but 70 μg. caused no death among the rats given the other 2 diets. The rats having the Jamaican diet did not grow and usually lost their hair. Modification of the Jamaican diet by replacing some of the carbohydrate with 10 per cent. protein improved growth very little. The resistance of the animals to hypoglycin-A was not related to their capacity for growth, since the lethal dose for the rats given stock diet was similar to that for those given the modified Jamaican diet. The mean glycogen content of the liver of 5 rats given the Jamaican diet was 7·17 g. per 100 g. wet tissue ; the corresponding figure for rats given stock diet was between 3 and 4. There was no significant pathological change when the livers were examined histologically. Blood glucose, estimated in 29 moribund rats, showed severe hypoglycaemia, with values usually below 20 mg. per 100 ml. It is suggested that the carbohydrate : protein ratio of the diet influenced the toxicity of hypoglycin-A.

I. M. Sharman.

2208

GERSHOLOWITZ, P., WEIDERSHEIM, M. and TUCKER, R. D. **Preparatory experiment on protection of skin against irradiation damage.** *S. African Med. J.*, 1955, **29,** 846–847. [Cape Town.]

Of 4 groups, each of 3 rats, 2 were given diets consisting entirely of homogenised uncooked bovine spleen, or half spleen and half a normal stock diet ; a fifth group was given the normal diet. Two weeks later each animal was exposed, in 3 areas of its skin, to X-rays in doses of 2000, 4000 and 6000 r. Of those receiving spleen one group continued on the all-spleen and another on the half-spleen diet, the 2 others reverted to the normal diet, and the fifth remained on it. At the end of 3 weeks damage was found to be greatest in the control rats which had had no spleen in their diet, and less in those given spleen than in those on the normal diet after exposure.—D. Harvey.

2209

MAYER, J., FRENCH, R. G., ZIGHERA, C. F. and BARRNETT, R. J. **Hypothalamic obesity in the mouse. Production, description and metabolic characteristics.** *Amer. J. Physiol.*, 1955, **182,** 75–82. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

The apparatus and method by which hypothalamic lesions were produced in mice are described ; they were adapted from those used for rats.

Normal female Swiss mice were found to weigh between 35 and 40 g., so operated mice were considered obese if their weight exceeded 45 g. The coordinates for the stereotaxic instrument are tabulated : with the most successful set of coordinates 11 out of 24 mice were made obese, 9 died and 4 operations failed. Animals which became obese usually gained 15 to 20 g. within 2 weeks after operation ; one reached 82 g. in 38 days. Liver and ovary weight were significantly below normal in obese mice.

When examined after death, obese mice always showed bilateral destruction of parts of the ventromedian nuclei and usually of the arcuate and periventricular nuclei. The median eminence and the brain substance ventral to the third ventricle were usually destroyed. The lateral hypothalamic area, mamillary bodies, para-ventricular and supraoptic nuclei were always intact.

Obesity was successfully induced in 2 out of 13 non-obese littermates of mice with hereditary obesity and diabetes. Their behaviour after operation did not differ from that of the Swiss mice. Except that about half the animals showed transitory excitement for 2 or 3 hr. after operation, usually running wildly about, the aggressive behaviour characteristic of hypothalamic obesity in rats was not observed. The obese mice were extremely inactive. Their B.M.R. when based on surface area was not significantly different from the normal. After fasting to reduce their weight, obese mice regained weight most rapidly on a high-fat and least rapidly on a high-protein diet. Blood sugar, sensitivity to insulin and response to growth hormone were normal.

Hypothalamic obesity is compared with spontaneous obesity and that produced by gold thioglucose.—D. Duncan.

2210

HOLLIFIELD, G., PARSON, W. and CRISPELL, K. R. **Studies of food drive and satiety in mice with gold thioglucose-induced obesity and the hereditary obesity-diabetes syndrome.** *Metabolism*, 1955, **4,** 537–541. [Dept. Int. Med., Sch. Med., Univ. Virginia, Charlottesville.]

Studies were made on female mice of the DBA strain or with hereditary diabetes and obesity and their littermate controls ; obesity was induced in the DBA mice by intraperitoneal injection of 20 mg. gold thioglucose when the mice were 3 months old. Six gold-obese mice and 6 non-obese controls about 4 to 5 months old, 12 gold-obese mice and 12 non-obese controls about 18 to 20 months old and 6 mice with hereditary obesity and 6 non-obese littermate controls about 3 months old were placed in revolving activity cages ; when activity, weights and food intakes became constant they were starved for 24 or 48 hr. and then allowed food to appetite. The ration throughout the study was ground Purina chow pellets. Spontaneous

running activity, weight and food intake were recorded daily.

The gold-obese mice, unlike normal mice, did not increase their running activity during starvation or decrease their activity when allowed food to appetite. The mice with hereditary obesity responded to starvation as normal mice, but when given food to appetite their response was not as striking as that of the normal mice.—G. F. Garton.

2211

NAFTALIN, J. M. **The effect of environment and mode of feeding and of rearing on the production of acute dietary liver necrosis in the rat.** *Ann. New York Acad. Sci.*, 1954, **57**, 862–868. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The environments were similar to those described earlier (Absts. 1038, Vol. 22; 1942, Vol. 23). The young rats received from 17 or 19 days of age a diet containing, per cent., casein (Glaxo "vitamin-free") 16 or 19, brewer's yeast 3, sucrose 68 or 65, lard 7, salt mixture 4, cod liver oil 2, with B vitamins but no added vitamin E. From 6 weeks of age the casein was reduced to 8 per cent. The rats were weaned at 24 days of age. When the low-protein diet was introduced one group in each environment was allowed to eat to appetite, other groups were restricted in intake.

The highest incidence of acute liver necrosis was in rats fed to appetite and kept at 70° to 78° F., especially when they had been weaned on the 17th instead of the 25th day of age. At all environmental temperatures restriction of food intake reduced or prevented necrosis, but when restriction was too great the rats died of inanition and not of necrosis, and the lower the environmental temperature the greater the effects of restriction.

D. Duncan.

2212

NAFTALIN, J. M. **Effect of different makes of casein on the production of acute dietary liver necrosis in the rat.** *Ann. New York Acad. Sci.*, 1954, **57**, 869–872. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The diets were as described in the preceding Abst., but the caseins were Glaxo lactic casein "C" unextracted and Genatosan "low-vitamin" casein. Young rats weaned on the 17th day were given these diets to appetite, and from the 38th day the casein was reduced to 8 per cent. and sucrose was increased. In one experiment a group of 10 rats received the Genatosan casein diet, with a supplement of 0·5 mg. vitamin B_{12} by mouth 3 times a week from 38 days of age. The environmental temperature was 74° to 78° F.

In 2 experiments with the Glaxo casein the mean survival of rats after the 38th day of age was 7 and 9 days and the mortality was 9 out of 10 and 33 out of 36, all the dead rats showing acute liver necrosis. Four died before the 38th day. With the Genatosan casein 4 out of 10 and 16 out of 36 rats died with liver necrosis. With Genatosan casein and vitamin B_{12}, one rat out of 10 died.

Differences in the preparation of casein are discussed. The Glaxo lactic casein "C" unextracted is a crude product of New Zealand origin. The Genatosan "low-vitamin" casein is usually made from British liquid milk, sometimes with dried skimmed milk from New Zealand added.

D. Duncan.

2213

HALDI, J., WYNN, W., LAW, M. L. and BENTLEY, K. D. (with RAMSAY, D.) **Dental caries in the albino rat in relation to the chemical composition of the teeth and of the diet. 1. Effect of prenatal and postnatal feeding of high protein, high fat and high carbohydrate diets.** *J. Nutrition*, 1955, **57**, 215–223. [Dept. Physiol., Div. Basic Sci. Health Serv., Emory Univ., Emory University, Ga.]

Two generations of rats were bred. The first was from parents on a commercial stock diet and, from weaning, 10 animals in each of 3 groups were given synthetic diets rich in sucrose, casein or fat. They were killed after 150 days. The second was from a similar F_1 generation and the young were reared and later fed for the same length of time on one of these same 3 diets, offspring getting the same one as their mother. Teeth were analysed for N, Ca, P, Mg, F and CO_2.

From data for both sets of rats no difference for any constituent was found among the groups within the generations. The commercial and synthetic diets differed considerably in mineral content, but not so the teeth of the F_1 and F_2 generations. The evidence seemed to support the view that, with supplies of these nutrients above certain minimum levels, genetic rather than nutritional circumstances would determine the amounts which would be deposited in teeth.

Incident to the work was the conclusion that the increase in amount of caries with the high-sucrose diet (see Abst. 2665, Vol. 22) could not be ascribed to a difference in the mineral composition of the teeth.—D. Harvey.

2214

BOMBARA, G. L'edema da ovoalbume nel ratto albino nell'inanizione acuta. [**Egg-albumin oedema in the white rat fasting completely.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 120–124. [Ist. Patol., Univ. Messina.]

Egg-albumin oedema of the rat, first described by Seyle (*Endocrinology*, 1937, **21**, 169), was induced by injecting 1 ml. fresh egg white intraperitoneally

into groups of 15 rats normally fed, or after they had fasted until from 24 to 35 per cent. of weight had been lost, or after from 38 to 50 per cent. loss. When fully fed the rats showed the normal degree of oedema, but after fasting the appearance of oedema was completely suppressed in 6 and 5 rats, respectively, and in the remainder it was slight and transitory.—E. M. Hume.

GENERAL METABOLISM AND FEEDING HABITS OF ANIMALS OTHER THAN MAMMALS AND BIRDS

2215

FROMM, P. O. and JOHNSON, R. E. **The respiratory metabolism of frogs as related to season.** *J. Cell. Comp. Physiol.*, 1955, **45,** 343–359. [Coll. Liberal Arts Sci., Dept. Physiol., Univ. Illinois, Urbana.]

Total oxygen consumption of frogs (*Rana pipiens*) was studied in a closed circuit respirometer; the frogs were immobilised with curare, but recovered subsequently. Frogs were unfed, or forcibly fed with tuna fish homogenate, and kept at 22° to 28° C. or 4° C.

Despite the constant room conditions there was a seasonal peak of oxygen consumption and CO_2 production in spring. The respiratory quotient was very high, mean 1·20, in autumn and declined slowly to 0·82 in spring and summer. Refrigeration of both fed and unfed frogs reduced oxygen consumption but not CO_2 production, and substantially increased the R.Q. Feeding had little or no effect at any season on oxygen consumption, CO_2 production or R.Q.—D. Duncan.

2216

UNDERHAY, E. E. and BALDWIN, E. **Nitrogen excretion in the tadpoles of *Xenopus laevis* Daudin.** *Biochem. J.*, 1955, **61,** 544–547. [Dept. Biochem., University Coll., London.]

Very young tadpoles of *Xenopus laevis* excreted N mainly in the form of ammonia. The proportion of urea to ammonia rose with growth until the hind limbs appeared, but then fell again and remained low in the metamorphosed toad. Total N output per g. bodyweight increased sharply in the late stages of metamorphosis. The tadpoles were well fed on dried liver powder.—D. Duncan.

2217

BIRSHTEIN, YA. A. and VINOGRADOV, M. E. Zametki o pitanii glubokovodnykh ryb Kurilo-Kamchatskoi vpadiny. [**The food of deep-sea fish of the Kurile-Kamchatka deeps.**] *Zool. Zh.*, 1955, **34,** 842–849. [Lomonosov Moscow State Univ., USSR.]

The difficulty with this investigation was that in raising deep-sea fish to the surface from great depths their intestines emptied under pressure from the enlarged swim-bladder, so with occasional exceptions it was possible to judge the nature of their food only from remnants in the mouth.

The principal food of *Coryphanaenoides cinereus* was plankton: crustaceans, oarfish and the like. *C. angustifrons* (one full intestine only) feeds on crustaceans of the ocean floor and just above it. Much more material was available for *C. acrolepsis*, which by its food should be judged a pelagic fish and not a fish of the ocean floor. These fish have a wide range of food, necton and macroplankton, not relatively small animals such as are eaten by the first 2 fish mentioned. They probably use their enormous eyes in hunting for food and are attracted primarily by luminous organisms. Their food habits change with age, starting with oarfish found at depths of 100 to 200 m., then *Calanus cristatus* (at the fifth stage of development) found at 50 to 500 m.; as no deep-water oarfish were found in the intestines of young fish, they presumably do not descend below 500 m. Adult *C. acrolepsis* appear to feed at depths below 2000 to 3000 m.

The principal food of 2 species of *Lampanyctus*, *L. leucopsarus* and *L. nannochir laticauda*, was *Calanus cristatus*. Of the other kinds of fish caught, *Bassozetus zenkevitchi* and 2 kinds of *Melamphaes* fed on plankton, whereas *Careproctus amblystomopsis* was without doubt a benthos feeder, as the large egg of an octopod which is always attached to the bottom was found in its intestine, and also the chaetae of ocean floor polychaets. Two deep-sea eels, *Ilyophis brunneus* and *Histiobranchus infernalis*, from a depth of 3000 m. can also be counted among the benthos fishes; in the stomach of the latter, in addition to ocean floor *Amphioda*, was found the small fruit of *Thelycrania alba*, a land flowering plant, which confirms previous findings that deep-sea animals can use residues of land plants as food.

H. Scherbatoff.

2218

GERKING, S. D. **Influence of rate of feeding on body composition and protein metabolism of bluegill sunfish.** *Physiol. Zoöl.*, 1955, **28,** 267–282. [Dept. Zool., Univ. Indiana.]

Bluegill sunfish of initial weight about 30 g. were kept in individual glass tanks and fed on mealworms at rates of from 1·16 to 3·59 per cent. of bodyweight daily for 30 days. Sample fish were

analysed at the beginning of the study and all fish at the end. Nitrogen retention was calculated by subtracting the N of the initial sample fish from that of a fish analysed at the end. N equilibrium was maintained on a daily intake of 7·2 mg., above which there was increasing retention of N. Maximum efficiency of utilisation of protein appeared to depend on maximum consumption of protein. The total body composition of the fish fed at different rates showed some variation, especially in fat content, which increased as the amount of feed increased.—A. M. Copping.

2219

IVLEV, V. S. Zavisimost intensivnosti obmena u ryb ot vesa ikh tela. [**Dependence of the intensity of metabolism in fish on the bodyweight.**] *Fiziol. Zh. SSSR Sechenova*, 1954, **40**, 717–721. [Latviisk. Otdel VNIRO.]

Oxygen consumption was measured in a large number of species of fish at a constant temperature of 18° to 20° C. Rate of oxygen consumption plotted against bodyweight gave a straight line, from which few values deviated. A mathematical expression is derived for the relationship. The implications of these experiments and the conditions influencing body temperature are discussed in terms of the concept of "active" or "protoplasmatic" and "indifferent" components of the body mass.—D. W. Taylor.

2220

PETTERSSON, I. **Occurrence and variation of arginine phosphate during insect metamorphosis.** *Acta physiol. scand.*, 1955, **34**, 116–123. [Dept. Zoophysiol., Univ. Lund.]

2221

BOLDAREV, V. O. Plodovitost' i pishchevaya spetzializatziya sibirskogo shelkopryada (*Dendrolimus sibiricus* Tshtv.). [**The fertility and nutritive specialisations of the Siberian silkworm (*Dendrolimus sibiricus*, Tshtv.).**] *Zool. Zh.*, 1955, **34**, 810–821. [Irkutsk Reg. Forestry Admin.]

The low fertility of the Siberian silkworm, a pest of some coniferous and other trees, in pine woods led to the conclusion that the caterpillars feed on pines only when no other trees are available and that they are on a starvation diet in pinewoods, where most of them perish at an early stage of development.

In laboratory experiments it was discovered that the caterpillars developed best on larch, with *Abies* next, with an average development on cedar and worst of all on pine and spruce needles. There was no reason to believe that there were 2 races. The largest and heaviest pupae, up to 6 g., developed on larch and became the most fertile in the adult stage (up to 826 eggs), with average size and fertility on cedar (up to 400 eggs), while on pine and spruce needles most of the caterpillars died. Although caterpillars on larch were heaviest and most developed they produced least excreta, 1595 pieces as against 2027 on cedar and 2097 on pines; the softer the needles, as in larch, the less the excreta produced.

The caterpillars did most damage to trees in the later stages of development, in the autumn preceding their second winter and in the next spring before pupating, which is the period when they have to build up reserves for the next stage of development.—H. Scherbatoff.

2222

FRAENKEL, G. **Inhibitory effects of sugars on the growth of the mealworm, *Tenebrio molitor* L.** *J. Cell. Comp. Physiol.*, 1955, **45**, 393–408. [Dept. Entomol., Univ. Illinois, Urbana.]

Larvae of the mealworm, *Tenebrio molitor*, L., were grown on semi-synthetic diets (see Abst. 1764, Vol. 21) with vitamins of the B complex, including carnitine, and 2 per cent. brewer's yeast. The carbohydrates tested were given as 80 per cent. of the diet.

The larvae grew well on glucose, maltose, dextrin, starch or glycogen and moderately well on mannitol, lactose, melibiose, trehalose, cellobiose, raffinose or melezitose. They grew well for a short time on sucrose and then died. They failed to grow on arabinose, xylose, galactose, sorbose, inulin, cellulose, rhamnose, ribose, α-methylglucoside or α-methylmannoside. They died very quickly on fructose, mannose, sorbitol or dulcitol. Results with lactose were variable. Cellulose was inert.

Sucrose, fructose and sorbitol, which were all hygroscopic and became too wet for the larvae, when mixed with equal parts of starch were as good as, or better than, starch alone.

When mixed with starch or glucose, arabinose, xylose, rhamnose or ribose retarded growth at levels of from 2 to 20 per cent. of the diet; so did galactose, mannose or sorbose, and dulcitol and α-methylglucoside were particularly toxic. Toxic effects were greater with glucose than with starch.

Intestines of larvae were homogenised and tested for enzyme activity. A hydrolysing enzyme was found for every sugar which had given good or fair growth, except melibiose. Lactase was found in 2 out of 5 tests.—D. Duncan.

2223

SRINIVASAN, V., MOUDGAL, N. R. and SARMA, P. S. **Influence of thyroxin and thyroglobulin on rice moth larva.** *Science*, 1955, **122**, 644–645. [Dept. Biochem., Univ. Madras.]

Thyroxine and cattle thyroglobulin, both of known potency, were given to larvae of a pure

strain of rice moth, *Corcyra cephalonica*, St., maintained under standard conditions. In each set of experiments 15 petri dishes were filled with 10 g. white flour and concentrations of thyroxine ranging from 0 to 24 μg. per g. diet, or thyroglobulin from 0·058 to 2·900 μg. per g. diet when expressed as thyroxine equivalent. The petri dishes were then seeded with 5 mg. fresh moth eggs. At the end of 15 days, 2 batches of 10 larvae were picked from each dish and weighed. Thyroxine up to 0·75 mg. per g. diet promoted growth of the larvae, but higher doses inhibited growth and death occurred at the highest concentration. Thyroglobulin at all concentrations failed to show any effect on growth. Thyroxine increased oxygen consumption, but thyroglobulin did not. It is suggested that this may have been due to inability of the larvae to split the protein molecule completely.—B. W. Simpson.

2224

SCHUMARD, R. F., HERRICK, C. A. and POPE, A. L. **The effect of diet on the length of third stage larvae produced by adult *Haemonchus contortus* harbored by lambs.** *J. Parasitol.*, 1955, **41**, 542–544. [Univ. Wisconsin.]

Eggs of *Haemonchus contortus* from lambs on different mineral intakes were cultured in the faeces of uninfested lambs on the same rations. The culture media had no effect on the growth of the larvae, as measured by the third stage. Highly significant differences in length were apparently due to the nutrition of the host of the parents of the larvae. Longer larvae developed from eggs from lambs getting cobaltised salt, 6·72 gm. $CoSO_2$ in 100 lb. iodised salt, and salt with traces of I, Co, Cu, Fe, Mn and Na.—G. C. Hunter.

2225

DAUGHERTY, J. W. **Intermediary protein metabolism in helminths. 3. The L-amino acid oxidases in *Hymenolepis diminuta* and some effects of changes in host physiology.** *Exp. Parasitol.*, 1955, **4**, 455–463. [Rice Inst., Houston, Tex.]

See also Abst. 1753.

5. HUMAN DIET IN RELATION TO HEALTH AND DISEASE

DIET

REQUIREMENTS

2226

FRANK, R. M. and JOHNSTON, F. A. **Total energy needs of women 22 to 36 years old.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 1007–1009. [New York State Coll. Home Econ.]

Eight women in whom basal metabolic rate was within normal limits were weighed at intervals during 4 months. They were allowed to vary their consumption of such foods as cream, butter and sugar so as to adjust energy intake to needs. In this way it was hoped that the women would maintain bodyweight. In fact, some lost and some gained weight. The average intake was 2140 Cal. Corrected for weight loss or gain this gave a requirement of 2215 Cal., in good agreement with the requirement of 2270 Cal. predicted from U.S. National Research Council (1953) standards (Abst. 3538, Vol. 24).—F. C. Aitken.

2227

FLOCH, H. and GÉLARD, A. Établissements de standards alimentaires adaptés aux conditions spéciales de notre Département guyanais. **[Establishment of food standards adapted to the special conditions of the Guiana Department.]** *Arch. Inst. Pasteur Guyane franç. Publ.* No. 347, December 1954, pp. 16.

The standards are founded on those proposed by the FAO Committee on Calorie Requirements (p. 517, Vol. 20) and by the U.S. National Research Council, 1948 (Abst. 4773, Vol. 18). The main difference is in taking the energy requirement of the reference woman as defined by the Committee to be 2400 instead of 2300 Cal. daily. The suggestion is made that the percentages of total energy from protein, fat and carbohydrate should be 12, 19 and 69, respectively. On these bases 12 tables are presented from which may be read the allowances of energy, Ca, Fe, vitamins A, B_1 and C and riboflavin for men, women and children, according to age and size, who live in French Guiana in a mean annual temperature of 26° C.

D. Harvey.

See also Abst. 2333.

FEEDING OF INFANTS AND CHILDREN

2228

FANTON, E. L'allevamento del prematuro. **[Rearing of premature infants.]** *Lattante*, 1955, **26**, 88–94. [Univ. Padua.]

There is a small section on feeding which, it is considered, should be with human milk given almost continuously throughout the day and every 2 hr. at night.—E. M. Hume.

2229

OCKLITZ, H. W. Die Ernährung der Mangelgeburten mit fettreichem Nahrungsgemisch. [**Feeding of premature infants with a fat-rich food mixture.**] *Monatsschr. Kinderheilk.*, 1955, **103,** 443–449. [Kinderklin., Univ. Rostock.]

The large number of infants born prematurely and the shortage of human milk make it desirable to find a form of nourishment that will induce the most rapid progress possible. Eighteen healthy, premature babies weighing from 1550 to 2150 g. at birth were gradually transferred when from 15 to 35 days old from human milk enriched with amino-acids to the butter, meal and full-milk mixture of Moro, containing 13 per cent. carbohydrate and 7·3 per cent. fat, and supplying 133 Cal. per 100 ml. The food was well tolerated and has since been used for more than 400 premature infants in the clinic.—E. M. Hume.

2230

CROSSE, V. M. **Care of the newborn.** *Postgrad. Med. J.*, 1955, **31,** 341–344. [Dept. Paediat., Univ. Birmingham.]

2231

DROESE, W. and STOLLEY, H. Bemerkungen zur Arbeit von A. Sinios: "Vergleichende Untersuchungen über Ernährung mit evaporierter Milch und Sammelfrauenmilch bei jungen Säuglingen", erschienen in Z. Kinderheilk. 75, 634 (1955). [**Comments on the paper of A. Sinios: "Comparative studies of feeding young infants with evaporated milk and pooled breast milk" in *Ztschr. Kinderheilk.*,** 1955, **75,** 634.] *Ztschr. Kinderheilk.*, 1955, **77,** 48–55. [Kinderklin., Univ. Munich.]

The authors of a study comparing whole milk mixture with evaporated milk plus 5 per cent. sugar but without other carbohydrate (Abst. 986, Vol. 24) criticise the work of Sinios comparing sweetened evaporated milk with breast milk (Abst. 4030, Vol. 25) on the grounds that his population was not big or representative enough, that his range of criteria was not wide enough for a comparison of substances so different as breast milk and cow's milk, and that he left out of account the possible effects of his concentrated (2/3 or whole milk) mixtures on the immature digestive organs and kidneys of premature infants. Another point overlooked by Sinios and others is that condensed milk is a sterilised milk, which Jochims and Wilckhaus (Abst. 5079, Vol. 24) have shown to be less satisfactory than pasteurised. The authors' view is that though it is possible in case of need to rear infants on condensed milk without other addition than 5 per cent. sugar, this is not ideal, and addition of a second carbohydrate, dextrin and maltose as in the United States, or cereals as in Germany, is desirable, both to supply energy when diluted cow's milk is used and on other grounds.—W. M. Deans.

2232

SINIOS, A. Schlusswort zur Arbeit: "Vergleichende Untersuchungen über Ernährung mit evaporierter Milch und Sammelfrauenmilch bei jungen Säuglingen". [**Final remarks on the paper "Comparative studies of feeding young infants with evaporated milk and pooled breast milk".**] *Ztschr. Kinderheilk.*, 1955, **77,** 56–60. [Hamburg.]

Sinios replies to the above criticisms and includes some criticisms of the work of Droese and Stolley and two minor corrections to his original paper.

W. M. Deans.

2233

PEHRSON, M. Einige Beobachtungen der Konsumptionsschnelligkeit des Säuglings bei verschiedenen Milchmischungen. [**Observations on the rapidity of feeding of infants with different milk mixtures.**] *Monatsschr. Kinderheilk.*, 1955, **103,** 325–327. [Kinderklin., Univ. Upsala.]

In 13 healthy infants aged from 1 to 3 months there was no appreciable difference between the mean feeding times for the same weight of 2 dried milk mixtures of different sugar content; the time for the same weight of breast milk was slightly longer than for the dried milk mixtures.

L. Wills.

2234

ELYAN, M. **Underfeeding in infants: a plea for early introduction of solid foods.** *Med. J. Austral.*, 1955, i, 175–176. [Townsville Hosp., Queensland.]

Changes in weight and general condition are described for 3 undernourished children, 2 white and 1 aboriginal, aged from 10 months to 2 years, who responded well to an adequate mixed diet. Failure by mothers to introduce solid foods at a sufficiently early age, and, as a result, underfeeding in the post-weaning period, are considered to be common among infants in Queensland.

M. H. Pierce.

2235

HUGHES, B. P. **The intakes of essential amino-acids of children who were deriving most of their protein from bread and vegetables.** *Brit. J. Nutrition*, 1955, **9,** 373–378. [Dept. Exp. Med., Med. Res. Counc., Univ. Cambridge.]

Recent data on the amino-acid composition of foods are reviewed and are considered adequate for calculating the composition of diets in terms of essential amino-acids only. Values for the amounts of these in meat, fish, milk, whole wheat, patent flour, potatoes, green vegetables and pulses are tabulated. They were used to calculate the

intakes of essential amino-acids by children in 2 German orphanages (see Abst. 2560, Vol. 25) and by a group of British children (see Abst. 3602, Vol. 17) whose diet before the war was much richer in animal protein. The diets of the German children, low in animal protein, provided less of most of the essential amino-acids but, except for methionine, they provided double the minimum amounts required for N equilibrium in the adult.

G. F. Garton.

2236

WELLIN, E. **Maternal and infant feeding practices in a Peruvian village.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 889–894. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Data were obtained by interview and observation during a 4-months' dietary study of infants and of pregnant and lactating mothers in Espinos, a Peruvian coastal village. During the first 3 days the infant is not fed but is offered cotton dipped in a laxative, usually almond, oil; during this period the mother expresses and discards the colostrum and takes a laxative. Breast feeding commences after the third day; the mother suckles the infant whenever it cries but, for some days, she underfeeds at each nursing and allows unrestricted suckling only after 1 week or more. Until some time between the sixth and twelfth month, the child receives only milk with, occasionally, herb tea or sweetened water. Infants are rarely exposed to direct sunlight before the sixth month. Milk for bottle-fed babies is always boiled. During both pregnancy and lactation the mother eats less meat, eggs, fresh fruit and vegetables than usual, and drinks only small amounts of milk; the bulk of her diet consists of maize, beans, squash, rice, soups and stews and teas.

The people of Espinos tend to adjust to their particular beliefs what scientific information reaches them about foods. The result may be a worsening instead of an improvement in their diet.

G. F. Garton.

2237

HUENEMANN, R. L., COLLAZOS C., C., HEGSTED, D. M., BRAVO DE RUEDA, Y., CASTELLANOS, A., DIESELDORFF, A., ESCOBAR, M., MOSCOSO, I., WHITE, P. L. and WHITE, H. S. **Nutrition and care of young children in Peru. 4. Chacan and Vicos, rural communities in the Andes.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 1121–1133. [Sch. Pub. Health, Univ. California, Berkeley.]

Studies were made of 32 children under 3 years of age living in the Andes, 13 of them in Chacan, a small farming community in the southern mountains, and 19 in Hacienda Vicos in the north. In both communities the children were breast fed until some time between the eighteenth month and the third year, with supplements of some of the family's grain, of potato soup or potatoes, sometimes cooked specially for the baby; these additions were introduced as early as the fifth month. The diets of weaned children were, like those of their families, almost entirely of grains, potatoes and other tubers, dried beans and, in Chacan but not in Vicos, turnip greens. All diets were lacking in Ca, protein, fat and, particularly in Vicos, in vitamin A; intakes of Fe and vitamins of the B group were generally high.

Other aspects of child care such as sleep, bathing, clothing, toilet training and immunisation were studied. Physical examinations showed that the children were small in size compared with Stuart's percentile ratings (Stuart and Stevenson, in "Mitchell-Nelson Text-Book of Pediatrics", 5th ed. Philadelphia, W. B. Saunders Co., 1950), and measurements of children in the Bolivian Andes (Ferrufino and Cecelino, *Bol. Soc. Boliviana Pediat.*, 1949, **3,** 18). All but 1 of the children had clinical signs of nutritional deficiencies, particularly of vitamin A.

The diets of women during pregnancy and lactation were similar to those normally eaten by the family and were deficient in the same nutrients. Some of the mothers would have altered their diets if they had had the means; others had, during lactation, used such foods as chocolate, oatmeal, tea, milk and pudding made from the white maizemeal.

The findings and those of earlier surveys in Peru are discussed. (See Absts. 1090, 2627, Vol. 25.)

G. F. Garton.

2238

SCRIMSHAW, N. S., BEHAR, M., PÉREZ, C. and VITERI, F. **Nutritional problems of children in Central America and Panama.** *Pediatrics*, 1955, **16,** 378–397. [Inst. Nutrit. Central America and Panama (INCAP), Guatemala City.]

A review article.

2239

FLOCH, H. Résultats d'essais d'utilisation de levures alimentaires en Guayane Française. **[Results of trials on the utilisation of food yeasts in French Guiana.]** *Arch. Inst. Pasteur Guyane Publ.* No. 307, December 1953, pp. 4.

Weights were recorded for 2 groups of boys in an orphanage. One was of 32 boys who, according as their ages were 5 to 7, 7 to 10 or over 10 years took 1, 2 or 5 g. dried yeast daily; the other was of 14 boys who had none. The average increases in weight over 5 months were 1·300 and 0·789 kg.

D. Harvey.

2240

SHARMA, N. L. **The problem of protein weaning foods in India.** *Indian J. Pediat.*, 1955, **22,** 191–207. [All-India Inst. Hyg. Pub. Health, Calcutta.]

2241

WELBOURN, H. F. **Notes on differences between Baganda and Luo children in Kampala.** *East African Med. J.*, 1955, **32**, 291–298. [Child Welfare Clin., Mengo District, Uganda.]

The Luo families came from Kenya and returned for several months every year; they were less sophisticated and literate than the indigenous Baganda who lived in rural or semi-rural conditions. The Luo children, though dirtier and less well looked after, were no more prone to infection than were the Baganda children. At the age of 6 months the Luo children, especially boys, were appreciably heavier than the Baganda children and those studied up to the age of 3 years showed a continuously satisfactory gain in weight, and often were heavier than European standards. There was no difference in the incidence of signs of malnutrition between the tribes. Possible causes of the difference in the weight curve are discussed. Among the Baganda infants were usually weaned between the 12th and 14th months but among the Luo as late as the 18th to 20th month. Further, most Baganda babies needed supplementary feeding at 6 months, but the Luo babies throve on breast feeding alone for at least a year. The Baganda diet was extremely monotonous, consisting of plantain or, failing that, sweet potatoes or cassava with only a relish of beans or groundnuts. The Luo ate a good mixed diet based on a cereal staple, maize and wheat, large amounts of beans with some dried fish, meat, milk and vegetables. The possibility that racial differences account for the difference in weight is mentioned also.—L. Wills.

2242

WELBOURN, H. F. **The danger period during weaning. A study of Baganda children who were attending child welfare clinics near Kampala, Uganda. 1. 2. 3.** *J. Trop. Pediat.*, 1955, **1**, 34–46; 98–111; 161–173. [Child Welfare Clins., Mengo District, Uganda.]

1. It was desired to assess the incidence among the population of mild as well as of classical, severe kwashiorkor. A check in growth and development during weaning, which for the purpose of the study was considered to begin at the age of 6 months when supplementary feeding should be started, and signs of malnutrition, in association with dietary deficiency of protein, were considered evidence of early kwashiorkor. The general background and the methods used at the clinics are described. The mean birthweight in 2 series of 1000 single births was about 6·5 lb. and the mean length, in a small series, about 18·5 in. Most of the babies were active and vigorous at birth, sucked vigorously and appeared to be born at term. The weight and length of boys and girls at different ages were compared with United States standards for the same age groups in children of European race. Up to the age of 6 months the mean values for weight and length of both sexes were close to the 50th percentile of the standards, but from about 6 months gains in weight and length fell and by the ninth month the mean values were below the 10th percentile of the standards. The rapid gain in weight of Baganda infants in the first 3 months, which enables them to make up for their lower birthweight, occurs when the supply of breast milk is very abundant and available on demand. The lessening of growth after the sixth month results from inadequate supplementary feeding and from frequent respiratory and malarial infections. For data on individual weights see Abst. 1071, Vol. 25.

2. The customary diet of the mothers was green bananas (*matoke*) or sweet potatoes, with a relish of small quantities of groundnuts, beans or green vegetables; meat and eggs were eaten occasionally. At about 6 months supplementary feeding of the infants with *matoke* or sweet potatoes and tea prepared as for adults was begun and about a third of the mothers gave some cow's milk as well. Complete weaning was sudden and generally took place at about 15 months, when the child was frequently sent away from home. The sudden withdrawal of breast feeding seemed to have psychological effects and often caused loss of appetite. Diet surveys for 6 village children and 6 others of educated parents showed that, by League of Nations standards, intakes of protein were low, especially those of the village children. For changes found in children over 6 months of age see Abst. 2648, Vol. 25. Enlarged liver occurred only in acute malarial infection. Other deficiency states were almost never seen. Malaria was endemic, but little disturbance of general health followed infection.

3. The effects of infections, malaria and whooping-cough, and of worm infestation are discussed (see Abst. 1071, Vol. 25). It is concluded that 50 per cent. of the 780 toddlers examined showed signs of mild kwashiorkor, though only 10 severe cases were seen. The condition is considered to result from the dietary deficiency in the weaning period, exacerbated by infection. A suitable, cheap vegetable protein preparation to combat deficiency is discussed.—L. Wills.

2243

MATTHEWS, D. S. **The ethnological and medical significance of breast feeding: with special reference to the Yorubas of Nigeria.** *J. Trop. Pediat.*, 1955, **1**, 9–24. [Univ. Coll., Ibadan, Nigeria.]

Yoruba women breast feed successfully for up to 2 years. Though the upper-class babies who are weaned at about 1 year weigh more, those still on the breast appear healthy in spite of apparent undernourishment. The average length of lactation was 22 months for the first and 18 months for the second child. Most of the infants receive traditional supplements of carbohydrate food from 6 months of age. The longer the lactation, the longer the period of amenorrhoea. No instance of hyperinvolution was seen. The menopause occurs early, often before the age of 40 years. The conditions favouring successful lactation are thought to be the good development of the breasts, the women's attitude to child-bearing and -rearing which is simple and free from anxiety, early marriage, high oestrogen activity and the universal practice of breast massage during pregnancy.

The causes of failing lactation in women in Britain and New Zealand are discussed in connection with the findings for Yoruba women; the lower incidence of breast feeding in those countries is concluded to result from the failure of women to adapt themselves to changing social conditions, so that a state of stress is produced. Measures to overcome the tendency are discussed.—L. Wills.

2244

HOLEMANS, K. and MARTIN, H. Étude de l'allaitement maternel et des habitudes alimentaires du sevrage chez les indigènes du Kwango. [**Study of breast feeding and of the nutritional habits at weaning of the natives of the Kwango.**] Addendum à l'étude de l'allaitement. Teneur en calcium et phosphore du lait de la femme indigène. [**Addendum to the study of lactation. Calcium and phosphorus content of the milk of native women.**] *Ann. Soc. belg. Méd. trop.*, 1954, **34,** 915–923; 925–927. [Clin. Maladies de l'Enfance, Univ. Liège.]

Samples, in the numbers and at the times indicated after birth, were analysed, of colostrum 19 at 2 to 4 days, transition milk 18 at 6 to 9 days and mature milk 194 at 1 to 36 months. The findings are compared with the data of Geigy-Christiaens [reference not given] for European mothers. Milk of African women had less protein, slightly more fat and much more lactose than that of European women; energy value differed little. Per 100 Cal. the African child would get only 6·2 Cal. from protein; the European would get 9·4 Cal. This relatively poorer quality of African mothers' milk is thought to be due to their poorer nutritional state, a view which receives support in the finding of a higher protein content in the milk from mothers who had received supplementary skimmed milk powder than in that of mothers with no such extra food.

Estimates of the amount of milk consumed by the African children in 24 hr. were from 323 to 417 g. below 1 year of age and, on the average, 293 g. above that age. Supplementary feeding varied greatly but generally it was rich in carbohydrate.

In the addendum data are given for Ca and P in milk; they varied widely at all stages of lactation.

L. Wills.

2245

KAYSER, K. Frauenmilchtrocknung. [**Drying of human milk.**] *Öst. Ztschr. Kinderheilk.*, 1955, **11,** 232–240. [1. Städt. Frauenklin., Erfurt.]

The history of the collection of surplus human milk and of the methods used to preserve it is briefly sketched. All methods, including freeze-drying, which failed to ensure its sterility, were rejected.

In Erfurt surplus human milk was dried to a powder in a high-vacuum apparatus. Only high quality milk from known healthy women was used. The process greatly reduced the number of micro-organisms. The milk powder was not issued for use until it had satisfactorily passed bacteriological tests. Some of the milk was first heated for 5 min. at 92° C. and some was not heated. There was some loss of vitamin C, vitamin A and carotene from the heated milk but no difference was noted in the quality of the products when they were used.—E. M. Hume.

2246

GÓMEZ LUS, R. Flora intestinal en el lactante. Composición según los distintos tipos de alimentación y modificaciones por la terapéutica antibiótica. [**The intestinal flora of the infant. Composition on different types of feeding and modifications due to antibiotics.**] *Rev. española Pediat.*, 1955, **11,** 411–442. French, English and German summaries.

The bacteriological techniques used and the criteria on which bacteria were classified are described. The infants were in 4 groups, breast-fed, partly breast-fed, artificially fed, and those receiving milk and complementary foods.

There was no significant difference which could be related to the type of feeding. There was a tendency for *Lactobacillus bifidus* to predominate in breast-fed infants, but it outnumbered *Bact. coli* in only 53 per cent. of samples from this group. In other groups *Bact. coli* predominated, especially in infants partly breast-fed. *Clostridium welchii* occurred in all groups, *Lactobacillus acidophilus* only in partly breast-fed infants. Enterococci were most common with artificial feeding. In identical twins with identical feeding the flora differed widely.

Penicillin given parenterally affected the intestinal flora, but streptomycin had little effect except

when given by mouth. Terramycin was especially effective in reducing the numbers of bacteria. The re-establishment of a normal flora after treatment with antibiotics is discussed.—D. Duncan.

2247

MÖSSMER, E. Viehfutter - Milch - Kind. [**Cattle food, milk and child.**] *Münch. med. Wochenschr.*, 1955, **97**, 1276. [Säuglings- und Kleinkinderkrankenhaus, Landshut.]

The author gives his impressions, after 40 years' experience, of the effects that the different kinds of food eaten by the cow have on its milk at different seasons, and on the infant fed on its milk. He considers the matter of considerable importance. For instance, many babies refuse the milk at the season when beet leaves are given, and certain mountain hays, given only in times of shortage, are regarded as actually poisonous.

E. M. Hume.

See also Absts. 1561, 2019, 2261, 2306.

DIETARY SURVEYS AND INDIVIDUAL STUDIES

2248

CHAPPELL, G. M. **Long-term individual dietary surveys.** *Brit. J. Nutrition*, 1955, **9**, 323–339. [Dept. Household Sci., Queen Elizabeth Coll., Univ. London.]

There were 2 subjects, one a woman whose duties were assessed as requiring less than moderate activity and the other a retired man thought to be more active than a sedentary man. For the first subject the survey was in 2 parts of 61 and 9 weeks' duration with an interval between them of 13 weeks; for the second the survey lasted 13 weeks. Mean daily intakes were calculated from food tables. In the following order of nutrients and units, total protein, animal protein, fat and carbohydrate in g., Ca, Fe, vitamin B_1, riboflavin, nicotinic acid and vitamin C in mg., vitamins A and D in I.U. and the number of Cal., the means for the first subject were 65·8, 34·1, 87·7 and 305·8; 1078, 12·8, 1·19, 1·60, 10·08 and 146; 2827 and 189; and 2275. For the second subject the means were 98·9, 53·8, 121·1 and 400·6; 1425, 15·79, 1·64, 1·86, 13·14 and 104; 3100 and 215; and 3089. Mean percentages of calories from fat, carbohydrate and protein, respectively, were, for the first, 34·7, 53·8 and 11·6 and, for the second subject, 35·2, 51·9 and 12·8.

Statistical analyses were made by methods to be described later (Church and Lipton, *Brit. J. Nutrition*, 1956, in the press). In the first survey standard errors for the means were between 8 and 15 per cent. except for vitamins A and C, 24 per cent., and vitamin D, 75 per cent.; in the second they were between 7 and 17 per cent. except for vitamin D, 76 per cent. The analyses showed also that an estimate obtained from a number of 1-week periods systematically distributed over a year was more accurate than one from a single sampling period of the same duration. An estimate of intake of a nutrient with a standard error of 5 per cent. would be provided by three 1-week periods at intervals of 4 months or by two 2-week periods with an interval of 6 months; a single period of as long as 12 weeks would not provide so accurate an estimate.—D. Harvey.

2249

MINISTRY OF FOOD. **Domestic food consumption and expenditure, 1953. Annual report of the National Food Survey Committee.** H.M.S.O., London, 1955, pp. 104. Price 4s. net.

For the 1952 report see Abst. 1081, Vol. 25. As additional features the present one includes a section on Scottish diets and a discussion of the difftences between urban and rural households. The total number of households was 11,395 and of persons 36,756.

During the year restrictions became fewer and the amount of meat eaten increased at the expense of fish. There were increases also in amounts of cheese, eggs, butter, sugar and fruit, but the amounts of cereal products and potatoes were less than in 1952.

The total value of consumption was 23s. 7d. and expenditure on food was 22s. 8d. per head weekly. The increase of 2s. 1d. over the 1952 amount was almost all on carcase meat, eggs, butter, tea, bacon and sugar. The use of white as distinct from national bread was small. Changes in and the final cessation of rationing of sugar were followed by an increase to 13·57 oz. per head weekly from the level of 11·00 oz. in 1952. There were, in general, increases also in nutrients over the 1952 amounts, except for Ca and vitamin C, which did not alter, and for vitamin D, which fell. Against the British Medical Association standards, intakes were adequate. There was a small reduction of energy from protein and carbohydrate and a slight increase of that from fat. Sweets, at 8·1 oz. per head weekly, provided 150 Cal. daily. Persons in rural households were 21·6 per cent. of the total. They differed from the urban group in eating more bread and flour, milk, cheese, eggs, fresh green vegetables and preserves, less potatoes and other vegetables and much less fish. Their intakes of Ca, carbohydrate and vegetable protein were greater because of these larger amounts of bread and flour.

After a re-assessment of incomes new levels were chosen for the social classes, Class A over £15, Class B £9 to £15, Class C £6 to £9 and Class D under £6. With these new grades the proportions of the population in the groups were 6, 23, 40 and 31 per cent. and the values of consumption 28s.

7d., 24s. 4d., 23s. 1d. and 22s. 9d., respectively. For the Old Age Pensioner (OAP) group it was 21s. 6d. Levels of nutrients were lowest in many cases in Class C in which the proportion of children was highest. Except for Fe in the diet of the OAP group all intakes exceeded 95 per cent. of the recommended amounts.

Family composition was much more important than social class in deciding type of diet. More was spent on food than in 1952, the average being 62s. 9d. for a household of 2 adults, both under 55 years of age and without children; the amount for the addition of each child was 8s. 6d. Least satisfactory were the diets in households with 3 or more children or with adolescents and children; such households tended to rely more than in previous years on welfare and school schemes for their milk supplies.

The analysis of Scottish data was for 1172 households with 4186 persons and an average weekly expenditure of 22s. 3d. per head. In comparison with the rest of the country the extreme differences in foods were for cakes and pastries 50 per cent. more eaten and for fresh green vegetables 66 per cent. less, but, on the average, deviations from recommended amounts of nutrients were similar to those found for Britain as a whole.—D. Harvey.

2250

[Ministerie Landbouw, Visserij en Voedselvoorziening]. De voeding in Nederland. [**Diet in The Netherlands.**] *Voeding*, 1955, **16**, 900–923. English summary.

Diet here means consumption estimated as closely as may be from statistics of supplies entering trade with estimates for consumption by self-suppliers. Pre-war data for 1936–38 have been revised and re-computed on the same basis as post-war and estimates for riboflavin and nicotinic acid have been added. The data in terms of foods, gross and per head, and of energy, protein (animal and plant), fat, carbohydrate, Ca, P, Fe, vitamin A, carotene, vitamin B_1, riboflavin, nicotinic acid and ascorbic acid are presented in 19 tables, covering the average for 1936–38 and the years 1947 to 1954 separately. Compared with 1936–38 the supplies of energy, animal protein, Ca, vitamin A and riboflavin have increased; that of nicotinic acid has fallen slightly. The rise in fat is explained as increase in consumption of margarine and that in vitamin A as the result of compulsory addition to margarine. Improved milk supply explains the rises in Ca and riboflavin.—I. Leitch.

2251

Mulder, T. Uitkomsten Nationaal Budgetonderzoek 1951. [**Results of the National Budget Survey, 1951.**] *Voeding*, 1955, **16**, 880–884.

Brief accounts are given of the expenditures on foods in certain general groups and amounts purchased of these foods by manual workers, analysed by income and size of family; expenditure of middle-class industrial and clerical workers, by place of residence and size of family, and expenditure and purchases of professional workers, by income and size of family; expenditure of families with pensioned members, by income and residence; consumption of families on relief and pensioned. The amounts of self-supplied foods are shown separately. See also Abst. 4043, Vol. 25.

I. Leitch.

2252

Swaak, A. J. Onderzoek naar de voeding en voedingsgewoonten bij meisjes van 14–23 jaar in Maastricht en omgeving. [**Diet and dietary habits of girls from 14 to 23 years old in Maastricht and district.**] *Voeding*, 1955, **16**, 956–976. [Gemeent. Geneesk. Dienst, Maastricht.] English summary.

The subjects were 233 girls of whom 105 were students at a school of domestic science, 50 factory girls, 39 office girls of whom 5 were shop assistants, and 39 in diverse occupations. The study was made by the students. A daily record was kept of food eaten for a week and during that week the girls were weighed and measured, Hb was estimated and age at menarche recorded. For the students, a more detailed clinical examination was made for "subclinical signs of deficiency". The results are presented in detail, the clinical signs "with much reserve", with an analysis of eating habits.

Menus were analysed in terms of the standards set up by Dols and den Hartog (Abst. 1022, Vol. 24) and were sub-standard in milk, milk products and vegetables. Diets were correspondingly low in carbohydrate, Ca, vitamin B_1, riboflavin and nicotinic acid. By the Sahli method 18 per cent. of the factory girls were judged anaemic, with Hb below 12·5 g. per 100 ml., but on the average Fe intake was adequate. Office girls were taller and heavier than factory girls. The signs of deficiency included bad teeth, folliculosis, gingivitis, dry hair and abnormalities of the tongue.—I. Leitch.

2253

Freiberg, D. Lebensstandard und Ernährung. [**Standard of living and diet.**] *Lebensmittel u. Ernährung*, 1955, **8**, No. 10, 7–8.

This article is mainly a resumé of a study of food consumption in 4 large cities of the United States in 1949 [reference not given but apparently to work in Abst. 5510, Vol. 25] but includes a statement based on preliminary findings of a study of household budgets in Austria in 1954 that about half the money goes for food, from 47·6 per cent. in Vienna to 55·9 per cent. in Feldkirch.—W. M. Deans.

2254

WOODHILL, J. M., VAN DEN BERG, A. S., BURKE, B. S. and STARE, F. J. **Nutrition studies of pregnant Australian women.** *Amer. J. Obstet. Gynecol.*, 1955, **70**, 987–1003. [Dept. Maternal and Child Health, Harvard Sch. Pub. Health, Boston, Mass.]

The first part deals with the occurrence of toxaemia and the condition of their infants among 52 primigravidae and 134 multigravidae attending the antenatal clinic of a Sydney hospital. " Cases were selected for interview on the basis of obstetrical examination that gave no indication of abnormality ", but a history of pre-eclampsia was not a cause of exclusion. Most of the husbands earned more than the current basic minimum wage. Diet histories relating to the pre-pregnant period and to the first and second halves of pregnancy were obtained, analysed and evaluated by the Burke procedures; they have already been reported in Abst. 2132, Vol. 23. On the average, 61 women had excellent or good, 62 had fair and 52 had poor or very poor diets. In 11 cases the diets could not be evaluated for all 3 periods owing to abortion or vomiting. The incidence of toxaemia ranged from 42 per cent. in women with very poor diets to 5·6 per cent. in those with excellent diets. The incidence was high in obese women, but no relation could be demonstrated to excessive weight gain during pregnancy. The incidence of prematurity increased as diets during pregnancy became worse, but there was no relation to pre-pregnant diets; similarly, average birthweights were related to the diet ratings.

The second part deals with the lactations of the same women. The better the average diet, the greater the proportion of women who succeeded in breast feeding for any given period. Early weaning was associated with obesity before pregnancy but not with excessive weight gain during pregnancy.—A. M. Thomson.

2255

DUBAR, I. G. **Analysis of food dollar in a children's home.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 1147–1149. [Texas Sch. for the Blind, Austin.]

A 7-day survey by the inventory method was made of food consumed in 6 cottages housing 173 blind children. Intakes of food groups, their proportionate costs and contributions of nutrients are shown.—F. C. Aitken.

2256

WARNICK, K. P., BRING, S. V. and WOODS, E. **Nutritional status of adolescent Idaho children. 2. Food habits.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 1143–1146. [Dept. Home Econ. Res., Univ. Idaho, Moscow.]

The results of a diet survey, previously analysed in terms of nutrients (Abst. 5505, Vol. 25) are presented in terms of food groups. Meal patterns and daily consumption are shown.—F. C. Aitken.

2257

ODLAND, L. M., PAGE, L. and GUILD, L. P. **Nutrient intakes and food habits of Montana students.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 1134–1142. [Dept. Home Econ. Res., Montana Agric. Exp. Stat., Bozeman.]

Studies were made of diet and food habits of 418 students born and reared in Montana and in good health; 221 aged 15 years were from the Bozeman and Great Falls area; 197 aged from 16 to 28 years were from other localities in the state. Data were obtained over a year on the foods generally consumed and details were recorded over a 7-day period of the foods actually eaten.

The mean daily intakes by all the women students, 111 in the first and 100 in the second group, exceeded two-thirds of the amounts recommended by the U.S. National Research Council (Abst. 3538, Vol. 24); for men the intakes generally exceeded the recommended amounts. Within sex groups there were only minor differences in average intake between the adolescent and the older students. The adolescents in the 2 areas consumed diets similar in composition except for ascorbic acid content, the intake of which was related to seasonal variation in fruit supplies. Of the women, 78 per cent. ate diets which provided less than two-thirds of the allowance of one or more nutrients; one-third had diets below this level in only one nutrient, namely, Fe, Ca or ascorbic acid; if two or more nutrients were below two-thirds of the recommended amounts the common deficiencies were of Ca in combination with Fe, vitamin B_1, riboflavin and/or ascorbic acid. Of the men, about 40 per cent. had less than two-thirds of the amounts of one or more of the recommended nutrients; half had diets low in only one nutrient, usually ascorbic acid; in diets in which more than one nutrient was low in amount the deficiencies were generally of Ca and energy, vitamin B_1, riboflavin and/or ascorbic acid.

The students ate relatively small amounts of leafy, green, and yellow vegetables, tomatoes and citrus fruit, eggs, potatoes and sweet potatoes and relatively large amounts of meat, fish, poultry and other fruits and vegetables. Forty per cent. of the breakfasts of men and 30 per cent. of those of women students were adequate, as judged by inclusion of a fruit, a cereal and an animal protein food. There was a direct relation between the number of such breakfasts and the number of subjects for whom the mean daily nutrient intake provided at least two-thirds of the recommended allowance of any nutrient.—G. F. Garton.

2258

FLOCH, H. and LECUILLER, A. Enquête sur la consommation alimentaire réelle et la valeur alimentaire de la ration guyanaise. [**Inquiry on actual food consumption and the food value of the diet in Guiana.**] 2. Discussion. [**2. Discussion.**] 3. Analyses de produits alimentaires guyanais. [**3. Analyses of food products of Guiana.**] *Arch. Inst. Pasteur Guyane Publ.* No. 277, January 1953, pp. 10; *Publ.* No. 285, June 1953, pp. 8; *Publ.* No. 286, June 1953, pp. 6.

1. The mean values for each of 100 diet studies in orphanages, a barracks and family homes are tabulated in terms of animal and vegetable proteins, animal and vegetable fats, carbohydrates and energy, together with the ratios of some of these. The number of persons concerned was 914, 512 adults and 402 children. The conclusions were that for about 40 per cent. of them the intake of energy and for from 45 to 50 per cent. the intake of food from animal sources was low.

2. The foodstuffs which the survey showed to be in use are listed and specimen menus for the 3 meals in a day are given. Prices for fresh vegetables are quoted in explanation of the small extent to which they are used.

3. Brief descriptions of some of the foods are given with data for energy-yielding and ash constituents of 13 and for vitamin C content of 26. (See also Absts. 1819, 1820, Vol. 26.)—D. Harvey.

2259

STRAUSS, W. (with SHATAN-HERZBERG, M., RIM, J. and ZAITSCHEK, D. V.) **A preliminary investigation into the food habits of Oriental Jewish communities with special reference to the changes enforced by immigration to Israel.** June 1955, pp. 19. [Dept. Hyg., Hebrew Univ. Med. Sch., Jerusalem.]

By the interview method information was obtained from 42 families who had lived in Israel for at least 3 years; their countries of origin and numbers were Iraq 11, Morocco 12, Yemen 9 and Aden 10. Menus for week-days and sabbath are fully described. The particular problems facing the separate groups were that the range of foods was narrower than in Iraq, cooking oil was scarcer than in Morocco, spices and peppers were in even greater demand and were more expensive than in Yemen; in contrast, the Aden community, which continues to receive parcels of food from its source, has become better adapted to the new conditions.

It is recommended that measurements of height, weight and Hb of some or all immigrants should be made at the time of arrival, that teaching of nutrition should reach a greater proportion of the immigrant housewives, that supplies of certain habitual foods such as rice, vegetables and spices be increased and the use of fresh milk encouraged.—D. Harvey.

2260

CHAUDHURI, S. **Haematological indices in an average Indian population and their correlation to the nutritive states and plasma proteins.** *J. Trop. Med. Hyg.*, 1955, **58**, 264–269. [Haematol. Res. Lab., Safdar Jang Annexe Hosp., New Delhi.]

The subjects, numbering 450, were in 4 groups with subdivisions and, in brackets, numbers as follows: (1) from the better classes, women, nursing and medical students (156), and men, clerks or orderlies in civil (15) and in military (20) hospitals; (2) children, urban in age groups 0 to 1, 1 to 4, 5 to 8 and 9 to 14 years (20, 7, 23, 30) and rural in the same age groups (0, 10, 5, 7); (3) pregnant women at a maternity centre in the town (25) and in the country (26); (4) families, urban (35 adults), rural (58 adults) and in slums on the city boundary (13 adults). Individual dietary surveys were made for subjects in the first 3 groups except for the babies under 1 year who were breast fed; for the families in group 4 a mean value for intake was calculated from the total intake of food. Blood samples were from a vein during fasting. The following data are tabulated: daily intakes of foods per head for group 4 families, ranges and means for intakes of protein, carbohydrate, fat and energy for rural and slum families and for subjects in group 3, means for daily intakes of energy and protein, bodyweight, total protein, albumin and globulin in plasma and red cell count, Hb, haematocrit, mean cell volume and mean corpuscular Hb concentration for each group as subdivided.

The main findings were: protein and energy were low in all diets other than those of military hospital staff; protein from animal sources was small in amount; a direct relation seemed to exist between diet and plasma proteins, especially albumin; a sex difference in favour of males was noted for intakes of energy and protein, level of plasma protein, red cell count, Hb and haematocrit; even when total protein in plasma was normal, albumin tended to be below and globulin above "accepted textbook normals for adults".

D. Harvey.

2261

SHARMA, D. C. **Mother, child and nutrition.** *J. Trop. Pediat.*, 1955, **1**, 47–53. [Devi's Child. Clin., Mandala, Burma.]

The conclusions are based on a clinical and field study. Burma is self-sufficient in food supply but, among the masses and particularly the Burmese, malnutrition is very frequent because of food prejudices and superstition. Prejudice is especially strong during pregnancy and lactation, when the

diet of the Burmese women is mainly of polished rice with very small amounts of fish and oil and occasionally small helpings of mutton or pulses; for various reasons, eggs, milk, sugar, vegetables and fruit are excluded. In the villages and among the poorer classes in the towns beriberi is common among Burmese women and infants but is not seen in the other races. In the mothers it is normally of the dry type and of gradual onset. In the infants signs appear often as early as the third or fourth week of life and death may be sudden. In one family several children may have been lost at an early age. Vitamin B_1 given by injection generally cures both mothers and infants and change to a suitable diet allows the mother to continue breast feeding with excellent results. Cases are quoted in illustration.—L. Wills.

2262

INTENGAN, C. L., DEL ROSARIO, I., ARZAGA, V. L., CONCEPCION, I., SALUD, R. D. and MANALO, J. D. **Nutritional evaluation of meals served in government institutions by chemical methods.** *Philippine J. Sci.*, 1954, **83**, 177–186. [Foods and Nutrit. Biochem. Lab., Inst. Nutrit., Manila.]

A survey was made of the diets served in 9 government institutions to children, convalescents, moderately active adults and very active adults. A tray was selected at random for each of the 3 meals for 3 mid-week days. Snacks and drinks between meals were included. In all, 144 meals were analysed. Rice was the basis of the diets. Values for nutrients including carotene were obtained by analysis; those for vitamin A were from food tables. Intakes were compared with the daily allowances recommended by the National Research Council of the Philippines as modified by the Institute of Nutrition. The amounts of vitamin B_1, vitamin C and Ca tended to be inadequate, but vitamin A and riboflavin were the nutrients which most often were truly insufficient. Increased consumption is recommended of foods rich in vitamin C, green and yellow vegetables, nuts and seeds, and enriched rice.—E. M. Hume.

See also Absts. 1880, 2236.

GENERAL STUDIES: DIET PLANNING: EDUCATION

2263

BROWE, J. H. **Evaluation of a nutrition program.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 895–897. [Bur. Nutrit., New York State Dept. Health, Albany.]

2264

FACHMANN, W., HAHN, E., KRAUT, H., MELLINGHOFF, K., OBERDISSE, K., SOUCI, S. W., WIRTHS, W. and ZACHARIAS, R. Berichte über Studienreisen im Rahmen der Auslandshilfe der USA. Mehr Wissen um Ernährung. [**Reports of study journeys under the auspices of the Foreign Aid Program of the U.S.A. More knowledge about nutrition.**] *AID, Land- u. Hauswirtschaft. Auswertungs- u. Informationsdienst*, 1955, No. 74, pp. 118. [Verlag Kommentator G.m.b.H., Frankfurt a.M.]

The first 90 pages of this report, compiled by Professor Kraut and Dr. Wirths of the *Max Planck Institut für Arbeitsphysiologie*, describe, with illustrations, food and nutrition arrangements in the United States as seen by the 8 Germans in a party of 28 from 8 European countries during a 3-months' tour under the auspices of the Foreign Aid Program in the spring of 1953. The itinerary extended from Washington, D.C., Philadelphia and several other places in Pennsylvania to Chicago and as far west as Minneapolis and St. Paul, Rochester, Minn., and Kansas City, Mo. After a brief sketch of agriculture in the U.S., successive chapters deal with the transfer of foods from producer to consumer, eating habits in the home and outside, with tables of foods consumed annually per head, nutrition surveys, school lunches, hospital feeding, and measures to improve nutrition still further by research, education of schoolchildren and the general public, and special plans for vulnerable groups of the population.

In the rest of the report, proposals inspired by experiences in the U.S. for improving nutrition in the different economic, psychological and educational conditions of West Germany are set forth and discussed. These include the following: increasing the consumption of fruit and fruit juices; increasing the amount of milk drunk, which would necessitate improving its quality; improving the food in hospitals, convalescent homes and communal feeding places; trials of the cafeteria system; improved food laws and market information; instruction in nutrition in schools of all kinds, and for teachers in training and medical and other students; dietitians' training to be extended to cover large-scale catering for the healthy; training of nutrition advisers; instruction of the healthy adult; provision of milk and perhaps fruit in schools; special measures for vulnerable groups, including the elderly; establishment of diet clinics in hospitals; medical support for the existing lay society of diabetics; establishment of metabolic clinics; bringing up to date of tables of food composition and methods of analysis; coordination of nutrition research with that of other countries, by exchange of literature and otherwise, and finally, formation of a non-official German Nutrition Society (since achieved).—W. M. Deans.

2265

DE CASTRO, J., BARBOSA, J. J. and SANTOS, W. Relatório do Brasil à 3.ª Conferência Latino-Americana de Nutrição 1953. [**Report on Brazil to the 3rd Latin-American Conference on Nutrition 1953.**] *Arq. brasil. Nutrição*, 1954, **10**, 9–43.

The problems of undernutrition and malnutrition in Brazil have been aggravated by a rapid development of industry at the expense of agriculture, and by concentration of the population in the industrial areas. The government recognises that the poor health of the people has a socio-economic origin, and it has taken vigorous steps to improve the situation.

Measures in force are described. Mechanisation of agriculture, increased production of food from the land and improvement of stock are given every assistance and encouragement, and finance for agricultural development by co-operation has been organised. Production and distribution of food are controlled.

Committees on nutrition have been formed which, after detailed investigation of the state of nutrition and health of the people, have set up canteens and restaurants for workers and students. School lunches are given in an increasing number of places. Foods are enriched with iron to combat the widespread anaemia, and iodised salt in areas of endemic goitre. Special consideration is given in the nutrition programme to pregnant women and to children. Medical examinations of many classes of the population are made, and treatment is given for specific illnesses when necessary.

A scheme is now in operation for training the social workers, technicians and scientists needed to extend the work.—T. D. Bell.

2266

FLOCH, H. Étude du problème de l'alimentation en Guyane française. [**Study of the problem of diet in French Guiana.**] *Arch. Inst. Pasteur Guyane Publ.* No. 298, October, 1953, pp. 7.

The population and resources of French Guiana are briefly summarised. Foodstuffs of animal origin are scarce; fresh milk is almost unobtainable. The principal vegetable foods are dried legumes, rice and "couac", a preparation from *Jatropha manihot*; the common fruit is banana, and few others are cultivated. Reference is made to diet studies and to the administration of yeast to children. (See Absts. 2239, 2258, Vol. 26.)

D. Harvey.

2267

FLOCH, H. and GÉLARD, A. Sur quelques points touchant l'alimentation-nutrition en Guyane française ayant des possibilités d'amélioration rapide. [**Some points on feeding and nutrition in French Guiana where there are possibilities of rapid improvement.**] *Arch. Inst. Pasteur Guyane franç. Publ.* No. 358, April 1955, pp. 6.

Three possible lines of action are considered: (1) cultivation of the round cherry, *Malpighia punicifolia*, as a source of vitamin C, of the palm *Astrocaryum vulgare* for carotene and of the guava for carotene, nicotinic acid and vitamin C; (2) encouragement of the growing of fresh green vegetables, in which difficulties are mainly cultural and result from erosion, heavy rainfall or pests such as the ant (*Atta sexdens*) or crickets; (3) development of a fishing industry, for the products of which transport markets would need to be organised. (See also preceding Abstract.)—D. Harvey.

2268

DAVIES, J. N. P. Nutrition et recherches en nutrition en Afrique Orientale anglaise. [**Nutrition and nutritional research in British East Africa.**] *Méd. trop.*, 1955, **15**, 561–566. [Med. Sch., Makerere Coll., Kampala, Uganda.]

A review.

2269

LANGER, A. and HENSHAW, P. S. **The interacting effects of public health, fertility behaviour and general economy on standards of living. 2. Qualitative evaluation of factors responsible for conditions in countries with similar situations.** *Amer. J. Med. Sci.*, 1955, **230**, 484–490; 519. [Nat. Committee on Maternal Health, Inc., 2 East 103rd St., New York 29.]

Interlingua summary.

Birth rate, death rate and other basic data as well as calculated indices of total fertility, population pressure, degree of economic development and the "situation index" defined earlier (Abst. 965, Vol. 26) are grouped into 5 ranges and tabulated for 70 countries. In a second table, countries are graded according to the severity of their problems of total fertility, population pressure and economic development. This reveals the particular conditions responsible for a high overall "situation index" and enables prediction of the probable ultimate effect on standard of living of, *e.g.*, health measures, though the accuracy of such predictions of course cannot exceed that of the basic data or the assumptions made.—W. M. Deans.

2270

KEYS, A., ANDERSON, J. T. and BROZEK, J. **Weight gain from simple overeating. 1. Character of the tissue gained.** *Metabolism*, 1955, **4**, 427–432. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

Twenty men were induced to overeat for 6 months with constant activity. Mean weight gain was 10·6 kg. The tissue mass gained was

estimated to be 13 to 15 per cent. extracellular fluid, 61 to 64 per cent. fat, 0 to 1 per cent. glycogen and the remainder cells. The composition of the tissue was independent of the weight gained over the range 2·5 to 22·3 kg. The percentage of cells was lower, and that of fat higher, than was previously estimated in tissue gained by men re-fed after prolonged severe undernutrition.

F. C. Aitken.

2271

GÉNIN, G. Le lait et l'industrie laitière dans le monde. [**Milk and the world milk industry.**] *Lait*, 1955, **35**, 514–520.

2272

PACI, C. Latte e riso binomio perfetto. [**Milk and rice : a perfect pair.**] *Riv. Zootec.*, 1955, **28**, 255–259.

Rice and milk are complementary, the one supplying essential amino-acids and vitamins which the other lacks ; together they are almost a complete food. Unfortunately the production and distribution of neither is controlled, and more often than not they appear on the market in poor quality. This is one reason for their lack of popularity and, in the circumstances, propaganda to increase consumption of either is useless. Essential to increased consumption are an all-round improvement in quality, some reduction in price and education in milling, use and cooking of rice.

T. D. Bell.

2273

MOQUAY, M. Utilisation alimentaire de la couenne. [**Alimentary uses of pork rind.**] *Thesis, Paris*, 1954, pp. 58.

Analytical data are given for the composition of pork rind and for the moisture it takes up when cooked. The nutritive value was studied with groups of rats. When added in its crude form and containing from 16 to 20 per cent. fat, pork rind improved the rate of growth over that of a group of rats on the basal diet of cereals. When, after extraction of the fat, it was included at a high level in their diet, the rats lost weight rapidly in the same way as has been reported for rats given an incomplete protein such as gelatine.

The preparation of jellies from pork rind and the methods and legal control of the use of the rind itself in the pork butchery trade are described and discussed.—D. Harvey.

2274

SERGENT, G. Une solution immédiate à la malnutrition de l'Africain : la récupération du sang de boeuf. [**An immediate solution for the malnutrition of the African : recovery of ox blood.**] *Bull. Acad. vét.*, 1955, **28**, 183–187 (with discussion 187–188). [Centre Prélèvements Biol., Paris.]

It is calculated that about 2,500,000 litres of ox plasma could be collected annually from slaughterhouses in Paris alone. Dried or fresh plasma and red cells have been eaten in many ways in European diets in times of stress. The food value of blood products, especially as sources of protein, is high. The preparation of dehydrated products for export to Africa is suggested as a means of combating the lack of protein prevalent in French African territories.—A. M. Copping.

2275

FRANKE, K. Sport und neuzeitliche Ernährungspraxis. [**Sport and modern nutrition practice.**] *Deutsch. med. Wochenschr.*, 1955, **80**, 1813–1814. [Bad Lauterberg.]

After a discussion of the needs of different types of athletes, the following recommendations are made : not too much to eat, and especially not too much fat ; part replacement of meat by milk products (curds, cheese, milk beverages and sour milk) and whole grain cereals ; fruit and salads instead of soup ; fat mainly as butter or as vegetable oils or high-grade margarine containing the essential unsaturated fatty acids ; mild herb or yeast flavourings rather than too much salt and pepper ; and for young people, fruit juice and milk beverages instead of tobacco, alcohol, coffee and kola.—W. M. Deans.

2276

FILHO, W. L. Rações de campanha e de reserva na aeronáutica. [**Field and reserve rations in the Air Force.**] *Arq. brasil. Nutrição*, 1954, **10**, 207–224.

There is a discussion of the research and experience of the U.S. Air Force, during and since the second world war, in planning rations suitable in both composition and form for the needs of flyers. On the basis of that information 3 types of ration have been prepared for the Brazilian Air Force. One is a package providing about 500 Cal. in the form of vitamin chocolate, chewing-gum and sweets and designed to maintain efficiency during short operations. The second, of which there are 5 variants, is a packed meal for longer bombing or patrol missions ; it contains a meat dish, sweets, biscuits and materials for preparing coffee, and provides about 1200 Cal. The third is an emergency ration in concentrated form and supplies 500 Cal. ; with it are packed Dramamine, cigarettes, matches and a water distiller.

D. Duncan.

2277

BELLOMO, A. Considerazioni sull'alimentazione nella vecchiaia. [**Considerations on diet in old age.**] *Acta gerontol.*, 1955, **5**, 250–255. [Div. Med. Geriat., Osp. Maggiore, Turin.] French and English summaries.

A plea for commonsense in the application of theoretical considerations to the diet of the elderly. Too rigid adherence to principles suggested by experimental work, *e.g.*, restriction of animal protein, bread and eggs in subjects with a tendency to high blood pressure, may lead to deficient and unattractive diets which will not promote wellbeing. The fixed habits of a lifetime must be considered also, and it is seldom necessary to forbid moderate use of alcohol or coffee.

D. Duncan.

FOOD ECONOMICS AND STATISTICS

2278

GACHOT, H. Die Entwicklung der Süssmostindustrie. [**The development of the fruit juice industry.**] *Lebensmittel u. Ernährung*, 1955, **8**, No. 9, 10. [Strasbourg.]

The rapid growth of the fruit juice industry in the last 30 years is illustrated by statistics from Switzerland (apple and grape juices) and the United States (frozen concentrated orange juice).

W. M. Deans.

See also Absts. 2250, 2255.

DIET IN ETIOLOGY OF DISEASE

METHODS OF ASSESSING STATE OF HEALTH

2279

HAMMOND, W. H. **Measurement and interpretation of subcutaneous fat, with norms for children and young adult males.** *Brit. J. Prev. Social Med.*, 1955, **9**, 201–211. [Minist. Health, London.]

Skin-fold thickness was measured with the Medical Research Council callipers and also with the modified Franzen callipers (Abst. 5545, Vol. 25). Joint trials were made by 3 observers to ensure that their standards were comparable. The subjects, just over 4500 in number, were in 6 groups including ages from infants to adult women, different social classes and a group of debilitated children.

Measurements from 16 different sites were well correlated; correlations between single sites and total fat were of the order 0·8 to 0·9; 2 sites usually gave multiple correlations of the order of 0·95, and 3 sites 0·97 or better.

Sub-scapular and abdominal measurements followed by biceps and either sub-costal or supra-iliac measurements gave the best indication of total fat. In 2 studies on children the changes at 5 or 6 different sites were followed for 24 months. It was found to be more important in such studies to use several sites. The 6 sites finally selected were biceps, triceps, sub-scapular, supra-iliac, subcostal and abdominal (umbilical region).

Age trends at the different sites are tabulated for both sexes and ages from 2 years upwards. In girls there was a slight decrease in fat on all sites from 2 to about 5 years, then a continuous increase to 15 years, when the data stop. In boys the trunk fat decreased from 2 to 7 years, then increased rapidly to 11 years and more slowly to 17. The arm fat in boys decreased until 8 years, rose slowly to 11 and then fell, first slowly and then steeply, to 18 years of age.

A scatter diagram shows the relation between calliper measurements and measurements of subcutaneous fat thickness from X-ray photographs. Correlations were from 0·82 to 0·90, depending on site and sex.

Mean measurements for different nutritional and social groups descended from good to poor nutrition and from high to low social class, but there was no social gradient in body fat comparable with those in height and weight.—D. Duncan.

GENERAL STUDIES

2280

ANDERSON, G. W. and NESBITT, R. E. L. (Jr.) **The clinical and pathologic aspects of premature perinatal death.** *Bull. Johns Hopkins Hosp.*, 1955, **97**, 113–135. [Dept. Obstet., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

2281

SHARMA, N. L. **Infant feeding, diarrhoea and malnutrition.** *J. Trop. Pediat.*, 1955, **1**, 117–119. [All-India Inst. Hyg. Pub. Health, Calcutta.]

2282

KULIN, L. Systematik der Ernährungsstörungen im Säuglingsalter. [**Classification of nutritional disturbances in infancy.**] *Ztschr. Kinderheilk.*, 1955, **77**, 201–207. [Kinderklin., Univ. Debrecen.]

2283

GRUNDLER, E. Beobachtungen bei der sogenannten alimentären Intoxikation des Säuglings. **[So-called alimentary intoxication in infants.]** *Ztschr. Kinderheilk.*, 1955, **77**, 37–47. [Kinderklin., Univ. Tübingen.]

Clinical and biochemical observations made in the years 1949 to 1953 on 320 infants with so-called alimentary intoxication are discussed. About half the infants failed to show all the classical signs of the disorder, but a low alkali reserve in the blood serum (below 30 vol. per cent.) was almost invariably found, and this is considered the most reliable diagnostic sign. In a few, low blood chloride was found instead, in others it was high or normal; these differences were not related to diarrhoea and vomiting or to the origin of the disorder, which was parenteral in 74, digestive disturbance at weaning in 29 and enteral infection in 211, the other 6 being premature infants with severe *icterus neonatorum*. Of the 211 with disorder originating in the digestive tract, 80 were already marasmic and 34 others were premature. Of the 320, 264, over 80 per cent., were under 3 months of age. In contrast to former times, there was no distinct peak of incidence in the summer months. Deaths in the first 36 hr. are diminishing owing to the use of antibiotics, especially chloromycetin.—W. M. Deans.

2284

INDIAN COUNCIL OF MEDICAL RESEARCH, THE LIVER DISEASES SUB-COMMITTEE. **Infantile cirrhosis of the liver in India. (Synonym. Infantile biliary cirrhosis.)** *Indian J. Med. Res.*, 1955, **43**, 723–750.

A review.

2285

PARKER, W. S., PRADER, A. and FANCONI, G. **Further observations on cystine storage disease.** *Pediatrics*, 1955, **16**, 228–238. [Kinderspital, Univ. Zürich.]

Two cases of the disease in infants are described.

2286

WUNDERLICH, C. Zur Frage cerebraler Schäden infolge Atrophie im Säuglingsalter. **[The problem of brain damage as the result of marasmus in infancy.]** *Ann. paediat.*, 1955, **185**, 193–211. [Kinderklin., Univ. Mainz.] English and French summaries.

This is an amplification of a paper given at the *Deutscher Kinderärztekongress*, Essen, 1954 (see *Mschr. Kinderheilk.*, 1955, **103**, 167), a follow-up study at 4 years of 56 [or 54] marasmic infants. Excluded were children with birthweight under 2500 g., those with suspected congenital or acquired brain damage, those with some underlying disorder, *e.g.*, fibrosis of the pancreas, and those in whom marasmus had followed acute intoxication. It was found that subsequent development depended less on the degree of duration of marasmus than on its causes and in particular on the goodness or badness of the economic and psychological environment. The 36 with a good background had more than caught up in height, but not the 18 with a poor background, though in weight for height they were not inferior. The former group walked and talked earlier and did better in the Bühler Hetzer mental test. The marasmic children with a poor background generally showed signs of neglect and poor feeding (either prolonged underfeeding, or senseless overfeeding, or dietary errors); many had had no vegetables or fruit for months or even years. Signs of vitamin C deficiency and rickets were common. Since these conditions were frequently found again at the follow-up, it was thought that they had more to do with the poor development of these children than the actual marasmus. Familial mental defect or disorder was not uncommon. Among children with a good background, marasmus generally resulted from other illness and although 8 of them showed brain disorder either at the outset or at follow-up, in at least 2 of these the connection with marasmus was not clear.

Findings for marasmic children do not necessarily apply to adults who have had hunger dystrophy.—W. M. Deans.

2287

VERZÁR, F. **Nutrition as a factor against addiction.** *Amer. J. Clin. Nutrit.*, 1955, **3**, 363–374. [Physiol. Lab., Univ. Basle.]

2288

HARTWICH, A. Ist unsere Ernährung gefährlich? **[Is our food dangerous?]** *Lebensmittel u. Ernährung*, 1955, **8**, No. 11, 6–7.

A resumé of a lecture by Professor L. Schönbauer on experiments showing that, contrary to popular fears, *Wiener Schnitzel*, crusts of bread and smoked meat do not contain carcinogenic hydrocarbons.

W. M. Deans.

2289

ZUIDEMA, P. J. **Calcification and cirrhosis of the pancreas in patients with deficient nutrition.** *Doc. Med. geogr. trop.*, 1955, **7**, 229–251. [Bethesda Hosp. and Internal Dept., Gadjah Mada Univ., Jogjakarta, Indonesia.]

A comprehensive review of the literature is given. In the cases previously reported, largely European or American, pancreatic lithiasis has been a disease chiefly of middle-aged males and thought to be a late complication of chronic

pancreatitis. Pain is a constant feature, and often there is a history of alcoholism. Steatorrhoea occurs in about 25 per cent. and diabetes mellitus in from 25 to 40 per cent., the latter being a late complication.

In the present study 7 patients, 4 male and 3 female, were aged from 15 to 28 years. Six, all seen in 1 year, attended as severe cases of diabetes. All of them were undernourished, none complained of abdominal pain, none gave a history of alcoholism and there was no suggestion of earlier pancreatitis; steatorrhoea and undigested muscle fibres were absent. In 2 patients the parotid glands were greatly enlarged. In some the diabetes was insulin-resistant. The patient who did not have diabetes complained of severe pain in the epigastrium and right upper abdomen. X-ray examination showed displacement of the duodenal loop and a large deposit of calcium towards its centre. Pancreatic calcification, which was generally disseminated, was diagnosed by X-ray examination in all but one patient, in whom it was found later at post-mortem examination; it was then established that the calcification was associated with marked fibrosis and early cirrhosis of the liver with fatty infiltration. Other diabetic patients with similar histories and general undernutrition were admitted, but X-ray examination did not reveal calcification of the pancreas. In samples of duodenal juice from 3 patients with and 6 without calcification the enzyme concentration was, in general, low.

These cases differ so markedly from those previously reported that the etiology is almost certainly distinct. The occurrence of the same picture in patients with no evidence of calcification and in others with varying degrees of calcification suggests that the process is terminal to some other condition, probably interstitial fibrosis associated with changes in the parenchyma. The patients came from low economic and social groups and the nature of their diet, low in energy and in animal protein, suggests that protein deficiency was important etiologically. The presence of signs of malnutrition in most of the patients, and the known relation between protein deficiency and pancreatic damage in kwashiorkor, support the theory of a dietary origin.—L. Wills.

2290

SUBRAHMANYESWARA RAO, T. T. V. **The health and related conditions of the students of two colleges in Masulipatam.** *J. Indian Med. Assoc.*, 1955, **25,** 446–450. [Hindu Coll., Masulipatam.]

The records of routine examinations of 9038 students made by the author since 1949 are summarised in respect of caste, parent's occupation, economic status, feeding habits, age, weight, height, chest circumference at inspiration and expiration, and incidence of disease.

From estimates of food consumption energy intake was calculated to be about 2400 Cal., which falls short of the requirement, taken as 2600 Cal. The number of subjects with signs of vitamin A deficiency was 140. Defective sight and pyorrhoea were the commonest clinical abnormalities.

The relation

$$X = \frac{A \times B}{18{\cdot}42}$$

was found between weight in lb. (X), height in inches (A) and mean chest circumference in inches (B).—D. Harvey.

2291

POPE, A. S. and GORDON, J. E. **The impact of tuberculosis on human populations.** *Amer. J. Med. Sci.*, 1955, **230,** 317–353. [Dept. Epidemiol., Harvard Univ. Sch. Pub. Health, Boston, Mass.]

A review with 68 references; 2 pages relate specifically to nutrition.

2292

KRAINICK, H. G., DEBATIN, F. and ZIERL, W. Inapparente Infektion und Stoffwechsel. [**Non-apparent infection and metabolism.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1350–1356. [Kinderklin., Univ. Freiburg i. Br.]

The first observation was made in a holiday camp among 37 diabetic children aged from 8 to 15 years. A girl who developed scarlet fever was sent to hospital; the others were treated with penicillin by mouth for 6 days, and none developed manifest scarlet fever. But 22 of them developed diabetic crises, the first to do so having severe acidotic coma before penicillin treatment was begun. The peak of the common rise in blood sugar was reached on the twelfth day after the infection was first detected. It was concluded that the metabolic disturbance was due to sub-clinical infection.

The second observation concerned a premature infant which at 3 weeks of age had, along with others in the ward, infection of the upper respiratory tract. These others had all the usual signs of such infection, but in this one there was only an increase of temperature to 37·6° C., which was accompanied by a fall in fat retention from 95 or 97 to 67 per cent. There was no dyspepsia.

D. Duncan.

2293

DIETZE, A. Zur Frage der langdauernden vegetativen Regulationsstörungen nach alimentärer Dystrophie. [**Long-lasting injury to sympathetic regulation after nutritional dystrophy.**]

Münch. med. Wochenschr., 1955, **97**, 1733–1735. [Ärztl. Dienst, Versorgungsverwaltung, Schleswig-Holstein.]

Such minor effects of malnutrition as sweating, palpitations, cyanosis of the extremities, itching of the fingers, appearance of dermography and headache seemed often to persist long after the more important signs had disappeared. Living conditions after the return from imprisonment might have tended to prolong the symptoms.

An investigation was therefore made of 200 men showing such effects, who had been taken prisoner in 1944–45 and been returned to Schleswig-Holstein in 1948–49, and who had been back for at least 5 years. They had been under the care of their doctors and all showed disturbances of the sympathetic nervous system. They included a large proportion of men whose home was not in Schleswig-Holstein, who had been out of work for a long time, who had come down in the world, who had no proper dwelling and whose family life was broken. It was considered that such circumstances had tended to prolong the nervous disturbances or even to promote them.—E. M. Hume.

2294

MEYERINGH, H., DIETZE, A. and HAESELER, W. Über den Gesundheitszustand der Spätheimkehrer der Jahre 1953/54. [**Health of late repatriates in the years 1953 and 1954.**] *Deutsch. med. Wochenschr.*, 1955, **80**, 1606–1612. [Arztl. Dienst, Versorgungsverwaltung, Schleswig-Holstein.]

The results of a study of 359 out of 486 late repatriates to Schleswig-Holstein in the winter of 1953–54 are discussed in conjunction with earlier work by the first author (Absts. 5689, Vol. 20; 2797, Vol. 22; 3613, Vol. 24) and others. Like earlier batches, these subjects had endured prolonged heavy work and underfeeding; and, as survivors, they may be a selected sample.

Only 25 (7 per cent.) had, or had had, lipophilic dystrophy, a much smaller proportion than before. Disorders of the circulation were still common, but mostly functional, though some had electrocardiographic changes which may have been due to dystrophy. Arteriosclerotic changes were no greater than in the ordinary population. There was evidence of a temporary rise in blood pressure when the feeding improved after the Russian currency reforms of 1948–49. Liver damage was established or suspected in 29 (9 per cent.) of 320 tested and was ascribed to dystrophy in 15 of these. Only 76 (21 per cent.) had had severe diarrhoea, and this relative freedom from digestive disorder may be the reason why these late repatriates were on the average in better physical condition than those who returned in 1948–49.

W. M. Deans.

2295

PASCHLAU, G. Zur Beurteilung der Salzsäuremangelzustände des Magens nach Hungerdystrophie. [**Assessment of the hydrochloric acid deficiency states of the stomach after hunger dystrophy.**] *Münch. med. Wochenschr.*, 1955, **97**, 1201–1205. [Ehem. Evangel. Krankenhaus, Göttingen-Rohns.]

In 171 patients with hunger dystrophy, gastric analysis during the first year after their return from Russia showed that 70 per cent. had anacidity and the remainder sub-acidity; none had normal acidity. Subsequent studies showed a slow recovery of normal secretion in just under half the patients. When complications were present the recovery might be delayed for up to 6 to 7 years, but in their absence recovery, when it occurred, was generally within the first 4 years. Success or failure in the restoration of acid secretion was not related to the occurrence or otherwise of dysentery or other gut infection during imprisonment. X-ray examination showed no difference in the extent of mucous membrane lesions between the groups. It was therefore concluded that delay in recovery was the result of the hunger dystrophy itself, and that the capacity to recover and the time required for it were related to the severity of the protein deficiency experienced. It is suggested that the delay in return of function may have been partly due to poor circumstances in which rest and good food were lacking.—L. Wills.

2296

VAN STEENIS, P. B. **Liver cirrhosis.** *Doc. Med. geogr. trop.*, 1955, **7**, 252–258. [Inst. Trop. Hyg. Geogr. Pathol., Royal Trop. Inst., Amsterdam.]

A report of 2 cases and a brief general discussion.

See also Abst. 2241.

DEFICIENCY DISEASES

General

2297

PATWARDHAN, V. N. **Genesis of nutritional oedema.** *Indian Med. Gaz.*, 1954, **89**, 736–742. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

2298

GOPALAN, C. and RAMALINGASWAMI, V. **Kwashiorkor in India.** *Indian J. Med. Res.*, 1955, **43**, 751–773. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor.]

A review prepared for the Liver Diseases Sub-Committee of the Indian Council of Medical Research.

2299

JELLIFFE, D. B. **Hypochromotrichia and malnutrition in Jamaican infants.** *J. Trop. Pediat.*, 1955, **1**, 25–33. [Univ. Coll. W. Indies, Jamaica.]

Hypochromotrichia is defined as a decrease in the colour of the hair in comparison with the colour usual for the ethnic group under consideration. By that definition in a recent study (Abst. 1152, Vol. 25) 15 of 18 patients with kwashiorkor showed depigmentation; some with histories of relapse had striped hair as described in FAO *Nutritional Studies* No. 13 (see p. 306, Vol. 25). The changes responded to high-protein diet. Among 252 poorly nourished individuals in a small village (see Abst. 3562, Vol. 24) the percentage with some degree of depigmentation was 75 in the age group from 1 year to 3 years, 62 from 3 to 9 years and only 6 from 9 to 17 years. The findings suggested that depigmentation of the hair, like frank kwashiorkor, which was not seen in the village, is related to the crisis which occurs at weaning. A further survey confirmed the findings and related the incidence of the hair changes to the socio-economic conditions. Paper chromatography of treated samples of normal and greatly depigmented hair yielded similar results for amino-acids. It is suggested that a hypochromotrichia index would be useful for assessing the state of protein deficiency among infants in malnourished African communities.—L. Wills.

2300

LACROIX, A. C. Le myo-oedème socio-physiologique. Son intérêt dans la connaissance des états collectifs de malnutrition. [**Sociophysiological myo-oedema. Its interest in connection with states of collective malnutrition.**] *Bull. Soc. Pathol. exot.*, 1955, **48**, 185–191.

Oedema of the muscles, known to occur in conditions of starvation or severe undernutrition, was demonstrated by pinching the biceps and noting the appearance of a pad of swollen tissue. In 4700 Algerian Mohammedan recruits whose home diet was low in protein and fats, the percentage incidence was 93 in those from rural homes and 74 in the city dwellers. After the recruits had been for 6 months on army rations rich in animal protein, the percentage affected fell to 56·6.

L. Wills.

2301

MUKHERJEE, K. L. and JELLIFFE, D. B. **Clinical observations on kwashiorkor in Calcutta.** *J. Trop. Pediat.*, 1955, **1**, 61–66. [Calcutta Sch. Trop. Med.]

Fifteen classical cases of kwashiorkor in Calcutta are described. The picture differed from that commonly seen in African infants in that the hair changes were slight. There was a definite seasonal incidence of kwashiorkor and also of diarrhoea, of which almost every patient had a history. The possible effect on quantity and quality of the milk of the almost continuous lactation after repeated pregnancies is discussed.

L. Wills.

2302

DE SILVA, C. C. **Suprarenal haemorrhages in kwashiorkor: a preliminary report.** *J. Trop. Pediat.*, 1955, **1**, 112–116. [Dept. Paediat., Univ. Ceylon.]

In 3 of 15 fatal cases of kwashiorkor, haemorrhage into the adrenal glands was found at post mortem. All 3 cases were severe with a very short history. The possibility is discussed that an added stress such as infection or heavy infestation with parasites might precipitate a fulminating attack of kwashiorhor in a malnourished, susceptible child, and that it is patients with the acute disease that are liable to adrenal haemorrhage. See also next Abst.

L. Wills.

2303

DE SILVA, C. C. **Kwashiorkor (protein malnutrition).** *Ceylon Med. J.*, 1955, **3**, 55–79. [Dept. Paediat., Univ. Ceylon.]

The incidence of kwashiorkor as measured by the number of patients admitted to hospital has increased from 1·4 per cent. of 2168 in 1950 to 2·9 per cent. of 3113 admissions in 1954. Of 127 children treated in 1953 and 1954, 78 per cent. were between 1 and 4 years of age; only 38 per cent. were between 1 and 2 years, the age group into which about 75 per cent. of patients in Africa fall. Detailed studies were made of 30 patients, and much of the paper deals with the pathology and symptoms of the disease as seen in them. From information, roughly quantitative in nature, which was supplied by mothers there was no evidence that the children with kwashiorkor derived more of their energy from carbohydrate or less from protein than did those showing undernutrition. The finding at 15 post-mortem examinations that in 4 severe cases there was haemorrhage of the adrenal glands is thought to be evidence of Selye's general adaptation syndrome.

The prevention of the disease is a socio-economic rather than a public health problem. The solution proposed, namely, making available and encouraging the consumption of soya beans and fishery products such as dried sprats, is one which will require co-operation of several state departments.—D. Harvey.

2304

RAMANATHAN, M. K. **Biochemical changes in the serum in nutritional oedema syndrome (kwashiorkor).** *Indian J. Med. Res.*, 1955, **43**, 517–520. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

Total protein, albumin, γ-globulin, urea, N.P.N., and cholesterol and its esters were estimated in the blood of a number of children showing the syndrome of nutritional oedema (kwashiorkor) before treatment with a high-protein diet began, again when the signs disappeared and finally on discharge from hospital. Control estimations were made on 12 healthy children.

Average values per 100 ml. serum at admission were: total protein 5·0 g., albumin 2·34 g., globulin 2·65 g., γ-globulin 1·33 g., urea 17·95 mg., N.P.N. 17·85 mg., total cholesterol 104·95 mg. and cholesterol esters 42·10 mg. Only the γ-globulin value was normal. All other values rose during treatment and at discharge were nearly normal. Reasons for the high γ-globulin value are discussed.

J. S. Thomson.

2305

CHEUNG, M. W., FOWLER, D. I., NORTON, P. M., SNYDERMAN, S. E. and HOLT, L. E. (Jr.) (with HASSELMEYER, E.) **Observations on amino acid metabolism in kwashiorkor. (A preliminary report.)** *J. Trop. Pediat.*, 1955, **1**, 141–147. [Child Med. Serv., Bellevue Hosp., New York.]

In 3 patients with kwashiorkor, examination of the urine by chromatography on paper and with a Dowex 50 column showed in addition to the peaks of identified amino-acids 13 others due to unidentified substances reacting with ninhydrin. The total excretion of free amino-acids was expressed as the ratio $\frac{\alpha\text{-amino-N}}{\text{creatinine}}$ in g. daily, since the commonly used amino-acid index, $\frac{\alpha\text{-amino-N}}{\text{total N}}$ in g. daily $\times$ 100, gives very high values because of the very low excretion of total N in patients with kwashiorkor. Before treatment, in terms of creatinine, excretion of free amino-acids was not higher than normal, but during treatment it rose at first and, as the cure progressed, fell again to the values before treatment. Had the results been expressed in the second form the initial value would have been raised and the later values reduced. In 6 specimens from the 3 patients, chromatography showed a high ratio of *iso*leucine to leucine which was due to increased *iso*leucine excretion, and, with the exception of the initial specimen in the one case that was followed during treatment, a high ratio of phenylalanine to tyrosine due to increased excretion of phenylalanine. In the initial specimens the excretion of threonine was low in 2 but normal in the third.—L. Wills.

2306

CLOSE, J. Contribution à l'étude du rôle des acides aminés dans l'étiologie du kwashiorkor. **[The part played by amino-acids in the etiology of kwashiorkor.]** *Ann. Soc. belg. Méd. trop.*, 1955, **35**, 411–424. [Inst. Recherche Sci. Afrique Centrale, Centre Recherche Sci., Kivu, Lwiro, Belgian Congo.] Flemish summary.

Samples of breast milk were obtained from 2 African mothers, one with a 4-month-old infant, completely breast fed, and the other with a child of 12 months, fed partly on the breast and partly on a mixed diet; both babies had severe, typical kwashiorkor. The contents of ammonia, total N and total individual amino-acids were estimated and the 24-hr. volume of milk was recorded.

The results were compared with those for the pooled milk of 9 African women with normal babies, and with standard European and American values (Soupart *et al.*, Abst. 2851, Vol. 24 and Beach *et al.*, Abst. 885, Vol. 11). They showed that the total N in the 3 African samples was considerably higher than the mean values for Europeans and Americans. Expressed as a percentage of the total N, the sum of the N from the different amino-acids and from ammonia ranged from 85·3 to 87·6, compared with a mean value of 85·5 for the milk of European mothers. The amino-acids in the African samples were present in about the same proportions as in the European samples, except that the percentage of methionine was considerably lower, and that of arginine definitely higher, than the European standards, though the proportions agreed with American values (Macy, Abst. 4569, Vol. 19). In the sample from the mother of the 4-month-old infant the values for valine, lysine and proline were low compared with the values from the pooled sample; the values for lysine and proline were low also in the milk from the mother of the 12-month-old infant, and so was the value for cystine. In the 4-month-old infant the total milk available daily was found to be 405 ml. by expression, and 354 ml. by weighing before and after the feed; on such an intake the infant received only 4·256 g. amino-acid N though the intake calculated as desirable was 12·520 g. In European infants of the same age the average daily intake of milk is 800 ml. and of amino-acid N 8·064 g. The amino-acid N intake of the African infant was therefore only 35 per cent. of the standard put forward by Albanese (Abst. 820, Vol. 22), and 53 per cent. of the average European infant's intake; the deficiency of leucine and methionine was particularly marked. The results are discussed, and to meet criticism it is pointed out that Holemans has found the mean daily milk secretion in Central African women to be very low (*Inst. Roy. Colon. Belge, Mem.*, 1954, **25**, No. 3).—L. Wills.

2307

NETRASIRI, A. and NETRASIRI, C. **Kwashiorkor in Bangkok. [An analytical study of 54 cases.]**

J. Trop. Pediat., 1955, **1**, 148–155. [Dept. Paediat., Fac. Med., Univ. Med. Sci., Bangkok.]

Kwashiorkor, typical of that in other endemic centres, was seen in 54 patients of whom most were Thai children and not Chinese, probably on account of the better diet eaten by the Chinese. All belonged to the lower income groups and a history of infection and ascaris infestation was common. The clinical, biochemical and haematological findings were true to type except that skin changes were severe and eye changes caused by vitamin A deficiency were common. Riboflavin and vitamin B_1 deficiencies were also frequent. Treatment was along the usual lines except that to save sight vitamin A had to be used in large doses. The crude death rate was 24·1 per cent., but many of the patients were admitted in a moribund state.—L. Wills.

2308

THOMPSON, M. D. **Comparison of milk and soya beans in the treatment of kwashiorkor in Uganda.** *Brit. Med. J.*, 1955, ii, 1366–1369. [Mulago Hosp., Kampala.]

The patients were in 2 groups. Thirty-five were given cow's milk protein, and 42 a preparation of soya beans (see Abst. 2193, Vol. 23) with for some a vitamin preparation and for others methionine. The results were measured by the numbers in whom anorexia was overcome, oedema lost, weight gained and levels of total protein in serum and of enzymes in pancreatic fluid raised. They showed that milk was better than soya beans, but failure with the beans was in many cases caused by the difficulty experienced in preparing a product sufficiently concentrated to maintain the necessary intake of protein. Neither the vitamin B_{12} in the vitamin preparation nor the methionine improved the response to soya beans.

In a discussion of the findings the view is held that the people's greatest need is for education, namely, instruction of the adult population in the value and best use of the sources of protein available.—D. Harvey.

2309

TROWELL, H. C., DAVIES, J. N. P. and DEAN, R. F. A. **Kwashiorkor and malnutrition.** *Acta paediat.*, 1955, **44**, 487–490. [Mulago Hosp., Makerere Coll. Med. Sch., Kampala, Uganda.] French, German and Spanish summaries.

In this reply to the discussion by Gómez *et al.* (Abst. 993, Vol. 26) the Uganda workers record their view that the term malnutrition is not sufficiently specific and maintain their preference for kwashiorkor as a name for the disease.—D. Harvey.

2310

DAVIES, J. N. P. **Children's diseases at Mulago Hospital 1950-51. An analysis of the causes of admission.** *East African Med. J.*, 1955, **32**, 283–290. [Dept. Pathol., Makerere Coll. Med. Sch., Kampala, Uganda.]

Malaria, respiratory disease and nutritional disorders, in that order, were the 3 commonest causes of admission. Diarrhoea and vomiting were usually the initial signs of an attack of malaria. In infants under 1 year of age marasmus was the commonest nutritional disorder, in those over 1 year kwashiorkor. The peak incidence of admissions for kwashiorkor was about 18 months or about 6 months after the peak incidence of malarial admissions, and the incidence of kwashiorkor fell more rapidly than that of malaria; few admissions for kwashiorkor occurred after the age of 3 years, but the incidence of admissions for malaria was high until about the 6th or 7th year. The difference in age incidence and other findings suggest that malaria and kwashiorkor are unrelated.

L. Wills.

2311

ASK-UPMARK, E. and MEURLING, S. **On the presence of a deficiency factor in the pathogenesis of amyoptrohic lateral sclerosis.** *Acta med. scand.*, 1955, **152**, 217–222. [Dept. Med., Royal Acad. Hosp., Upsala.]

Examinations were made of 111 persons who had undergone gastric resection. Diagnosis of amyotrophic lateral sclerosis was definite in 1 and problematic in 2 others. Of 20 patients in whom the diagnosis had been established in the decade 1945 to 1954, 5 had had gastric resection, 1 required it and 2 had diabetes with emaciation. Malnutrition in some form is suggested as a concomitant condition. (See Abst. 3602, Vol. 15.)

D. Harvey.

See also Abst. 2242.

Vitamin A

2312

BASS, M. H. and CAPLAN, J. **Vitamin A deficiency in infancy.** *J. Pediat.*, 1955, **47**, 690–695. [Paediat. Serv., St. Joseph Hosp., Far Rockaway, N.Y.]

A normal infant, aged one month, developed allergy to cows' milk, as evidenced by the development of eczema. A soya bean preparation, Mull-Soy, was therefore given instead of milk, and was later supplemented with bananas, rice and peaches. By an oversight no vitamin A was provided. At the age of about 8 months the child was anaemic and mentally and physically backward. The corneas were blurred and had small ulcerations; and there was blood in the urine. During observation in hospital, hydrocephalus developed with

bulging of the anterior fontanelle. The temperature rose to 104° F. The absence of vitamin A from the diet was then realised, and rectified by daily intramuscular doses of 100,000 I.U. The temperature fell rapidly to normal, and in 2 days the fontanelle was flat. Within 10 days the child had completely recovered from all the abnormalities, and was discharged from hospital. In another infant, hydrocephalus developed as an effect of vitamin A deficiency caused by congenital absence of the bile duct. The hydrocephalus was corrected by injection of vitamin A, but the child died. The speed with which hydrocephalus can appear or disappear suggests that it cannot be caused by compression resulting from the abnormal growth of bone.—T. Moore.

2313

FLIERINGA, H. J. Avitaminose van het oog. [**Vitamin deficiency in relation to the eye.**] *Nederland. Tijdschr. Geneesk.*, 1955, **99,** 3022–3026.

A lecture review.

2314

GAMP, A. and GROS, H. Störungen des Vitamin-A-Stoffwechsels bei chronischer Polyarthritis. [**Disturbances of vitamin A metabolism in chronic polyarthritis.**] *Ztschr. ges. inn. Med.*, 1955, **10,** 597–600. [Klin. Rheumakranke, Bad Kreuznach.]

Vitamin A was estimated in the blood serum of 11 patients with chronic polyarthritis, 3 with chronic polyarthritis and Sjögren's syndrome, 8 normal persons and 6 patients with liver cirrhosis before and after administration of large amounts of vitamin A. The mean values before administration, in I.U. per 100 ml., were for the healthy persons 224 with range 184 to 270, for those with chronic polyarthritis 173 with range 104 to 225, and for those with liver cirrhosis 95 with range 0 to 178. Individual values for the 3 patients with Sjögren's syndrome were 176, 176 and 250. A single dose of 150,000 I.U. vitamin A was given twice, once before administration of the same dose daily for 6 days and once 2 days after it. The responses of the arthritic patients did not differ greatly from those of the healthy subjects unless the liver or spleen was affected, when the response was less : in the patients with liver cirrhosis the response was much less.—E. M. Hume.

2315

HISSARD, R., JACQUET, J. and VILLETTE, O. Gale norvégienne et vitamine A. [**Norwegian itch and vitamin A.**] *C.R. Acad. Sci.*, 1955, **241,** 1003–1005.

In a woman aged 46 with Norwegian itch the infestation with sarcoptes was associated with hyperkeratosis, manifested by the formation of crusts on the skin. There was a history of chronic alcoholism, and Laennec's cirrhosis had developed with ascites. Secondary deficiency of vitamin A was suspected, and was confirmed by analysis of the blood plasma. Massive oral and parenteral doses of vitamin A raised the blood value, arrested the hyperkeratosis and reduced the vitality of the sarcoptes. The benefit lasted only for as long as the treatment was continued, and the hyperkeratosis could be made to regress or increase repeatedly according to whether the vitamin was given or not. Eventually a permanent cure was effected by combining vitamin A administration with attacks on the sarcoptes by means of benzyl benzoate.—T. Moore.

Vitamin D

2316

AMERICAN MEDICAL ASSOCIATION, COUNCIL ON FOODS AND NUTRITION. **Importance of vitamin D milk.** *J. Amer. Med. Assoc.*, 1955, **159,** 1018–1019.

The Council expresses the opinion that the general use of vitamin D milk in the United States in recent years has played an important part in reducing the incidence of rickets to the existing extremely low level. Council will continue its present policy of encouraging the use of milk fortified with 400 U.S.P. units of vitamin D per quart.

L. Wills.

2317

BERRY, W. T. C., BOYES, K. M. B., PARR, W. C. and SMITH, K. F. **Children who take no cod liver oil.** *Monthly Bull. Minist. Health and Pub. Health Lab. Serv.*, 1955, **14,** 162–165. [Minist. Health, Savile Row, London, W.1.]

A study was made in late winter in Salford, where there is little sun and much rain, of 37 children between the ages of 1 and 2 years who had had no cod liver oil or only a little and of 50 children who were known to have had at least 1 teaspoonful on 5 days a week for 6 months. Of the first group 27 had been reared on dried or evaporated milk and their average daily intake of vitamin D was estimated at 700 I.U. The others had been reared mainly on cow's milk after a short period of breast feeding and their daily intake of vitamin D was estimated to range from nil to 300 I.U. During the second year of life the average daily intake of vitamin D by the first group was only about 25 I.U. ; that of the group given cod liver oil about 450 I.U.

Only 12 of the first group were judged clinically to be in good condition, compared with 34 of the group given cod liver oil, and only 13 were above expected weight for age, compared with 28, but a number of them were from problem families, so

that the inferiority may not have been due to lack of cod liver oil. Six were suspected of having early rickets, but no rickets, healed or active, was detected in any of the children by X-ray photography of the wrist. The value for serum alkaline phosphatase, the state of tooth eruption, and the Hb value did not differ significantly between the groups.

It is pointed out that some of the infants on dried milk would have been taking as much as 2300 I.U. vitamin D daily at 6 months if they had had cod liver oil as well, and it is suggested that dangerously high values for Ca in the blood might have resulted.—W. M. Deans.

2318

FANCONI, G. Das Vitamin D als Heilmittel und als Gift. **[Vitamin D as a medicament and as a poison.]** *Schweiz. med. Wochenschr.*, 1955, **85,** 1253–1261. [Kinderklin., Univ. Zürich.]

In a lecture the great variation in the individual requirement of vitamin D is stressed. Examples are given of children with rickets when receiving what would appear to be a sufficient supply, and of children showing detrimental effects from relatively small doses. The case of a girl of 14 is cited; she showed high blood Ca and stunted growth after receiving the equivalent in halibut liver oil of 2 tablespoonfuls of cod liver oil daily for a year. Other topics considered are idiopathic hypercalcaemia, vitamin-D-resistant rickets and phosphate diabetes.—E. M. Hume.

2319

HALLMAN, N., HJELT, L. and TÄHKÄ, H. **Chronic hypercalcemia and vitamin D in early childhood. 1. Clinical observations.** *Ann. Paediat. Fenn.*, 1954–55, **1,** 338–354. [Child. Clin., Univ. Helsinki.]

Eleven children aged from 6 to 29 months were admitted to hospital for failure to thrive, with slow weight increase, lack of appetite, vomiting and constipation. All had a high plasma Ca value; some had previously had interstitial pneumonia which is accompanied by a high plasma Ca value, and all had had large single intramuscular doses of vitamin D. All except 3 were premature. All were mentally and physically backward. Blood and urine were investigated. All the children were anaemic. Plasma Ca values ranged from 13·5 to 15·0 mg. per 100 ml. Values for plasma inorganic P were normal, for alkaline phosphatase were low and for plasma and erythrocyte Mg high in some instances; values for urea N and N.P.N. were high. There was proteinuria. Treatment was with a diet low in Ca and without vitamin D. Two babies died of intercurrent infection but the rest recovered. It is customary in Finland to give premature infants a single intramuscular injection of 250,000 I.U. vitamin D_2 at from 3 to 4 weeks of age, followed by another of 500,000 I.U. a month later, and to continue prophylaxis with oral doses of from 3000 to 5000 I.U. daily. It is recognised that such amounts are large.—E. M. Hume.

2320

CARTER, R. E. B., DENT, C. E., FOWLER, D. I. and HARPER, C. M. **Calcium metabolism in idiopathic hypercalcaemia of infancy with failure to thrive.** *Arch. Dis. Childhood*, 1955, **30,** 399–404. [University Coll. Hosp. Med. Sch., London.]

Detailed clinical, metabolic and biochemical studies were made of idiopathic hypercalcaemia in a boy of 9 months old. There was no evidence that excessive amounts of vitamin D had been given. The serum Ca value was 13·8 mg. per 100 ml. The administration of 10,000 "units" of vitamin D daily for 12 days resulted in an immediate rise of the Ca value in the plasma and deterioration of the clinical condition. Later the boy was maintained on a constant Ca-free diet without vitamin D, to which was added for different periods 610 mg. Ca daily; the plasma value rose and fell with the Ca intake and the plasma urea tended to fluctuate with the Ca value; on a mixed diet containing about 200 mg. Ca, plasma Ca rose at first but fell again later. The clinical condition reflected closely and rapidly the plasma value for Ca. After about 4 months under observation the patient gradually became more tolerant of Ca and after 12 months was able to take a normal diet. Growth and development were then normal. It is concluded that the condition is caused by abnormal sensitivity to vitamin D.—L. Wills.

2321

BRYANT, H. **Unprescribed medicaments, medical advice and vitamins in infancy.** *Med. Officer*, 1955, **94,** 209–212. [Bolton, Lancs.]

Information was obtained about the medicaments given without medical advice in the first year of life to 503 of the 586 infants born in Bolton during 3 consecutive months; 63·4 per cent. of them belonged to the Registrar-General's social and economic group 3. Only 8 infants received no unprescribed medicine. There was no significant difference between the social classes in the amounts of unprescribed vitamin preparations given, but more than half of the 58 infants who received no vitamin addition belonged to social class 5. To 97 infants no vitamin was given apart from the cod liver oil and orange juice received through the Welfare Food service, and 8·6 per cent. of all the infants received no supplement of vitamins A and D at all.—L. Wills.

2322

DENT, C. E., HARPER, C. M., MORGANS, M. E., PHILPOT, G. R. and TROTTER, W. R. **Insensitivity to vitamin D developing during the treatment of postoperative tetany. Its specificity as regards the form of vitamin D taken.** *Lancet*, 1955, **269**, 687–690. [Med. Unit, University Coll. Hosp., London.]

In 4 patients after accidental removal of the parathyroid glands during operations on the thyroid gland, the consequent tetany at first responded to treatment with vitamin D_2, and large amounts caused hypercalcaemia and signs of excess. Later the vitamin ceased to be effective even in doses as large as 8 mg. daily. A change to A.T. 10 or, with one patient, to vitamin D_3 immediately controlled the tetany and the patients were satisfactorily maintained with daily doses of 1 mg. or less of A.T. 10 or of 2 mg. vitamin D_3. Tests for plasma Ca and Ca balance during the periods of resistance confirmed the failure of vitamin D_2 to influence the Ca metabolism at that time. Vitamin D_3 or A.T. 10, however, immediately raised the amount of Ca in the plasma and urine, and decreased the plasma P and the amount of Ca in the faeces.

It is thought probable that the same state of resistance might arise with any form of vitamin D if given in large doses for a considerable time, and in treating post-operative tetany change of the preparation from time to time is recommended.

E. M. Hume.

2323

GREGERSEN, E. **Primary vitamin-resistant rickets.** *Acta paediat.*, 1955, **44**, 491–500. [Paediat. Dept., Copenhagen County Hosp., Gentofte.] French, German and Spanish summaries.

The case described is that of a girl first seen at the age of 22 months but whose development had not been normal since the age of 12 months. She had received up to 3500 "units" of vitamin D daily from about 7 months old, but had severe rickets. A cure was effected with 300,000 "units" of vitamin D daily, and the patient was maintained with 50,000 "units" daily for a year, but was then lost sight of till she was re-admitted at the age of 8 with severe deformities and a fracture. For cure 600,000 "units" of vitamin D_2 daily were needed, but signs of overdosage were liable to appear. Maintenance was with 150,000 "units" daily. The need for continued treatment is stressed. The case presented no special feature.

E. M. Hume.

2324

JUNG, W. Phosphataseuntersuchungen im mütterlichen und kindlichen Blut. Ein Beitrag zur Frage der angeborenen Rachitis. [**Estimations of phosphatase in the blood of mother and child. Communication on congenital rickets.**] *Monatsschr. Kinderheilk.*, 1955, **103**, 347–350. [Kinderklin., Univ. Mainz.]

Serum alkaline phosphatase was estimated during the winter and spring in the maternal and cord blood of 220 women. None of the mothers had received vitamin D in pregnancy, and birth was at term. For 40 non-pregnant women a mean value of 8·2 with range from 5 to 13 "units" [presumably per 100 ml.] had been obtained. The mean value for the maternal blood was 20·2 "units" with range from 12 to 36, and for the cord blood 16·35 with range from 10 to 28. There was no relation between the two values for individuals. Estimation was made on the venous blood of 50 of the babies within the first 6 days of life; the results were closely similar to those for the cord blood. In half the infants X-ray photographs were taken of both wrists, but there was no sign of rickets. Previous experience had shown that administration of 15 mg. vitamin D_3 from 6 to 8 weeks before term did not prevent the increase of phosphatase. It is concluded that the high values are the expression of a physiological state, and are not a sign of congenital rickets.

E. M. Hume.

2325

FELDER, J. and SCHREIER, K. Hypophosphatasie. [**Low phosphatase.**] *Monatsschr. Kinderheilk.*, 1955, **103**, 437–443. [Kinderklin., Univ. Heidelberg.]

An account is given of a child of 19 months, undersized, malnourished and with kyphosis, a rachitic rosary and enlarged epiphyses. The urine contained quantities of cylinders of amorphous salts. Alkaline phosphatase was almost completely absent from the blood and urine and from material obtained by sternal puncture. Ca and P in the blood serum were within the higher range of normal; in the urine they were very high. Treatment with 50,000 I.U. vitamin D daily had only a detrimental effect. Although the condition was not apparent at birth, it is considered to be a rare inborn error of metabolism of which only 3 other cases have been described. The prognosis was uncertain.—E. M. Hume.

2326

KAWAZOE, K. **Roentgenological studies on the curvature of fibula shaft in rickets.** *Tokushima J. Exp. Med.*, 1955, **2**, 45–52. [Dept. Paediat., Sch. Med., Univ. Tokuskima.]

Measurements were made from X-ray photographs of indices of curvature of the fibula at points one-quarter, half and three-quarters of the way up. The subjects were 89 healthy children and 478 who had rickets. In the normal children convexity was internal and, at each point of measurement, increased with age.

Of the rachitic children under 1 year of age, 231 were well nourished and 119 malnourished. When they were grouped according to 3 degrees of increasing severity of rickets, internal convexity in each group was greater in the malnourished than in the well nourished patients. Among those over 1 year of age and able to walk, convexity was external at the lower part of the fibula. In patients with bow-legs or knock-knees the curvature of the fibula generally followed that of the tibia.—D. Harvey.

Vitamin E

2327

Di Nardo, A., Gatti, E. and Pace, G. Vitamina E e diabete mellito. (Comportamento di alcuni aspetti del ricambio lipidico e glucidico.) **[Vitamin E and diabetes mellitus. Some aspects of lipid and carbohydrate metabolism.]** *Acta vitaminol.*, 1955, **9,** 172–180. [Div. Med. "Brera", Nuovo Osp. Magg.] French, English, German and Spanish summaries.

Total lipids, total and free cholesterol and phospholipins in the blood, and fasting blood sugar were estimated in 8 diabetics before and during treatment for from 20 days to 9 months with 400 mg. *d*-α-tocopheryl acetate daily; 2 of the subjects received insulin as well. Five other diabetics were treated with vitamin E in the same dosage for 10 days, and the response of the blood sugar to 0·75 g. glucose per kg. bodyweight and sensitivity to insulin were tested beforehand and at intervals for 4 hr. afterwards. In 4 diabetics blood sugar was measured at intervals up to 1½ hr. after administration in successive tests of glucose alone, glucose with insulin, and glucose with insulin from 5 to 6 hr. after a single oral dose of 10 g. vitamin E had been given.

In none of the 3 experiments was any consistent influence of vitamin E shown.—E. M. Hume.

Vitamin B Complex

2328

Pett, L. B. **Vitamin requirements of human beings.** *Vitamins and Hormones*, 1955, **13,** 213–237. [Div. Nutrit., Dept. Nat. Health Welfare, Ottawa.]

2329

Grüneis, P. Ueber die Behandlung akuter Leberparenchymerkrankungen mit hohen Dosen von Vitamin B-Komplex und Desoxycorticosteronacetat. **[Treatment of acute parenchymatous liver disease with large doses of the vitamin B complex and deoxycorticosterone acetate.]** *Wien. klin. Wochenschr.*, 1955, **67,** 725–729. [1. Med. Abt., Städt. Allg. Poliklin., Vienna.]

During a period of 9 years the use of deoxycorticosterone acetate combined with large doses of vitamin B complex proved valuable as an initial treatment in many forms of acute hepatitis. Case histories are quoted to show the beneficial effects on the disease and on the general condition of the patients. A table is given showing the diverse types of jaundice in 37 patients treated during the last two years and the relatively short stay in hospital required after treatment with the hormone and B vitamins. Both components appeared to be necessary, but their precise effects are unexplained.—A. M. Copping.

2330

Colombo, C. and Verga, G. Indagini sulla fluorescenza linguale alla luce di Wood in psichiatria. Osservazioni su 411 soggetti. **[Lingual fluorescence under Wood's light in psychiatry. Observations on 411 subjects.]** *Acta vitaminol.*, 1955, **9,** 157–162. [Clin. Malatt. Nerv., Univ. Milan.] French, English, German and Spanish summaries.

In most persons the dorsal surface of the tongue shows an orange-red fluorescence in Wood's light. It is considered probable that the fluorescence is connected with the metabolism of porphyrin. In 214 healthy persons examined by Tomaszewski, fluorescence was absent in 39 (*Brit. Med. J.*, 1951, i, 117).

Lingual fluorescence was investigated in 411 patients in the Psychiatric Hospital in Milan. Intensity of fluorescence could not be measured, but it was described as partial when it was shown by less than two-thirds of the tongue. The incidence varied in different types of patient. Fluorescence was absent in about half the patients with alcoholism, depression or syphilis. The incidence was normal in epileptics and senile patients, fluorescence being absent in about 19 per cent. Schizophrenics had an intermediate value of 31 per cent. It is pointed out that owing to their condition many of the patients might be taking deficient diets, lacking particularly the B vitamins. Lingual fluorescence is regarded as a useful guide to nutritional status.—E. M. Hume.

2331

Masuda, K., Okamura, K., Aoyama, J. and Obara, M. **Clinical observations of so-called "Shibi-Gatchaki," an endemic malnutrition associated with one-sided rice diet.** *J. Vitaminol.*, 1955, **1,** 229–248. [Masuda Hosp., Goshogawara, Aomori-ken.]

The syndrome, which occurred in from 50 to 70 per cent. of the population, was studied in 100 patients of all ages. All the subjects showed signs and symptoms of deficiency of both riboflavin and nicotinic acid and other signs of

malnutrition. Lesions of the skin and mucous membranes were very frequent, anal and genital itching was present in 51, glossitis in 91 and angular stomatitis in 75. Laboratory tests on 33 showed abnormal liver function in about half, macrocytic anaemia in two-thirds and a positive Millon's test in 9 out of 10. The 24-hr. excretion of vitamin B_1, riboflavin and N^1-methylnicotinamide in the urine was low, as was the value for riboflavin in the blood. The syndrome was considered to be a multiple deficiency of B vitamins; it usually responded to treatment with the vitamin B complex. It was attributed to malnutrition from weaning, when the diet of the infant, like that of all the people in the district, is highly polished rice with only very small amounts of other foods.

L. Wills.

2332

KING, J. H. (Jr.) and PASSMORE, J. W. **Nutritional amblyopia. A study of American prisoners of war in Korea.** *Amer. J. Ophthalmol.*, 1955, **39,** No. 4, Part 2, *Suppl.*, 172–186. [Ophthalmol. Serv., Walter Reed Army Hosp.]

Twenty-two subjects with nutritional amblyopia were studied. Most of them were captured early in the Korean war when conditions for prisoners were especially bad. Loss of sight had been gradual; the average period before onset was 11 months. The diet reported was deficient in many ways but deficiency of vitamin B_1 was thought to be the one which was responsible. Of the other diseases from which prisoners suffered, beriberi was present in a larger proportion of those with amblyopia than of those without it. The state of the eye was studied in detail. The typical findings in the chronic stage of the disease were reduced vision, bilateral, pericentral or paracentral scotomata about 5 degrees in size, and temporal pallor of the head of the optic nerve. Electroretinograms suggested that the atrophy of the optic nerve, as evidenced by the pallor and atrophy of the disc, was ascending in type, and that there was involvement of the retina with the rods and cones affected.

Treatment was with a diet high in energy, protein and vitamins. Only two patients showed improvement, but visual aids provided help.

E. M. Hume.

2333

BEAL, V. A. **Nutritional intake of children. 3. Thiamine, riboflavin and niacin.** *J. Nutrition*, 1955, **57,** 183–192. [Child Res. Counc., Univ. Colorado Sch. Med., Denver.]

For part 2 see Abst. 2566, Vol. 25.

Intakes of vitamins by 63 children during the the first 5 years of life were assessed from 934 24-hr. diet histories obtained at intervals of a month up to 6 months of age and then at intervals of 3 months. The results are tabulated with maximum and minimum values and 25th, 50th and 75th percentiles to show the true distribution of the results. The vitamin B_1 intake rose steadily for the first 15 months, then remained unchanged till 3 years of age, when it again increased up to 5 years. The riboflavin intake increased for the first year, decreased in the second and third years and then rose again. The nicotinic acid intake generally increased throughout the age span studied. For vitamin B_1 and riboflavin the intakes were slightly above the recommended allowances of the National Research Council (1953) for the age groups, and for nicotinic acid they were slightly below, but there was no evidence that they were inadequate.—A. M. Copping.

2334

BALAKRISHNAN, S. and RAJAGOPALAN, R. **Thiamine nutrition status of human subjects receiving supplements of curds.** *Indian J. Med. Res.*, 1955, **43,** 559–568. [Dept. Biochem., Indian Inst. Sci., Bangalore.]

Three similar groups of children were given the same basic poor rice diet, one group without supplement, another group with 0·5 lb. curd daily providing extra energy (protein) as well as about 90 μg. vitamin B_1 and other B vitamins. In the third group each child received 90 μg. synthetic vitamin B_1 in 1 g. sugar daily. At the end of 2 months the children receiving curd showed an average weight gain of 1·35 lb. and an increase in faecal and urinary excretion of vitamin B_1, attributed to increased synthesis of vitamin B_1 in the gut. No such change was seen in the children in the other 2 groups.—L. Wills.

2335

HOLT, L. E. (Jr.) and SNYDERMAN, S. E. **The influence of dietary fat on thiamine loss from the body.** *J. Nutrition*, 1955, **56,** 495–500. [Dept. Paediat., Coll. Med., Univ. New York.]

The vitamin B_1 requirement of 2 infants aged 8 and 18 months was estimated as previously described (Abst. 1209, Vol. 19), and the diet was then changed to one in which 80 per cent. of calories was provided as carbohydrate instead of 50 per cent., and calories from fat were restricted to 10 per cent. With the change urinary excretion of vitamin B_1 decreased, and rose to its original value only after an increase of about 40 per cent. in the intake of vitamin B_1. An increase in demand for vitamin B_1 in metabolic processes with increase of carbohydrate is deduced.

A. M. Copping.

2336

RAAB, W. Vitamin B_1 und Herz. **[Vitamin B_1 and the heart.]** *Wien. klin. Wochenschr.*, 1955, **67,** 647–650. [Coll. Med., Univ. Vermont, Burlington.]

After a brief review of the literature describing the heart lesions and their treatment in oriental and occidental beriberi, a general article gives the clinical and experimental evidence for the presence of some degree of vitamin B_1 deficiency in other forms of heart disease, especially thyrotoxic cardiac failure.—L. Wills.

2337

RUIZ TORRES, A. Razonamientos sobre un caso de polineuritis alcoholica. [**A case of alcoholic polyneuritis.**] *Rev. clín. española*, 1955, **58**, 173–176. [Madrid.]

2338

JIMÉNEZ GARCIA, J. L. Neuralgia del trigémino y cocarboxilasa. [**Trigeminal neuralgia and cocarboxylase.**] *Medicamenta*, 1955, **24**, 358–359. [Cat. Farmacol., Fac. Med., Seville.]

Five patients with trigeminal neuralgia, essential in 3 of them and secondary to inflammation in 1 and to diabetes in 1, were treated with cocarboxylase, usually 50 mg. given by intramuscular and 50 mg. by intravenous injection daily for some days. Pain was completely relieved and there did not appear to be any tendency to relapse.

E. M. Hume.

2339

LICHTENBELT, H. K. v. M. and FLORIJN, E. **Treatment of diabetic coma with thiamine pyrophosphate.** *Acta med. scand.*, 1955, **152**, 259–269. [Dept. Med., Univ. Hosp., Utrecht.]

To ascertain whether there is a deficiency of vitamin B_1 pyrophosphate in diabetic coma, blood pyruvic acid was estimated by a method eliminating acetoacetic acid which had been shown to be estimated with pyruvic acid. With this method, only an insignificant rise of blood pyruvic acid was found during diabetic acidosis, and it was probably due to restlessness. Vitamin B_1 pyrophosphate in the blood was estimated in normal subjects and in diabetics with and without acidosis. In none of them was the value ever below normal though it was frequently significantly higher in the diabetics, a result providing evidence that phosphorylation of vitamin B_1 is normal in diabetes. To confirm the result the formation of vitamin B_1 pyrophosphate after intravenous injection of 60 mg. vitamin B_1 was estimated in healthy subjects and in patients in diabetic coma, and found to be greater in the diabetics. There was no difference between healthy and diabetic subjects in the rate of disappearance of vitamin B_1 pyrophosphate from the blood after an intravenous injection of 100 mg. of it. Prolonged treatment of diabetic coma led to a significant fall in the blood pyrophosphate value, but the value could be restored by giving vitamin B_1 orally or parenterally. Treatment with vitamin B_1 pyrophosphate had no effect on the values for blood sugar, pyruvic acid, or acetoacetic acid or on the alkali reserve of patients with diabetic acidosis, and it did not cause any clinical improvement.

It is therefore concluded that there is no failure in phosphorylation of vitamin B_1 in diabetic coma and no indication for the use of the pyrophosphate. since the relative deficiency which develops during treatment can be successfully treated with vitamin B_1.—L. Wills.

2340

BENSAUDE, A., JOUAN, F. and BERNARD, G. Contribution à l'étude du prolapsus rectal de l'enfant. [**On rectal prolapse in children.**] *Presse méd.*, 1955, **63**, 1533–1534. [Paris.]

A study of the social and economic background of 40 infants with rectal prolapse showed that 26 belonged to the poorest class, 33 came from extremely unhealthy homes and 26 were dirty. Digestive troubles were present in 28, associated in 24 with other pathological conditions, and 13 had histories of recent severe illness. Treatment with one or more courses of 12 intramuscular injections each of 50 mg. vitamin B_1 resulted in cure or great improvement in 32 of the patients; of the 8 failures only 4 required operation. Inquiry from 6 months to 2 years later showed no relapse.

L. Wills.

2341

GAIER, H. and JANTSCH, H. Beitrag zur therapeutischen Leistung und Wirkungsweise des Vitamin-B_1-haltigen Rosskastanienextrakts Venostasin bei peripheren arteriellen Durchblutungsstörungen. [**The therapeutic effect and mode of action of the vitamin-B_1-containing horse chestnut extract Venostasin in peripheral arterial circulatory disturbances.**] *Wien. klin. Wochenschr.*, 1955, **67**, 879–882. [1. Chirurg. Klin., Univ. Vienna.]

Of 85 patients with vascular disease treated by injection of Venostasin (Oesterr. Ichthyol G.m.b.H. Seefeld, Tirol), almost all showed good effects after the first few doses. Improvement in circulation, pulse rate, blood pressure, skin colour and general condition was noted. It was considered that the probable function of the extract, which contained vitamin B_1, was to raise capillary resistance and decrease permeability, and to produce a tonic effect on the blood vessels and changes in blood chemistry including alterations of cholesterol metabolism.—A. M. Copping.

2342

HERSOV, L. A. **A case of childhood pellagra with psychosis.**

RODNIGHT, R. and MCILWAIN, H. **Indicanuria and the psychosis of a pellagrin.** *J. Mental Sci.*,

1955, **101,** 878–883; 884–889. [Dept. Biochem., Inst. Psychiat., Maudsley Hosp.]

Pellagra is described in a boy of 10 years whose diet had been mainly of tinned foods. In addition to the usual skin lesions the boy had slight neurological signs and severe confusional psychosis. On a full diet there was no improvement, but treatment with nicotinic acid, nicotinamide, and a high-protein and carbohydrate diet with extra milk, and Marmite resulted in prompt improvement, complete healing of the skin lesions in 14 days and a gradual return to normal mentality. The only abnormal pathological and biochemical finding was a high urinary output of indican. As the boy did not respond at all to a normal diet it was argued that his deficiency resulted from a high requirement and not from a low intake of the vitamin.

The urinary excretion of nicotinic acid metabolites was estimated in the same boy and in a healthy boy of the same age, while having a diet providing about 10 mg. nicotinamide daily, and the same diet with the addition of 100 mg. nicotinamide daily. There was no striking difference between the subjects in their excretion of nicotinic acid metabolites. Estimation of urinary indican output in normal children showed that it ranged from 10 to 150 mg. daily, the amount excreted increasing with age. A boy of the same age as the patient excreted less than 100 mg. daily, the patient from 230 to 360. Change in the intestinal flora or oral administration of 1·5 g. *l*-tryptophan with 1 g. *d*-tryptophan on 2 successive days had no significant effect on the urinary excretion of indican. It is suggested that indicanuria may cause loss of tryptophan and increase the requirement for nicotinamide.—L. Wills.

2343

FRAZIER, E. I., PRATHER, M. E. and HOENE, E. **Nicotinic acid metabolism in humans. 1. The urinary excretion of nicotinic acid and its metabolic derivatives on four levels of dietary intake.** *J. Nutrition,* 1955, **56,** 501–516. [Dept. Home Econ., Agric. Exp. Stat., Alabama Polytech. Inst., Auburn.]

Six healthy young women of similar physique and basal metabolic rate were given a diet containing 11·3 mg. nicotinic acid daily for 18 days, then 14·3 mg. daily for 10 days, then 7·2 mg. for 12 days and finally 16·3 mg. for 13 days. The first increase in intake of nicotinic acid gave increased excretion of nicotinic acid and its metabolites to a total equivalent to 86 per cent. of intake. The first decrease in intake was followed by a decrease in output, but the total output was 128 per cent. of the intake. When the intake was again increased the output increased, especially of N^1-methylnicotinamide and pyridone derivatives. In the last period the output was only 77 per cent. of the intake. There was considerable variation in the metabolic performances of the 6 subjects. The observations are discussed with reference to probable normal requirements for nicotinic acid and tryptophan.—A. M. Copping.

2344

BARTLETT, M. N. **Red blood cell niacin and plasma riboflavin levels in a group of normal children.** *J. Nutrition,* 1955, **57,** 157–168. [Child Res. Counc., Univ. Colorado Med. Centre.]

Nicotinic acid in the red blood cells and riboflavin in the plasma were estimated by fluorimetric methods in blood from healthy children aged from 2 days to 16 years. In 86 children nicotinic acid was estimated in the red cells at intervals during 5 years, and a similar study of plasma riboflavin was made in 92 children. In addition nicotinic acid was estimated in 185 and riboflavin in 120 other normal children. The results, presented as scatter diagrams, showed no correlation between the intake of nicotinic acid or riboflavin and the blood values for those vitamins. The median value for the two vitamins remained almost constant from the third year of life with no change related to growth. The range of values at all ages was very wide and no significant difference was found between boys and girls.—A. M. Copping.

2345

DE, H. N., DATTA, P. and MANKAD, P. N. **Studies on riboflavin metabolism with typical Indian dietaries.** *Indian J. Med. Res.,* 1955, **43,** 501–509. [Dept. Biochem., Mahatma Gandhi Mem. Med. Coll., Indore.]

Metabolism studies were made on 13 subjects, 8 eating typical vegetarian diets, and 5 non-vegetarian diets with wheat or rice as staple cereal. The daily intake of riboflavin ranged from 0·83 to 1·35 mg. for vegetarians and from 0·94 to 1·14 mg. for non-vegetarians. The vegetarians excreted from 8·5 to 19·8 per cent. of their intake and the non-vegetarians from 18·2 to 26·8 per cent. When a test dose of 5 mg. riboflavin was given with the basal diet the maximum amount excreted was about 20 per cent. of the dose. If 10 mg. riboflavin daily was given for a week, up to 66 per cent. of the test dose of 5 mg. was excreted. In subsequent periods with daily doses of 2 mg. or 1 mg. followed by a test dose of 5 mg. the amount excreted remained of the same order as that obtained by saturation with 10 mg. daily. Hence it is considered that typical Indian diets based on cereals such as rice, wheat or jowar, with or without animal protein, supply the minimum necessary amount of riboflavin.—A. M. Copping.

2346

CHAPMAN, D. G. and CAMPBELL, J. A. **Reliability of the riboflavin excretion technique in determining availability of coated tablets.** *Canad. J. Biochem. Physiol.*, 1955, **33**, 753–757. [Food and Drug Labs., Dept. Nat. Health Welfare, Ottawa.]

In order to confirm the validity of a urinary excretion test for availability of riboflavin in sugar-coated tablets (*J. Amer. Pharm. Assoc., Sci. Ed.*, 1954, **43**, 297) the response of 8 men to graded doses of riboflavin was examined. For doses of 1, 3 or 5 mg. the excretion was the same whether the amount was given as a single dose or in 10 small doses. With doses of 1, 3, 5, 7·5 and 10 mg. the amounts excreted in the urine during the following 24 hr. were in proportion to the dose. The equation for the mean response line was

$$y = 0{\cdot}580\,x - 0{\cdot}610.$$

The lines did not pass through the origin and there was a difference in slope for the individual subjects. The results confirmed those previously reported.

A. M. Copping.

2347

BEIGLBÖCK, W. and KAHLE, R. Über die Beeinflussung des Hippursäuretestes durch Pantothensäure. [**Influence of pantothenic acid on the hippuric acid test.**] *Klin. Wochenschr.*, 1955, **33**, 1056–1057. [Inn. Abt., Städt. Krankenhaus, Buxtehude.]

Administration of pantothenate at the same time as, or 30 min. before, injection of sodium benzoate caused an increase in the amount of hippuric acid excreted. The same effect was seen in patients with normal liver function and with different forms of liver disease. The role of pantothenate in acetylation processes is discussed and its use in treating patients with disturbed liver function is suggested.—A. M. Copping.

2348

RAUSCH, E. Vorläufige Ergebnisse über die klinische Verträglichkeit von Paratebin mit Pantothenat. [**Preliminary results with pantothenic acid on the clinical tolerance for Paratebin.**] *Münch. med. Wochenschr.*, 1955, **97**, 1625–1626. [Orthopäd. Klin., Univ. Cologne.]

In trials with adult patients it was found that large doses of Paratebin (streptomycin) could be given without neurotoxic side reactions if pantothenate was administered at the same time. In 3 children with tuberculous meningitis very high doses of streptomycin were well tolerated when pantothenate was given.—A. M. Copping.

2349

VILTER, R. W. **Vitamin B_6 in medical practice.** *J. Amer. Med. Assoc.*, 1955, **159**, 1210–1213. [Dept. Int. Med., Coll. Med., Univ. Cincinnati, Ohio.]

In a review article dealing with the vitamin B_6 group of substances, the chemistry, distribution in nature, availability in different forms, human requirements and role in the cell are discussed briefly. Methods used to detect deficiency of vitamin B_6 are reviewed, and the amount of xanthurenic acid excreted in the urine after a test dose of *dl*-tryptophan is considered to be the most reliable. Reports are quoted of the production by means of a deficient diet of a deficiency state characterised by convulsions and anaemia, and reversed by treatment with vitamin B_6, in 2 hydrocephalic infants, and of the production, again with a deficient diet, of seborrhoeic dermatitis and mental changes in adults.—L. Wills.

2350

COURSIN, D. B. **Vitamin B_6 deficiency in infants. A follow-up study.** *Amer. J. Dis. Child.*, 1955, **90**, 344–348. [Res. Inst., St. Joseph's Hosp., Lancaster, Pa.]

Twenty infants, previously showing severe disturbance of the nervous system (Abst. 3647, Vol. 24) when being fed on a milk mixture supplying 60 μg. vitamin B_6 per litre, were kept under observation for up to 3 years. Each patient was treated initially with vitamin B_6 and then received a diet containing adequate amounts of the vitamin. Physical and mental development and electro-encephalograms were completely normal.—L. Wills.

2351

GLENDENING, M. B., COHEN, A. M. and PAGE, E. W. **Influence of pyridoxine on transaminase activity of human placenta, maternal and fetal blood.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90**, 25–28. [Dept. Obstet. Gynaecol., Univ. California Sch. Med., San Francisco.]

Glutamic-aspartic transaminase activity was measured by a modification of the method of Tonhazy *et al.* (Title 3155, Vol. 20) in the blood of non-pregnant and pregnant women and in the cord blood and placenta at delivery. Activity resides chiefly in the blood cells. There was no significant difference between the values for non-pregnant and pregnant women; the latter were doubled when daily doses of 10 mg. pyridoxine were given. Cord blood showed high transaminase activity which was apparently not related to that of the maternal blood. Transaminase activity was high also in placental tissue and was not affected by giving pyridoxine to the mother for several weeks before delivery. It is suggested that foetal tissues contain optimum amounts of vitamin B_6 but that adult tissues do not, and that a supplement of the vitamin may be desirable during pregnancy.—A. M. Copping.

2352

MARQUEZ, L. R. and REYNOLDS, M. S. **Intake and elimination of vitamin B_6 and metabolites by women. 1. Non-pregnant women.**

TURNER, E. R. and REYNOLDS, M. S. **2. Pregnant women.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 1116–1118; 1119–1120. [Dept. Foods Nutrit., Sch. Home Econ., Univ. Wisconsin, Madison.]

1. In 6 healthy women aged from 33 to 35 years eating a diet of their own choice, the average daily intake of vitamin B_6 was 0·86 with range 0·52 to 1·2 mg. The daily faecal excretion ranged from 0·224 to 0·760 mg.; the daily urinary excretion from 0·064 to 0·126 mg. as the vitamin and from 1·95 to 4·23 mg. in the form of 4-pyridoxic acid calculated as pyridoxine. The total urinary excretion was thus 3 or 4 times the intake of the vitamin. The subjects were in negative N balance in 11 out of 15 experimental periods.

2. In 4 pregnant women similar results were obtained during the last trimester of pregnancy except that, possibly owing to higher intake of protein, the average daily intake of vitamin B_6 was 1·39 with range 0·68 to 2·01 mg. Total urinary excretion ranged from 1·83 to 5·43 mg. In the non-pregnant state 3 of the women had a lower intake of the vitamin.—L. Wills.

2353

TINELLI, G. and CALVARIO, M. L'indice xanturenico in affezioni neurologiche. [**The xanthurenic index in nervous disorders.**] *Acta vitaminol.*, 1955, **9,** 223–227. [Clin. Malat. Nerv., Univ. Bari.] French, English, German and Spanish summaries.

The xanthurenic acid index, which relates the amount of xanthurenic acid excreted in the urine to the amount of *l*-tryptophan given in a test dose of 0·1 g. per kg. bodyweight, was estimated in 15 epileptics and 21 patients with disturbances of the nervous system such as Friedrich's ataxia, Parkinsonism, chorea and Erb's progressive muscular dystrophy. The amount of xanthurenic acid excreted by normal subjects is not large enough to give an index greater than 1. Of the epileptics, 7 had an index greater than 1, and of the other patients 11; in the latter the raised index was not consistently associated with a certain type of disease. One epileptic and 4 other patients with high values for the index were given intramuscular injections of pyridoxine for from 4 to 7 days, and in every one of them the index fell to below 1.

Estimation of the index is regarded as a useful test for the state of vitamin B_6 nutrition.

E. M. Hume.

2354

GASSER, C. and HITZIG, W. 6-Mercaptopurin (Purinethol) in der Behandlung der Leukämie im Kindesalter. Vergleiche mit Cortison und Aminopterin. [**6-Mercaptopurin in the treatment of leucaemia in children. Comparisons with cortisone and aminopterin.**] *Helv. paediat. Acta*, 1955, **10,** 508–589. [Kinderklin., Univ. Zürich.] French, Italian and English summaries.

2355

UNGLEY, C. C. **The chemotherapeutic action of vitamin B_{12}.** *Vitamins and Hormones*, 1955, **13,** 137–211. [Royal Victoria Infirmary, Newcastle upon Tyne.]

2356

BARBIERI, L. L., RUMPIANESI, G. and GASBARRINI, L. Interreazioni della vitamina B_{12} con la tiamina e la riboflavina in soggetti indenni da lesioni epatiche ed in epatopazienti. [**Interactions of vitamin B_{12} with vitamin B_1 and riboflavin in subjects with and without liver disorders.**] *Acta vitaminol.*, 1955, **9,** 149–156. [Ist. Clin. Med. Gen., Univ. Bologna.] French, English, German and Spanish summaries.

Vitamin B_1 and riboflavin were estimated chemically in the urine of 10 patients with liver diseases and 10 without, before, during and after intramuscular injection of 500 μg. vitamin B_{12} daily for 3 days. The amount of both vitamins excreted before and after the treatment was less in the patients with liver disease. During treatment the amount of both vitamins in the urine rose greatly in those with liver disease and scarcely at all in those without. The highest values were obtained in response to the first and second injections; that after the third was less.—E. M. Hume.

2357

WOKES, F., BADENOCH, J. and SINCLAIR, H. M. **Human dietary deficiency of vitamin B_{12}.** *Amer. J. Clin. Nutrit.*, 1955, **3,** 375–382. [Ovaltine Res. Labs., King's Langley, England.]

The evidence is collected about the development and nature of the vitamin B_{12} deficiency occurring in British Vegans, persons subsisting on a totally vegetarian diet. In a group of 117 British Vegans of all ages, deficiency signs were more frequent than in Dutch or American Vegans; it is pointed out that the British group had had a longer period on the diet and included more young people, and the mean percentage of their calories derived from protein was 7 compared with 9 and 10·4 in the Dutch and American groups, respectively. Signs of deficiency generally appeared after several years on the diet, but some subjects still had no signs after 5 years. The most frequent signs were

in the mouth, including sore tongue, paraesthesia and other nervous symptoms; fully developed subacute combined degeneration of the cord was described previously in a boy of 15 years (Abst. 1219, Vol. 25). Amenorrhoea and other menstrual disorders were present in 8 of 22 women aged from 15 to 45 years. About 20 per cent. of the subjects complained of pain in the back.

In Vegans in apparently good health, the only ones that it was possible to examine, the average serum value for vitamin B_{12} was 111 $\mu\mu$g. per ml. with a range from 45 to 193; in 9 subjects the value was below 100, which would be definite evidence of vitamin B_{12} deficiency. The red cell count plotted against the serum vitamin B_{12} value gave a curve which resembled that seen in cases of subacute combined degeneration rather than that found in pernicious anaemia. The mean corpuscular volume of the red cells was increased. There was evidence that tyrosine metabolism and the detoxication of cyanide, both processes in which vitamin B_{12} probably plays a part, were disturbed. The weights of the Vegan children showed the rate of growth to be subnormal. The findings support the view that a state of vitamin B_{12} deficiency exists in Vegans. It is pointed out that the diet must be almost completely lacking in the vitamin so that the variation in the serum vitamin B_{12} values must result from differences in the extent of synthesis and absorption of the vitamin from the gut.—L. Wills.

2358

Wokes, F. and Picard, C. W. **The role of vitamin B_{12} in human nutrition.** *Amer. J. Clin. Nutrit.*, 1955, **3,** 383–390. [Ovaltine Res. Labs., King's Langley, England.]

Two hypotheses are outlined which might explain activity of vitamin B_{12} as animal-protein factor. Both involve the assumption that hydroxocobalamin (or aquocobalamin), and not cyanocobalamin, is the active form of vitamin B_{12}. The cyanide utilisation hypothesis postulates that, in the liver, hydroxocobalamin competes with rhodanese for CN. Rhodanese together with S donors converts CN to thiocyanate, most of which is excreted in the urine. Hydroxocobalamin takes up CN to form cyanocobalamin which may supply essential, one-carbon fragments for the synthesis of labile methyl groups. Liberation of the CN from cyanocobalamin regenerates hydroxocobalamin. The alternative sulphur-transfer hypothesis postulates the uptake of thiocyanate by hydroxocobalamin to form thiocyanatocobalamin, which might revert to cyanocobalamin, giving up its sulphur to an active intermediate X to form SX, which could be a precursor of essential sulphur-containing metabolites.—F. C. Aitken.

2359

Goldeck, H. Über Eisen- und Vitamin B_{12}-Mangel, einschliesslich ihrer Kombinationsbilder. [**Deficiency of iron and vitamin B_{12} including the picture of their combined lack.**] *Münch. med. Wochenschr.*, 1955, **97,** 1177–1178. [2. Med. Klin., Univ. Hamburg, Eppendorf.]

A general article.

2360

Saita, G., Moreo, L. and Sartorelli, E. La vitamina B_{12} nel saturnismo: azione sulla crasi ematica, sulla punteggiatura basofila e sul ricambio porfirinico. [**Vitamin B_{12} in lead poisoning: action on the blood picture, punctate basophilia and porphyrin metabolism.**] *Med. del Lavoro*, 1955, **46,** 404–410. [Clin. Lavoro L. Devoto, Univ. Milan.] English and German summaries.

It was previously found that liver extract was helpful in the anaemia of lead poisoning (*Med. del Lavoro*, 1955, **46,** 199). Nine subjects exposed to the risk of lead poisoning for not more than 4 years were treated 9 or 12 times with an injection of 500 μg. vitamin B_{12}, given every other day. There was a mean increase for all the patients of 10 per cent. for Hb and 12·5 per cent. for the red cell count, a result which was not as good as with liver extract. Reticulocytes showed a moderate increase. The number of cells with punctate basophilia decreased rapidly at first and then much more slowly. In the red blood cells, protoporphyrin increased at first and then decreased; coproporphyrin if present disappeared. In the urine coproporphyrin decreased. Vitamin B_{12} is considered to have a moderate normalising influence on porphyrin metabolism.—E. M. Hume.

2361

Neber, H. Die Therapie verschiedener Hautkrankheiten, insbes. allergischer Genese, mit Vitamin B_{12}. [**Treatment of skin diseases, particularly those of allergic origin, with vitamin B_{12}.**] *Münch. med. Wochenschr.*, 1955, **97,** 1102–1103. [Osnabrücker Str. 17, Berlin-Charlottenburg 1.]

When skin conditions were treated with vitamin B_{12}, the best results were obtained with contact dermatitis and drug eczema, which frequently cleared up completely and rapidly. Considerable improvement was obtained also in acne vulgaris and in a single patient with lichen planus, but the results were disappointing with eczema of unknown origin and acne rosacea. The dose of vitamin B_{12} varied with the severity of the condition but an injection of 1000 μg. 2 or 3 times a week was frequently used.—L. Wills.

2362

ANNAND, J. C. **Growth factors as desensitizing agents.** *Practitioner*, 1955, **175**, 725–729. [Dundee.]

In 23 of 30 children suffering from allergy, including asthma, urticaria or eczema and periodic gastro-enteritis, there was great improvement, generally after a latent period of 4 or 5 weeks, when a daily oral supplement of liver or cyanocobalamin, with or without intrinsic factor, was given. Secondary infections tended to cause relapse, probably by reducing absorption.

L. Wills.

2363

MURATA, K. and MIYAMOTO, T. **The determination of vitamin B_{12} activity in human blood.** *J. Vitaminol., Japan*, 1955, **1**, 297–304. [Lab. Food Nutrit., Fac. Sci. Living, Osaka City Univ., Nishi-ku.]

Vitamin B_{12} was extracted from whole blood after treatment with trypsin and pancreatin, and estimated with *Lactobacillus leichmannii*. Part of the study was made in the United States and part in Japan. The values for all subjects in mμg. per ml. ranged from 0·10 to 0·66 with an average of 0·28 for 52 U.S. subjects and of 0·37 for 52 Japanese subjects.—A. M. Copping.

2364

KARLIN, R. Sur la vitamine B_{12} et la méthionine du sérum sanguin chez la femme, pendant la gestation et la lactation. [**Vitamin B_{12} and methionine in the blood serum of women during pregnancy and lactation.**] *C.R. Soc. Biol.*, 1955, **149**, 971–974.

Vitamin B_{12} was estimated with *Lactobacillus leichmannii* and methionine with *Leuconostoc mesenteroides* in blood from 20 non-pregnant women, 165 pregnant women and 7 women during lactation. The values for both vitamin B_{12} and methionine tended to be low during the middle trimester of pregnancy and during lactation. The amount of vitamin B_{12} in the milk was very low and was related to the vitamin B_{12} and methionine content of the serum.—A. M. Copping.

2365

FOY, H., KONDI, A. and MANSON-BAHR, P. E. C. **Penicillin in megaloblastic anaemias of Africans. Effect on serum-vitamin B_{12} levels and absorption of radioactive vitamin B_{12}.** *Lancet*, 1955, **269**, 693–699. [Wellcome Trust Res. Labs.]

The patients with megaloblastic anaemia studied fell into 2 classes, in one of which there was a response to oral or parenteral penicillin or to oral vitamin B_{12}, and in the other to oral folic acid but not to penicillin or vitamin B_{12}. In the patients who responded to penicillin or vitamin B_{12} the serum vitamin B_{12} before treatment ranged from 20 to 100 $\mu\mu$g. per ml. but rose to normal after treatment. In contrast those who responded to folic acid had normal or high values for vitamin B_{12} in the serum, ranging from 300 to 1300 $\mu\mu$g. per ml. Treatment with penicillin of patients with values below 700 $\mu\mu$g. per ml. raised the value for vitamin B_{12} in the serum, but not for the red blood cells or Hb, but if the value for vitamin B_{12} in the serum was initially above 700 $\mu\mu$g. per ml. penicillin did not alter it. In both classes excretion of radio-active vitamin B_{12} was within normal limits. Free HCl was present in the gastric juice before and after histamine. A single patient with histamine-resistant achlorhydria and signs of subacute combined degeneration was diagnosed as having early pernicious anaemia. In the patients examined by gastroscopy, including the one diagnosed as pernicious anaemia, there was no evidence of gastric atrophy. The findings suggest that intrinsic factor was present in all the patients. The possible influence of the largely carbohydrate diet on the intestinal flora and the effect of penicillin on the flora and hence on the amount of vitamin B_{12} available are discussed.—L. Wills.

2366

DONNER, L., HEŘMANSKÝ, F. and PUDLÁK, P. Zhoubná chudokrevnost v Pražském kraji. [**Pernicious anaemia in the district of Prague.**] *Čas. Lék. čes.*, 1955, **94**, 581–587. Russian and English summaries.

2367

CONLEY, C. L. and KREVANS, J. R. **New developments in the diagnosis and treatment of pernicious anemia.** *Ann. Int. Med.*, 1955, **43**, 758–766. [Dept. Med., Johns Hopkins Univ., Baltimore, Md.] Interlingua summary.

Of 14 patients with pernicious anaemia presenting with severe subacute combined degeneration of the cord without appreciable anaemia, more than half had been treated earlier with multiple vitamin preparations containing folic acid. Such treatment in mild anaemia is dangerous. Diagnosis in doubtful cases was made by Schilling's test for the urinary excretion of radio-activity after an oral dose of radio-active vitamin B_{12} followed by a large parenteral flushing dose of inert vitamin B_{12}. The most reliable treatment is considered to be injection of vitamin B_{12} since, even after very large oral doses of the vitamin, the serum value remains subnormal although a complete haematological remission may have been produced and maintained for many months.—L. Wills.

2368

KLAYMAN, M. I. and BRANDBORG, L. **Clinical application of cobalt^{60}-labeled vitamin B_{12} urine test.** *New Engl. J. Med.*, 1955, **253**, 808–812. [Dept. Med., Univ. Chicago, Ill.]

The findings of other workers that, in pernicious anaemia and after total gastrectomy, only insignificant amounts of radio-activity appear in the urine after an oral test dose of radio-active vitamin B_{12} followed by a flushing parenteral dose of inactive vitamin B_{12}, were confirmed. In addition, 3 patients not suffering from either condition excreted only insignificant amounts of radio-activity after the test dose; in 2 of them the failure was apparently due to faulty absorption, caused by removal of a large part of the small intestine in one and by diffuse gastric carcinoma in the other; in the third the failure was not explained. Other patients showed small excretions of which the significance was not clear.

L. Wills.

2369

HÖPKER, W. Eiweisszufuhr und Erhaltungsdosis bei Perniciosakranken. [**Protein supply and maintenance dose for patients with pernicious anaemia.**] *Klin. Wochenschr.*, 1955, **33**, 1002–1006. [Med. Klin., Univ. Greifswald.]

The mean haematological findings in a group of 38 patients with pernicious anaemia, who received in addition to the basic treatment with parenteral liver extract a supplement of 0·5 litre whole milk daily and 250 g. cheese weekly, did not differ significantly from those for a similar group of patients given the basic treatment only. The mean daily maintenance dose of vitamin B_{12} for all the patients during 9 months was 2·3 μg. with range 0·5 to 4·5.—L. Wills.

2370

MONTO, R. W. and REBUCK, J. W. **Observations on the mechanism of intranasal absorption of vitamin B_{12} in pernicious anemia.** *Blood, J. Hematol.*, 1955, **10**, 1151–1155. [Div. Haematol., Dept. Labs., Henry Ford Hosp., Detroit, Mich.]

Crystalline vitamin B_{12}, given intranasally in doses of 100 μg. in saline solution or as a lactose powder, produced a haematological response in 32 patients in relapse and when given every 3 or 4 weeks maintained 55 patients in satisfactory remission. Nasal washings obtained from a normal subject after the instillation of 150 μg. vitamin B_{12} were given by stomach tube to a patient in relapse. There was no response, but the same patient responded later to 150 μg. vitamin B_{12} when it was placed on the nasal mucosa. The opinion is offered that the vitamin is absorbed directly and not after combination with intrinsic factor.—L. Wills.

2371

REISNER, E. H. (Jr.), WEINER, L., SCHITTONE, M. T. and HENCK, E. A. **Oral treatment of pernicious anemia with vitamin B_{12} without intrinsic factor.** *New Engl. J. Med.*, 1955, **253**, 502–506. [Div. Haematol., Dept. Med., Postgrad. Med. Sch., Univ. New York.]

Of 43 patients with pernicious anaemia the majority were brought into and maintained in satisfactory remission for from 12 to 28 months on an oral dose of 1 mg. vitamin B_{12} given once or twice a week or every 2 weeks. The cost was materially less than for injections.—L. Wills.

2372

GERNER, G. and HENNING, N. Das Vitamin-B_{12}-Bindungsvermögen des menschlichen Magensaftes in Beziehung zum histologischen Bild der Fundusschleimhaut. [**Vitamin-B_{12}-binding capacity of human gastric juice in relation to the histological picture of the fundus mucosa.**] *Gastroenterologia*, 1955, **84**, 103–118. [Med. Klin., Univ. Erlangen.] English and French summaries.

The methods used are described; the vitamin B_{12} of the gastric juice was estimated microbiologically with *Euglena gracilis*. Biopsy material was obtained from the lower third of the fundus. In 46 subjects the vitamin B_{12} content of the fasting juice was related to the amount of free acid, regardless of the clinical condition of the subject. With normal acidity the mean value per ml. was for free vitamin B_{12} 4·66 $\mu\mu$g. with range 0·10 to 37·4 and for total vitamin B_{12} 82·70 $\mu\mu$g. with range 0·48 to 208·0. With hyperacidity both mean values were increased to 11·53 and 130·62, respectively. In subacidity and anacidity, respectively, the mean free value was increased to 26·05 and 50·55, though the mean value for total vitamin B_{12} remained the same as with normal acidity. In 28 subjects with no gastric symptoms the mean value for free vitamin B_{12} was 6·45 with range 0·00 to 66·40; the mean for total vitamin B_{12} was 118·45 with range 0·48 to 460·00, and the mean binding capacity in 35 min. 122·39 $\mu\mu$g. per ml. with range 0·00 to 387·40. In 11 subjects with histologically confirmed chronic superficial gastritis the corresponding figures were 10·45, 70·25 and 216·32; the last value was not significantly greater than the normal mean binding capacity. In 10 patients with histologically confirmed atrophic gastritis associated with anacidity, of whom 2 had pernicious anaemia, the corresponding values were 49·01, 96·69 and 26·04, the last value being significantly below normal. After parenteral treatment of the pernicious anæmia patients with vitamin B_{12} there was a great rise in the free vitamin value. After histamine injection there was a slight rise in the vitamin-B_{12}-binding capacity of

the gastric juice in normal subjects but a decrease in patients with gastritis. [There are discrepancies between text and tables and arithmetical errors seem to occur.]—L. Wills.

2373

MASSEY, B. W. and KLAYMAN, M. I. **Observations on epithelial cells exfoliated from the upper gastrointestinal tract of patients with pernicious anemia, simple achlorhydria, and carcinoma of the esophagus and stomach.** *Amer. J. Med. Sci.*, 1955, **230,** 507–514. [Frank Billings Med. Clin., Dept. Med., Univ. Chicago, Ill.] Interlingua summary.

2374

ŁOPOREK, M., BISHOP, R. C., NELSON, N. A. and BETHELL, F. H. (with HAINES, M. T. and KLIMOVICH, J.) **Urinary excretion of Co^{60}-vitamin B_{12} as a test for effectiveness of intrinsic factor preparations.** *J. Lab. Clin. Med.*, 1955, **46,** 665–670. [Thomas Henry Simpson Mem. Inst. Med. Res., Univ. Michigan, Ann Arbor.]

Pernicious anaemia patients in remission were given an oral dose of ^{60}Co vitamin B_{12}, and the percentage of it excreted in the urine in 24 hr. was estimated by Schilling's technique. In most of the subjects the excretion was about $0{\cdot}5 \pm 0{\cdot}2$ per cent. of a standard dose of 0·05 μC. ^{60}Co, but in a certain number the excretion was high, so that a control test of this kind must always be made before a patient is used to test a preparation of intrinsic factor. For tests of intrinsic factor suitable subjects were given, with the radio-active ^{60}Co, a given quantity of the preparation of intrinsic factor, and the output of radio-activity was measured and compared with that after radio-active ^{60}Co alone. Some preparations showed a maximum concentration beyond which their activity decreased, possibly on account of the presence of inhibitory material in the preparation, or because there is an optimum ratio of intrinsic factor to vitamin B_{12}. Results with preparations of known potency and with normal gastric juice suggested that excretion of 2·5 per cent. of the dose was the minimum proportion which could be taken to indicate activity.—L. Wills.

Vitamin C

2375

LEVINE, V. E. **Scurvy in Nebraska: 2. The epidemic of scurvy among the Indians of the Omaha tribe, 1845-1846.** *Amer. J. Digest. Dis.*, 1955, **22,** 294–295. [Dept. Biol. Chem. Nutrit., Sch. Med., Creighton Univ., Omaha 2, Nebr.]

See Abst. 4159, Vol. 25.

2376

HAYNES, R. C. (Jr.) and SCHEID, H. L. **Lack of effect of ascorbic acid on hydrocortisone metabolism in man.** *J. Clin. Endocrinol.*, 1955, **15,** 1257–1261. [U.S. Army Med. Nutrit. Lab., Fitzsimons Army Hosp., Denver, Colo.]

Measurement of hydrocortisone in plasma and of 17-hydroxycorticoids and 17-ketosteroids in urine from 5 normal men showed that large doses of ascorbic acid did not significantly affect the metabolism of hydrocortisone given by mouth.

A. Hepburn.

2377

ROWLANDS, R., KAMASASTRI, P. V., JOSEPH, M. and ROW, M. **Studies in ascorbic acid.** *Indian J. Med. Res.*, 1955, **43,** 627–635. [Christian Med. Coll. Hosp., Vellore.]

The average total ascorbic acid concentration in whole blood from 43 normal adults, 100 out-patients with gastric disturbances and 100 miscellaneous patients was 0·88, 0·42 and 0·41 mg. per 100 ml., respectively. Two, 33 and 32 from the respective groups had less than 0·25 mg. per 100 ml.

Ascorbic acid saturation tests were made on 43 normal subjects. There was good correlation between the number of days to reach saturation, the kind of diet and the initial blood value for ascorbic acid. It was, therefore, thought that saturation tests provided little additional information, and that the dietary history and blood ascorbic acid value were sufficient for survey work.

A. Hepburn.

2378

MEL'NIKOV, A. A. Vliyanie vitamina C khloristogo kal'tziya na reaktivnost sosudov i vodnyi obmen pri nefritakh. [**The influence of vitamin C and calcium chloride on vascular reactivity and water metabolism in patients with nephritis.**] *Klin. Med., Mosk.*, 1955, **33,** No. 4, 85–86.

The cold pressure and nicotine test revealed that a continuous drip of calcium chloride had a pressor effect on the vascular system of patients with chronic nephritis. Injection of from 2 to 3 ml. of a 10 per cent. solution of ascorbic acid had an antipressor effect. Calcium chloride stimulated diuresis. Ascorbic acid alone inhibited it, but in the presence of calcium chloride given by continuous drip it stimulated diuresis. In chronic nephritis administration of ascorbic acid over a long period or even permanently is recommended in a dose of 60 mg. daily, with calcium chloride only when the disease is severe, or when vitamin C is ineffective.—E. S. Fountain.

2379

IKEUCHI, M. **Biochemical studies on D-arabo-ascorbic acid in vitamin C deficiency.** *J. Vitaminol., Japan*, 1955, **1,** 193–199. [Lab.

Biochem., Tokyo Jikeikai Sch. Med., Minato-ku.]

When human subjects suffering from vitamin C deficiency due to malnutrition were given araboascorbic acid by intravenous injection they excreted 10 to 15 times as much reduced araboascorbic acid in the urine as the reduced ascorbic acid excreted by similar subjects receiving ascorbic acid. After 6 hr., 5 per cent. of total ascorbic acid was excreted and more than 50 per cent. of total araboascorbic acid. The antiscorbutic activity of araboascorbic acid was therefore considered to be trifling in comparison with that of ascorbic acid.—A. Hepburn.

Other Vitamins

2380

HAUSCHILD, W. Schockverhütung durch Rutin. [**Protection from shock with rutin.**] *Münch. med. Wochenschr.*, 1955, **97**, 1101–1102. [Chirurg. Klin. Charité, Univ. Berlin.]

In view of satisfactory results reported in animal experiments, the protective effect of rutin against anaphylactic shock was investigated in 10 patients undergoing tests for serum treatment of leucaemia or malignant metastases. The patients were given from 6 to 66 injections of rabbit serum by different routes within from 15 to 77 days. When rutin was injected 5 min. before the serum, anaphylactic reactions were prevented or minimised. Small local reactions sometimes occurred but quickly subsided. The possibility of using rutin as a protection against shock in many forms of serum treatment is suggested.

A. M. Copping.

2381

SAITA, G., GATTONI, L. and SARTORELLI, E. Le modificazioni dell'attività protrombinica nel saturnismo. Azione della vitamina K. [**Modifications of prothrombin activity in lead poisoning. Effect of vitamin K.**] *Med. del Lavoro*, 1955, **46**, 541–548. [Clin. Lavoro L. Devoto, Univ. Milan.] English and German summaries.

The prothrombin time of Quick was estimated and the concentration calculated in 39 subjects with lead poisoning, 15 of them with acute lead colic, and 24 of them in a chronic state. In 22 of them factor V and factor VII, which contribute to the conversion of prothrombin to thrombin, were estimated separately. In the 15 subjects with acute colic, the prothrombin concentration was normal in 5 and low in 10. In the 24 chronic cases, it was normal in 11 and low in 13. Deficiency of factor VII was always present if the prothrombin value was low, but might exist also with a normal value. Factor V was little affected in any of the subjects. Blood values for bilirubin were somewhat raised, and liver damage was therefore thought probable. As test of liver function, prothrombin was estimated in the blood before and 3, 5 and 24 hr. after an intravenous injection of 10 mg. vitamin K in 7 of the acute and 10 of the chronic cases. In each group the prothrombin value returned to normal within 5 hr. in some and within 24 hr. in others, but in 2 of the chronic cases the value returned to normal only within 24 hr. after 50 mg. had been injected. It is considered that damage to liver parenchyma existed in proportion to the difficulty of restoring the prothrombin value to normal, but that it was never severe.—E. M. Hume.

2382

DE GARIS, M. C. **Vitamin K and the Rh-negative mother.** *Med. J. Austral.*, 1955, ii, 311. [Geelong, Victoria.]

From favourable experience in preventing haemorrhage in mother and child, and jaundice in the child, it is recommended that 20 mg. vitamin K 3 times daily should be given to all rhesus-negative mothers as soon as they are known to be pregnant.—E. M. Hume.

2383

STREHLER, E. Gegenwärtiger Stand der sog. "Vitamin-U"-Therapie der Magendarm-Ulcera. [**Present position of the so-called "Vitamin U" treatment of peptic ulcer.**] *Gastroenterologia*, 1955, **84**, 119–132. [Zürich.] English and French summaries.

A review. See Abst. 4221, Vol. 20.

DENTAL DISEASES

2384

NIEMAN, C. Invloed van suiker op tandcaries. [**Effect of sugar on dental caries.**] *Voeding*, 1955, **16**, 977–986.

The Medical Research Council 1955 dental survey (Abst. 5664, Vol. 25) and the Swedish study at Vipeholm (Abst. 4175, Vol. 25) are described and compared and the results are discussed in relation to some experiments on animals.

I. Leitch.

2385

WILKINSON, F. C. **Fluoridation in the prevention of dental caries.** *Practitioner*, 1955, **175**, 488–494. [Univ. London.]

2386

JENKINS, G. N. **The pros and cons of fluoridation.** *Brit. Dent. J.*, 1955, **99**, 249–263. [King's Coll., Newcastle upon Tyne.]

A review with numerous references.

2387

SHAW, J. H. Devemos adicionar fluoretos às águas de abastecimento público? [**Problem of adding fluorides to the public water supply.**] *Bol. Ofic. sanit. panamer.*, 1955, **39**, 151–162. [Sch. Med. Dent., Harvard Univ.]

2388

GALAGAN, D. J. and VERMILLION, J. R. **Effect of topical fluorides on teeth matured on fluoride-bearing water.** *Pub. Health Rep., Washington*, 1955, **70**, 1114–1115.

The study was made on 282 children aged from 7 to 16 years, in Tucson, Arizona, where the water supply contained 0·7 p.p.m. F. Either right or left quadrants of the teeth were treated 4 times during a year with sodium fluoride, and control teeth with tap water. The incidence of caries in the treated teeth was 9 per cent. less than in the control, but the difference is stated to be not significant.—J. S. Thomson.

2389

SIDDIQUI, A. H. **Fluorosis in Nalgonda District, Hyderabad-Deccan.** *Brit. Med. J.*, 1955, ii, 1408–1413. [Osmania Med. Coll., Hyderabad-Deccan.]

Three villages about 50 miles from the city of Hyderabad with populations of 95, 813 and 1100 were chosen. The general standard of living of the people was poor and the ranges for F content of water from their wells were, respectively, 9·2 to 11·8, 5·5 to 6·8 and 2·5 to 7·5 p.p.m. Clinical findings are tabulated for 32 persons in whom there were neurological signs and radiological, haematological and biochemical studies also are reported.

The findings were in agreement with the high intakes of F by the patients. The physical strain of carrying loads on their heads is thought to have caused changes in the skull and cervical spine, areas which have seldom been reported as affected. One patient was excreting 3·4 p.p.m. F in urine 10 years after he had left the endemic area. In a chicken with the disease the bones were found to contain 37·8 mg. F per 100 g. dry matter.—D. Harvey.

2390

TAKAMORI, T. **Recent studies on fluorosis.** *Tokushima J. Exp. Med.*, 1955, **2**, 25–44. [Dept. Int. Med., Sch. Med., Univ. Tokushima.]

A summary of results already published by other workers from the author's department in Tokushima University. See Title 4469, Vol. 23; Absts. 3403, Vol. 24; 878, 2640 and 2749, Vol. 25.

D. Harvey.

POISONS: PATHOGENIC ORGANISMS: FOOD LAWS

2391

PAUL TRÜB, C. L. and REPLOH, H. Erkrankungen durch Lebensmittel in der Nachkriegszeit (1946–1950) im Lande Nordrhein-Westfalen. [**Illnesses due to food in the post-war period, 1946-50, in Nordrhein-Westphalia.**] *Arch. Hyg., Berlin*, 1954, **138**, 98–129. [Medizinalabt. Bezirksregierung, Düsseldorf.]

Outbreaks of food poisoning are considered under the headings typical bacterial infections, atypical bacterial infections and poisoning with chemical substances with which are included beans, potatoes in an inedible state and genuine chemical poisons gaining accidental access to food or water. The number of officially registered cases analysed was 5858. Suggestions are made about amending the laws.—E. M. Hume.

2392

[COMMISSION FOR NUTRITION, SWITZERLAND.] 3. Tätigkeitsbericht der Eidg. Kommission für Volksernährung, Lebensmittelgesetzgebung und -kontrolle zu Handen des Eidg. Departementes des Innern umfassend die Jahre 1953 und 1954. [**3rd Report of the Commission for Nutrition, Food laws and Food Control to the Swiss Federal Department of the Interior for the years 1953 and 1954.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1955, **46**, 261–274; in French, 275–287.

The main matters dealt with by the Commission were: milk, bacteriological improvement and elimination of tuberculous cows (findings embodied in new laws); bread, reconsideration of extraction rate in connection with dental caries, since dentists declare that school entrants' teeth, which improved during the war, are now worse than before it; health of mountain population, plans for 3-year small-scale surveys in restricted areas where nutritional deficiencies are known to occur; additions to foods, (1) addition of vitamin D to milk for children recommended, but not general addition of vitamins to milk, or to spirits or tobacco, (2) fluorine to prevent caries, group of experts to consider whether addition of F to water, salt or other foods is desirable in Switzerland, regular taking of fluoride tablets by pregnant women and children under 11 suggested as an interim measure, (3) anti-oxidants, those occurring naturally in foods permissible unless in excess, and a few tested synthetic ones where spoilage would otherwise be inevitable, (4) colours, encouragement of the use of the 12 synthetic colours on the international list first set up at Bad Godesburg in May 1954. Steps were also taken towards initiation of studies of the possible biological effects of insecticides and artificial manures.—W. M. Deans.

See also Absts. 1517, 1551.

IMMUNITY

2393

NICHOLLS, R. W. **Infantile eczema in a breast-fed baby; relief from goat's milk.** *Med. J. Austral.*, 1955, i, 798. [Yackandandah, Victoria.]

A change from breast milk to goat's milk produced immediate and lasting relief in a baby of 7 months with eczema of the scalp and limbs. Previous treatment with 1 per cent. hydrocortisone ointment or intramuscular injection of corticotropin had given only slight or temporary improvement.—M. H. Pierce.

2394

LEPORE, J. J. **Ketocholanic acids as an adjunct in management of high fat diet allergies.** *Amer. J. Digest. Dis.*, 1955, **22**, 318–319. [Marlboro, Mass.]

Three patients allergic to fatty foods were treated successfully with a low-fat diet and a ketocholanic acid preparation, Triketol.—F. C. Aitken.

THERAPEUTIC AND PREVENTIVE DIETETICS

GENERAL

2395

MOELLER, H. C., GROSSMAN, M. I., PALM, L., CUSHING, A., STADLER, J. B. and BECKER, G. H. **A study of two intravenous fat emulsions in human subjects.** *J. Lab. Clin. Med.*, 1955, **46**, 450–460. [U.S. Army Med. Nutrit. Lab., Denver, Colo.]

Febrile responses in human subjects and rabbits to infusions of cottonseed oil and olive oil emulsions were recorded and expressed quantitatively as fever indices. There was no significant difference in fever index between the emulsions.

Biochemical and haematological studies in the human subjects showed that the magnitude of the febrile response was not well correlated with optical density, total fatty acid, free fatty acid or lysozyme of the serum or with changes in leukocytosis.

Concentration of free fatty acid in serum rose during the lipaemia which was induced by infusion of fat emulsion.—F. C. Aitken.

2396

MOLL, J. C., STICKLER, G. B. and DAUGHERTY, G. W. Die Flüssigkeits- und Elektrolytbehandlung. 1. Die patho-physiologischen Grundlagen der Flüssigkeits- und Elektrolyttherapie. [**Treatment with fluid and electrolytes. 1. Pathophysiological basis of treatment with fluid and electrolytes.**] 2. Planung und praktische Durchführung einer Flüssigkeits- und Elektrolyt-Therapie. [**2. Planning and practice of treatment with fluid and electrolytes.**] 3. Anwendung der Flüssigkeits- und Elektrolyt-Therapie in der Kinderheilkunde. [**3. Use of treatment with fluid and electrolytes in paediatrics.**] 4. Flüssigkeits- und Elektrolyttherapie der inneren Medizin. [**4. Treatment with fluid and electrolytes in internal medicine.**] *Deutsch. med. Wochenschr.*, 1955, **80**, 1505–1508; 1702–1704; 1770–1772; 1846–1854. [Mayo Clin., Rochester, Minn.]

3. Most of the signs of digestive disorders in infants can be explained by loss of water and electrolytes. The scheme of treatment described is that of Harrison (*Pediat. Clins. N. Amer.*, 1954, p. 335 (May)).

4. This part deals with the treatment of kidney disorders, heart disorders, diabetic coma, acute adrenal insufficiency and treatment before and after operations, and concludes with a list of 76 references.—W. M. Deans.

See also Absts. 1563, 1980.

DIABETES

2397

JACKSON, W. P. U. **A concept of diabetes.** *Lancet*, 1955, **269**, 625–631. [Dept. Med., Univ. Cape Town.]

See also Title 1867, Vol. 23.

2398

ROBERTSON, J. **The management of diabetes in childhood.** *Postgrad. Med. J.*, 1955, **31**, 89–92. [Diabetic Dept., King's Coll. Hosp., London.]

2399

GOODMAN, J. I. **Management of uncomplicated diabetes mellitus.** *Metabolism*, 1955, **4**, 446–458.

2400

HUGH-JONES, P. **Diabetes in Jamaica.** *Lancet*, 1955, **269**, 891–897. [Dept. Med., Univ. Coll. W. Indies, Jamaica.]

Of 215 patients with diabetes 13 were insulin-resistant and had little tendency to ketosis. They were usually young and thin. Trials made with local plant infusions reputed to cure diabetes were unconvincing.—F. C. Aitken.

2401

NABARRO, J. D. N., BECK, J. C. and STOWERS, J. M. **Fructose in the treatment of severe**

diabetic ketosis. *Lancet*, 1955, **269**, 1271–1274. [Middlesex Hosp., London.]

Trials with fructose in the treatment of ketosis did not give results which would justify its routine use in severe diabetic ketosis.—F. C. Aitken.

2402

FRANKE, H. and FUCHS, J. Ein neues antidiabetisches Prinzip. Ergebnisse klinischer Untersuchungen. [**A new antidiabetic principle. Results of clinical studies.**]

ACHELIS, J. D. and HARDEBECK, K. Über eine neue blutzuckersenkende Substanz. Vorläufige Mitteilung. [**A new substance that reduces blood sugar. Preliminary communication.**]

BERTRAM, F., BENDFELDT, E. and OTTO, H. Über ein wirksames perorales Antidiabeticum (BZ 55). [**An antidiabetic active by mouth (BZ 55).**] *Deutsch. med. Wochenschr.*, 1955, **80**, 1449–1452; 1452–1455; 1455–1460. [1. Inn. Abt., Auguste Viktoria Krankenhaus, Berlin-Schöneberg.]

A sulphonamide, N_1-sulphanilyl-N_2-*n*-butylcarbamide, has been found, when taken by mouth, to reduce the blood sugar after 2 to 3 hr. in both healthy subjects and diabetic patients. It was found to be ineffective in patients with mild acidosis, in younger diabetics and in those whose disease was of long standing, and to be contra-indicated in patients with liver or skin disorders. Diet control is still considered to be important.

W. M. Deans.

2403

HARTMANN, A. F. **Pathologic physiology in some disturbances of carbohydrate metabolism.** *J. Pediat.*, 1955, **47**, 537–570. [Dept. Paediat., Washington Univ. Sch. Med., St. Louis, Mo.]

Disturbances in children of carbohydrate metabolism, such as diabetes, galactose-storing disease, hypoglycaemia and ketosis, are discussed with special reference to the author's published work (Titles 3432, Vol. 7; 5023, Vol. 8; 681, Vol. 24 and Absts. 3818, Vol. 17; 4717, Vol. 24).

F. C. Aitken.

See also Absts. 1977, 2327, 2339.

GASTRO-INTESTINAL CONDITIONS

2404

USMANI, H. A. **Preliminary observations on the treatment of diarrhoea in children with carrot soup.** *Indian J. Pediat.*, 1955, **22**, 244–246. [Dept. Paediat., Patna Med. Coll. Hosp.]

Treatment was successful in 19 of 25 patients.

F. C. Aitken.

2405

BENJAMIN, B. and SCHULMAN, J. L. **Use of reference tables in fluid therapy of diarrheal dehydration.** *Amer. J. Dis. Child.*, 1955, **90**, 392–406. [Dept. Paediat., State Univ. New York Coll. Med., Brooklyn.]

Tables are given for treatment of 3 degrees of estimated dehydration produced by diarrhoea in infants and children weighing from 2 to 20 kg. The fluids are isotonic saline, *M*/6 lactate, 5 per cent. dextrose and 15 per cent. KCl solution, and explanations and an illustration of the necessary apparatus are provided. In older infants and children feeding by mouth can generally begin after 24 hr.; in very young infants it is thought better to continue intravenous administration of fluids for 2 to 4 days and to offer small amounts of milk cautiously by mouth, generally on the third day.—W. M. Deans.

2406

CLEMENT, R. Tratamiento de la deshidratacion en el lactante. [**Treatment of dehydration in the infant.**] *Rev. española Pediat.*, 1955, **11**, 349–353. [Paris.]

2407

CHOWDHURY, A. K. R., SAHA, K. C. and CHADHA, U. N. **Comparative study of measures used in peptic ulcer therapy.** *J. Indian Med. Assoc.*, 1955, **25**, 251–256. [R.G. Kar Med. Coll. Hosp., Calcutta.]

2408

FISCHER, R. Hämatologische Untersuchungen bei Magenoperierten. [**Haematological investigations in patients who have had stomach operations.**] *Langenbecks Arch. klin. Chirurg.*, 1955–1956, **281**, 184–191. [Chirurg. Klin., Univ. Tübingen.]

2409

JACKSON, W. P. U. and LINDER, G. C. **The clinical and metabolic effects of massive intestinal resections.** *Acta med. scand.*, 1955, **102**, Suppl. 306, 96–106. [Dept. Med., Univ. Cape Town.]

Two cases are described. In one patient who died 3½ years after operation there were signs of poor absorption, specific deficiencies and mental disorder but no anaemia or tetany; a fall in plasma protein occurred late. The picture was of under-nutrition rather than the jejuno-ileal insufficiency syndrome (Bennett and Hardwick, Abst. 3068, Vol. 10). In the other patient, who made excellent progress, there was no evidence of poor absorption 5 years after operation.—F. C. Aitken.

2410

BERG, G. and FRENGER, W. Verdauungs- und Resorptionsstörungen nach Ausschaltung grösserer Abschnitte des Dünndarms.

[Disturbances of digestion and absorption after by-passing of large parts of the small intestine.] *Deutsch. med. Wochenschr.*, 1955, **80,** 1799–1802. [Med. Klin., Univ. Erlangen.]

Six patients are described in whom digestive disturbances developed after surgical treatment had considerably reduced the functional length of the small intestine. All had frequent fluid stools. Digestion and absorption were reduced and all the patients were emaciated.

Five had low serum albumin, 2 with oedema, though 2 had normal total serum protein. The clinical condition suggested deficiency of all the main dietary components and of Fe, but, although 2 patients had osteoporosis and 2 had pigmented skin, no clear sign of mineral or vitamin deficiency was found.—D. Duncan.

2411

FRAZER, A. C. **Steatorrhoea.** *Brit. Med. J.*, 1955, ii, 805–809. [Dept. Pharmacol., Univ. Birmingham.]

Steatorrhoea is defined as the passage of fluid or semi-fluid, bulky, pale, fatty and usually offensive stools. The passage of formed stools of abnormally high fat content should not be called steatorrhoea. The relation of steatorrhoea to faulty intestinal absorption is indicated and the defects of absorption are classified as pancreatogenous, hepatogenous and enterogenous. Enterogenous conditions are differentiated as gluten-induced enteropathy, tropical sprue or anastomatic syndromes. Dietary treatment to reduce bacterial activity in the intestine and other specific measures, such as administration of pancreatic enzymes, bile salts, folic acid or a gluten-free diet, are described.

F. C. Aitken.

2412

HAWKINS, C. F. **The treatment of steatorrhoea.** *Postgrad. Med. J.*, 1955, **31,** 552–557. [Dept. Clin. Med., Univ. Birmingham.]

Some patients with steatorrhoea respond to treatment with a gluten-free diet. For those who do not the diet recommended is one high in protein, 100 to 120 g., and low in fat, 50 g. or less.

Anaemia, osteomalacia and tetany, dehydration and electrolyte disturbance may occur with steatorrhoea. The treatment of these conditions is outlined, together with the method of relieving diarrhoea and the use of adrenal cortical hormone.

An addendum gives instructions to patients on a gluten-free diet.—F. C. Aitken.

2413

FRIEDLANDER, P. H. and GORVY, V. **Steatorrhoea. A review of 40 patients, with particular reference to diagnosis.** *Brit. Med. J.*, 1955, ii, 809–812. [Middlesex Hosp., London.]

The term steatorrhoea is used when the fat in the faeces exceeds 10 per cent. of the amount of fat ingested each day. Steatorrhoea is classified as primary, which includes idiopathic steatorrhoea, tropical sprue and coeliac disease, or secondary, where a lesion that might cause faulty fat absorption has been diagnosed. Of the 40 cases reviewed 13 were primary, 23 were secondary and in 4 the type was uncertain. The bases of the differential diagnosis are discussed.—F. C. Aitken.

2414

SHELDON, W. **Coeliac disease.** *Lancet*, 1955, **269,** 1097–1103. [King's Coll. Hosp., London.]

2415

VAN DE KAMER, J. H. and WEIJERS, H. A. **Coeliac disease. 5. Some experiments on the cause of the harmful effect of wheat gliadin.** *Acta paediat.*, 1955, **44,** 465–469. [Central Inst. Nutrit. Res. T.N.O., Utrecht.] French, German and Spanish summaries.

For part 4 see Title 1189, Vol. 24.

The possibility was investigated that the harmful effect of wheat gliadin in coeliac disease was due to its high glutamine content. Two patients in good condition and on a wheat-free diet were given glutamine in doses of 2 g. rising to 4 g. daily. These amounts, equivalent to 125 to 250 g. wheat flour, had no adverse effect. Gliadin was boiled with *N* HCl for 45 min., a procedure which converted 90 per cent. of the glutamine into glutamic acid and NH_3 but affected the peptide bonds only slightly. This preparation was given in place of gliadin to 2 patients showing the toxic effects of wheat protein. One recovered completely. The second and more severely ill recovered when the gliadin preparation given had been boiled for 2 hr. and only 3 per cent. of the glutamine remained unchanged.

The experiment suggested that glutamine bound in gliadin, but not free glutamine, was the cause of the harmful effect of wheat gliadin. The ratio amide N : non-amide N in several foods was estimated. All harmless proteins had ratios of 11 or less; harmful protein had higher values, such as wheat flour 23, wheat gliadin 30.—F. C. Aitken.

2416

HOLLER, G. Untersuchungen und Erfahrungen mit "Cellumikromoor". **[Studies and results with "Cellumikromoor".]** *Gastroenterologia*, 1955, **83,** 343–348. [Allg. Krankenhaus, Baden, near Vienna.] English and French summaries.

A mixture of carboxymethylcellulose with powdered peat is suggested for treatment of digestive tract disorders.

2417

FERRER, F. P. and BOYD, L. J. **Effect of yogurt with prune whip on constipation.** *Amer. J. Digest. Dis.*, 1955, **22**, 272–273. [New York Med. Coll., Metropol. Hosp. Res. Unit, Welfare Island 17.]

Prune whip yogurt was given as a night feeding in place of laxative to 194 elderly patients. Twenty-eight patients refused to take it. Of the remainder only 7 had to resort to laxatives during the experiment. Of the patients given the yogurt 91 were diabetic and the supplement, which supplied 247 Cal., raised blood sugar in 22 per cent. of them. Substitution of a milk-prune whip mixture supplying 141 Cal. raised blood sugar in nearly half of the diabetics. [There are several arithmetical errors.]

F. C. Aitken.

See also Abst. 1837.

THYROID DISEASE

2418

BRÜGEL, H. Erhöhte Jodidgier der Schilddrüse ohne Thyreotoxikose. [**High iodine turnover in the thyroid gland without thyrotoxicosis.**] *Deutsch. med. Wochenschr.*, 1955, **80**, 1305–1311. [Med. Klin., Städt. Krankenhaus Stuttgart, Bad Cannstatt.]

The 24-hr. iodine uptake of the thyroid was studied in more than 2000 patients. A few were found in whom the uptake was more than 50 per cent. above normal, but who had no clinical evidence of thyrotoxicosis. Their condition was attributed to "vegetative dystonia". In 15 of them treatment for from 7 to 10 days with thyroid extract or thyroxine resulted in uptake of I being normal at the next test. In 3 others 1 mg. I daily for 10 days had no effect, but thyroid extract was effective. In 3 patients with thyrotoxicosis, thyroid extract given for from 7 to 10 days did not reduce uptake of I, but had no untoward effect.

D. Duncan.

ANAEMIA

2419

JANELE, J. **Bone marrow and anemia in premature infants.** *Ann. paediat.*, 1955, **185**, 257–279. [2. Paediat. Clin., Charles Univ., Prague.] German and French summaries.

Bone marrow was withdrawn during the first 72 hr. of life from 100 premature infants of birth-weight less than 2500 g. The low cell count of the smears, the low total number of nucleated cells and high myeloid : erythroid ratio on the third day of life indicated insufficient erythropoiesis. It is concluded that, at this stage, treatment with Fe is useless.—F. C. Aitken.

2420

HEIMENDINGER, H. and UNDRITZ, E. Ist das tiefe Absinken der Hämoglobinwerte im Kindesalter physiologisch oder Ausdruck eines Eisenmangels ? [**Is the deep fall of the haemoglobin value in childhood physiological or the expression of iron deficiency ?**] *Schweiz. med. Wochenschr.*, 1955, **85**, 919–920 ; 933–936. [Kinderspital, Basle.]

In both sexes the Hb value is usually high at birth and then falls rapidly, reaching a minimum between 1 and 3 years of age, and slowly rises again to puberty, after which the values for boys are higher than for girls.

Hb was estimated in the blood of 158 boys and 87 girls aged from 17 days to 15 years in 2 homes in Basle, one for very poor, and one for somewhat less poor, children. Ferrogluconate (Ferronicum, Sandoz) to supply about 2 mg. Fe per kg. body-weight daily was given to 141 of them for 4 or 5 months. Before treatment the curve of Hb values at different ages showed the early low values and subsequently rose slowly. On treatment most of the children showed rapid increase of Hb with better appetite, better colour and good resistance to colds, catarrh and influenza. Children with normal values showed no increase ; the few children with influenza or an allergic condition failed to respond, but the failure was usually temporary. Six bed-wetters were cured while receiving Fe, but relapsed when it was withdrawn. They asked for the treatment to be resumed. Initial disturbances caused by the treatment, such as diarrhoea and loss of appetite, were not difficult to overcome.

It is concluded that the low Hb values so frequent in childhood are caused by inadequate intake of Fe. If a diet richer in Fe is insufficient to combat the anaemia, treatment with Fe should be given for 6 weeks in summer and for 2 or 3 months in winter.

E. M. Hume.

2421

DAVIDSON, W. M. B. and MARKSON, J. L. **The gastric mucosa in iron-deficiency anaemia.** *Lancet*, 1955, **269**, 639–643. [Stobhill Gen. Hosp., Glasgow.]

Gastric biopsy specimens were obtained from 42 patients with Fe deficiency anaemia and from 31 control patients with other disorders. The mucosa was histologically abnormal in 74 per cent. of the anaemic and in 29 per cent. of the control patients. Achlorhydria was found in 48 per cent. of anaemic and in 13 per cent. of control patients. The mucosa was abnormal in all but 1 patient with achlorhydria. Of patients without achlorhydria 50 per cent. of those with anaemia and 18 per cent. of controls had abnormal mucosa. This suggests that achlorhydria develops after Fe-deficiency anaemia has become established.—F. C. Aitken.

2422

RAINER, O. and ZOLINER, S. Die perorale Eisenresorption nach totaler Gastrectomie. [**The absorption of iron given by mouth after total gastrectomy.**] *Wien. klin. Wochenschr.*, 1955, **67**, 735–737. [2. Med. Abt., Landeskrankenhaus, Klagenfurt.]

In 12 patients 4 years to 16 weeks after total gastrectomy there was no sign of failure to absorb Fe, as judged by balance estimations. The results were within the normal range for the dose of Fe given orally, though the fasting value for Fe in serum was low in some of the patients, and 2 were certainly anaemic. In 5 other similar patients, 1 with normal and 4 with low fasting values for serum Fe, the rise after the test dose exceeded normal, and in 3 was high enough to be evidence for definite Fe deficiency. One of these Fe-deficiency subjects was severely anaemic and the serum showed a high unsaturated Fe-binding capacity. It is suggested that the results show that total gastrectomy does not of itself interfere with absorption of Fe and that the Fe-deficiency anaemia sometimes present is due to the atrophic enteritis that develops sooner or later in this type of patient.—L. Wills.

2423

ARIAS VALLEJO, E. La anemia de los individuos con estómago en cascada. [**Anaemia in subjects with cascade stomach.**] *Rev. española Enferm. Apar. digest. Nutricion*, 1955, **14**, 621–630. English summary.

Of 56 patients with the cascade form of hour-glass stomach, 27 had hypochromic microcytic anaemia and 2 had hyperchromic macrocytic anaemia. The hypochromic form responded well to treatment with Fe. Both patients with hyperchromic anaemia had histamine-resistant achlorhydria and megaloblastic bone marrow and responded to treatment with liver. The hypochromic form could sometimes be traced to haemorrhage, but in other patients it seemed to be due to faulty absorption of Fe.—D. Duncan.

2424

TASKER, P. W. G. **Studies of the nutritional anaemias of Malaya: the prevalence of iron deficiency.** *Trans. Roy. Soc. Trop. Med. Hyg.*, 1955, **49**, 478–482. [Inst. Med. Res., Kuala Lumpur.]

The patients, who numbered 314, were mainly Southern Indians and Chinese of the poorer classes attending as out-patients. Many were later admitted to hospital. Estimations were made of serum Fe, Hb, and packed cell volume.

When Hb was above 14 g. per 100 ml. mean serum Fe with standard deviation was 145 ± 41 μg. per 100 ml.; as it fell, so also did serum Fe, and when Hb was below 7 g. serum Fe remained nearly constant with a mean value of 52 ± 16 μg. As mean corpuscular Hb concentration (MCHC) fell from 36 to 29 per cent. so too did serum Fe; below that level serum Fe was again constant at less than 50 μg. When plotted against Hb the curve for MCHC fell as Hb diminished and reached a minimum of about 22 per cent.

The data show that Fe deficiency is a frequent cause of nutritional anaemia and that an Hb value of 6 g. per 100 ml. is the critical one at which patients look very ill and require treatment in hospital.—D. Harvey.

2425

VENKATESWARA RAO, S. **Nutritional anaemia.** *Antiseptic*, 1955, **52**, 697–706. [Osmania Hosp., Hyderabad-Deccan.]

One medical unit of a hospital admitted in $3\frac{1}{2}$ years 147 adults with anaemia which was not secondary to some other disease. Of these 103 had nutritional anaemia and in 41 of these the condition was associated with hypoproteinaemia. Treatment was with improved diet, liver injections and vitamins and Fe by mouth and response was good in 85 patients.—F. C. Aitken.

2426

BERRY, C. G. **Anaemia of pregnancy in Africans of Lagos.** *Brit. Med. J.*, 1955, ii, 819–823. [Dept. Pathol. (Weir Res.), St. James' Hosp., London, S.W.12.]

Details are given of clinical and laboratory findings for 30 women taken at random from those admitted to hospital for treatment of anaemia. In most patients the anaemia was macrocytic and hypochromic. The results of treating 13 with vitamin B_{12}, 9 during pregnancy and 4 immediately after delivery, are also presented. In the first of these groups there was a response in 7, rapid in 4 patients and less so in 3; in the second group 2 patients failed to respond and later died.

The findings are discussed.—D. Harvey.

2427

WOODS, J. D. and RYMER, J. J. H. **Pernicious anaemia in the South African Bantu.** *Lancet*, 1955, **269**, 1274 – 1275. [Edendale Hosp., Pietermaritzburg.]

Pernicious anaemia with subacute combined degeneration of the spinal cord is described in a Bantu woman. The neurological disorder worsened on treatment with folic acid and was relieved by vitamin B_{12}.—F. C. Aitken.

2428

HOLLINGSWORTH, J. W. and ADAMS, F. M. **Megaloblastic anemia of pregnancy in two sisters. Case reports and an investigation of the**

hemolytic mechanism by means of erythrocyte survival studies. *Blood, J. Hematol.*, 1955, **10,** 933–940. [Dept. Haematol., Army Med. Serv. Grad. Sch., Washington, D.C.]

The patients were treated successfully with folic acid. Before treatment, and 10 and 48 days after the beginning of folic acid therapy, red cells from the patients were labelled with radio-active Cr and introduced into normal subjects. Curves of decreasing radio-activity were steeper than normal, especially for cells obtained before, or after only 10 days', treatment. The possible significance of these findings is discussed.—F. C. Aitken.

See also Absts. 2092, 2365–71, 2374.

OTHER CONDITIONS

2429

VENKATACHALAM, P. S., SRIKANTIA, S. G. and GOPALAN, C. **Changes in body composition during nutritional rehabilitation.** *Indian J. Med. Res.*, 1955, **43,** 511–516. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

Of 8 malnourished subjects studied, aged from 14 to 45 years, 3 had clinical oedema and 5 were emaciated and had no oedema. The oedematous patients were given a diet supplying 3300 Cal. with 119 g. protein and the others 2900 Cal. with 84 g. protein. Changes in bodyweight were recorded during rehabilitation for up to 88 days and N balance studies were made ; total body fluids were estimated by the urea-dilution method and total body solids were calculated.

Patients showing nutritional oedema lost weight rapidly during the first few days ; thereafter their weight remained stationary. Changes in bodyweight tended to give a misleading picture of the amount of total solids laid down. In all but one the increase in body solids was greater than the amount of protein retained. Since the patients were visibly accumulating fat, it was uncertain whether all the protein retained was built into the tissues. Clinical changes during rehabilitation were similar to those previously noted by other workers.—J. S. Thomson.

2430

MOYER, C. A. **The treatment of burns.** *Surgery*, 1955, **38,** 806–812. [Dept. Surg., Sch. Med., Washington Univ., St. Louis, Mo.]

2431

MCCANN, M. and TRULSON, M. F. **Long-term effect of weight-reducing programs.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 1108–1110. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

A one-year and two-year follow-up study of the effect of individual or group therapy in obesity (Title 3591, Vol. 24) was extended for a third year. The results for 147 subjects, indicated that, for most, treatment had been without effect.

F. C. Aitken.

2432

YOUNG, C. M., MOORE, N. S., BERRESFORD, K., EINSET, B. M. and WALDNER, B. G. **The problem of the obese patient.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 1111–1115. [Sch. Nutrit., Cornell Univ., Ithaca, N.Y.]

Results are presented of the treatment of 168 obese patients at a community nutrition clinic. In only half of the patients was treatment worth while. Its failure appeared to be directly related to emotional instability.—F. C. Aitken.

2433

FRYER, J. H., MOORE, N. S., WILLIAMS, H. H. and YOUNG, C. M. **Satiety values of isocaloric diets for reducing, with special reference to the glucostatic theory of appetite control.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 868–875. [Sch. Nutrit., Cornell Univ., Ithaca, N.Y.]

Twelve healthy men, aged from 19 to 29 and overweight, were given reducing diets providing 1800 Cal. daily with different amounts of carbohydrate, fat and protein. At the end of a 3-week period of adaptation to each diet capillary and venous blood samples were taken from each subject at intervals throughout a full day. Sugar was estimated and the difference between levels in the samples, Δ-glucose, was taken as a measure of available glucose.

The satiety values of the 3 diets were compared. Opinions differed but, in general, the low-protein diets were thought to be least satisfying. The mean values for blood sugar on the different diets and the effect on the glucose curves of increasing the energy from 1800 to 3000 Cal. daily were studied. No correlation was found between the capillary, venous or Δ-glucose level and the satiety value of the diets. The diet with the greatest satiety value produced the lowest mean levels of blood glucose and Δ-glucose. Instances occurred of complete lack of hunger in the presence of negligible or even apparently negative levels of Δ-glucose ; in 2 subjects hunger occurred in the presence of substantially positive values for Δ-glucose.

The mean loss of weight during the 9 weeks of experiment on the diets with 1800 Cal. was 23·6 lb.

G. F. Garton.

2434

WENGER, R. Arteriosklerose und Diät. [**Arteriosclerosis and diet.**] *Wien. klin. Wochenschr.*, 1955, **67,** 700–704. [1. Med. Klin., Univ. Vienna.]

From this review it is concluded that, though the relation of diet to arteriosclerosis cannot yet be defined, a diet low in energy, fat and cholesterol but rich in protein and vitamins should be used for treatment and prevention of the disease.

L. Wills.

2435

BRONTE-STEWART, B., KEYS, A. and BROCK, J. F. (with MOODIE, A. D., KEYS, M. H. and ANTONIS, A.) **Serum-cholesterol, diet, and coronary heart-disease. An inter-racial survey in the Cape Peninsula.** *Lancet*, 1955, **269**, 1103–1108. [Cape Town.]

Data, derived in part from a wider study, are presented for 364 men who were free from disease and who belonged in almost equal numbers to the 3 communities, Bantu, Coloured and European, living in Cape Town. The men were between 40 and 58 years of age and were working in industry. Their diets were studied and a semi-quantitative assessment was made of their intakes of animal and vegetable fats. Clinical histories were collected and the final number of subjects was reached after exclusion of those with indications of coronary atherosclerosis; they numbered 1, 5 and 9 in the Bantu, Coloured and European groups, respectively.

The mean values for data on blood samples from the groups in that same order were: total cholesterol 166·3 ± 47·2, 204·1 ± 54·8 and 234·0 ± 52·9 mg. per 100 ml.; percentage of total cholesterol in β-lipoproteins, 71·9 ± 10·1, 76·8 ± 9·9 and 82·6 ± 7·1. The absolute levels in the α-lipoprotein fraction were almost identical for the groups, about 40 mg. cholesterol per 100 ml.

When the subjects in each community were grouped according to income it was found that, with rise in income, intake of vegetable fat was unaffected; intake of animal fat and the level of cholesterol in serum rose as income increased. For coronary heart disease in Cape Town the mortality rate of Europeans is more than twice that of Cape Coloured; among Bantu such disease is exceedingly rare as a cause of death.

The findings for this localised population are considered to support the hypothesis that these blood changes influence the pathogenesis of coronary heart disease.—D. Harvey.

2436

KATZ, L. N. **The rôle of diet and hormones in the prevention of myocardial infarction.** *Ann. Int. Med.*, 1955, **43**, 930–941. [Cardiovasc. Dept., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

2437

SIEDE, W. Zur Frage der Behandlung von Leberkrankheiten mit Aminosäuren. [**Treatment of liver disorders with amino-acids.**] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselkr.*, 1955, **15**, 188–197. [Med. Klin., Diakonissenkrankenhaus Elisabethenstift, Darmstadt.]

The treatment of chronic liver disorders with amino-acids is discussed with references to the literature. Administration of amino-acids singly, *e.g.*, methionine, is considered undesirable. Curds are a good source, or for severe cases protein hydrolysates by mouth or stomach tube rather than parenterally.

The question of amino-acid mixtures for acute liver disorders is then considered, with brief references to the author's experiments (reported at the *Nordwestdeutscher Internistenkongress*, Kiel, July 1953) on rats poisoned with carbon tetrachloride, in which liver regeneration was more rapid on a mixture of all essential amino-acids or on polypeptides than on ordinary diet with sugar, and to clinical results with over 100 patients with acute hepatitis treated with protein hydrolysates (to be reported elsewhere). Among these, 43 out of 53 in coma or incipient coma from virus hepatitis recovered; they had, however, also had choline and vitamin B complex. A summary and tables are also given for N balance experiments by Bonin in the author's clinic (in the press) on 8 patients with hepatitis, severe in 4 of them, and on 2 healthy subjects given Hepa-Tissan, a mixture of amino-acids and invert sugar, or casein, added to a basal diet of protein 70, fat 60 and carbohydrate 150 to 275 g. daily so as to increase N intake by about 6 g. Positive N balances were thereby achieved; with the amino-acid mixture faecal N did not increase and the increase in urinary N was mainly in urea in all but 3. From this it was concluded that amino-acids in limited amounts can be utilised by the deranged liver, and it is suggested that from 15 to 24 g. (2·5 to 3·9 g. N), not more than 1 g. per hr., can be given continuously per 24 hr. by stomach tube. Liver insufficiency with high residual N is a contra-indication.—W. M. Deans.

2438

DAVIDSON, C. S. **Cirrhosis of the liver treated with prolonged sodium restrictions: improvement in nutrition, hepatic function, and portal hypertension.** *J. Amer. Med. Assoc.*, 1955, **159**, 1257–1261. [Thorndike Mem. Lab., Boston City Hosp., Mass.]

Thirty patients, 28 of whom were chronic alcoholics, were given an adequate diet, but Na intake was restricted to 200 mg. daily. In 18 there was diuresis, prompt in 4 cases, delayed in 14, with loss of oedema and ascites. Nutritional state and liver function showed improvement in many, and there was often evidence of reduced portal hypertension. The remaining 12 patients showed no loss of oedema and ascites, but there

was no further ascites formation. All but one of these had an inadequate trial of Na restriction.

F. C. Aitken.

2439

SARIN, L. R. and MITAL, B. S. **Crude liver extract used intravenously in hepatic cirrhosis.** *Antiseptic*, 1955, **52,** 837–842. [Dept. Med., S.M.S. Med. Coll. Hosp., Jaipur.]

Twenty patients with liver cirrhosis were treated with crude liver extract, 0·5 ml., increasing by 1 ml. each day, in 10 per cent. glucose, given intravenously. Clinical improvement was noted in 16 as judged by a feeling of wellbeing, increase of appetite and, in some, disappearance of ascites.—J. S. Thomson.

2440

SCHNEIDER, R. W. **Problems in the differentiation of the milk-alkali (Burnett's) syndrome and hyperparathyroidism, illustrated by two case reports.** *Cleveland Clin. Quarterly*, 1955, **22,** 184–189. [Dept. Endocrinol.]

Burnett's syndrome is characterised by a high value for Ca in the serum and a low value in urine. Its cause is excessive intake of milk and absorbable alkali. There is no skeletal damage and the dental lamina dura is present. The disease results in renal failure. Primary hyperparathyroidism is characterised by high values for Ca in both serum and urine and is caused by a tumour in the parathyroid tissue. There is skeletal damage and absence of dental lamina dura. The result is again renal failure. Under certain circumstances the diseases may be much alike. Such circumstances are illustrated by 2 abnormal case histories. In one patient, later proved to have Burnett's syndrome, urinary Ca was high; in the other case, of hyperparathyroidism, it was low. The differentiation was made with the intravenous calcium-load test by the technique of Howard *et al.* (Abst. 3250, Vol. 23). When 30 mg. calcium gluconate per kg. bodyweight was given in saline solution over a 4-hr. period, the first patient showed no change in serum P and a reduction in urinary P. The second patient showed a reduction in serum P and an increase in urinary P. This indicated a parathyroid tumour, which was found and removed.

B. W. Simpson.

2441

GUIOT, G. Quelques notes pratiques sur les troubles du métabolisme de l'eau. [**Practical notes on disturbances of water metabolism.**] *Méd. trop.*, 1955, **15,** 347–356. [Corps de Santé Colonial.]

Water metabolism is considered from the point of view of the doctor practising in the tropics. Simple methods for assessing and treating disturbances of it are set out.—E. M. Hume.

2442

RAMAKRISHNAN, S. P. **Malaria and nutrition with special reference to *Plasmodium berghei* infections in rats.** *Indian J. Malariol.*, 1954, **8,** 327–332. [Malaria Inst. India, Delhi.]

The author reviews his previous experimental work (Absts. 3500, Vol. 24; 996, 5448, Vol. 25) in connection with the human problem of malaria and nutrition.—E. M. Hume.

See also Absts. 2315, 2323, 2329, 2341, 2361.

6. FEEDING OF ANIMALS

GENERAL, INCLUDING DIGESTIBILITY TRIALS

2443

Increase of fat and meat after fattening. A mistake in Kellner's "Fütterungslehre", which has been discovered after 48 years. *C. V. Trouw and Co. Bull.*, September 1955, 85–90. Spinozastraat 1, Amsterdam-C.

A study of the change in composition of animals, ox and pig, during fattening has uncovered a peculiar error in Kellner's book "Grundzüge der Fütterungslehre", 11th ed. revised by Prof. Dr. A. Scheunert. The chemical composition is compared of 2 oxen, 4 years old, one half-fat and weighing 558·8 kg. and the other fat, at 643·7 kg., and of 2 pigs from the same litter, one lean at 42·6 kg. and the other fat at 83·9 kg. Calculations based on the oxen showed that of the difference in weight of carcase 94·5 per cent. was fat, 0·6 per cent. nitrogenous substances, water 6·2 per cent. and minerals — 1·3 per cent. For the pigs the differences were, in the same order, 63·4, 8·2, 27·7 and 0·7 per cent. But Kellner sums up the change in composition during fattening roughly in accord with the changes in the pigs.

An appeal to Prof. Scheunert produced the following comment. The data in question come, not from work of Kellner but from the paper of Lawes and Gilbert (*Phil. Trans. Roy. Soc.*, 1859, **2,** 493) and the summing up, which Kellner borrowed with the tables, refers in the original to the pigs only. Kellner's summing up figures for oxen, which agree roughly with those for the Lawes and Gilbert pigs, refer neither to work of his own nor

to the Lawes and Gilbert oxen but to averages of 98 animals analysed by other workers. The mistake which attributes these averages to the Lawes and Gilbert analyses has been repeated without discovery since the first print in 1907.

I. Leitch.

2444

BLAXTER, K. L. and GRAHAM, N. M. **Plane of nutrition and starch equivalents.** *J. Agric. Sci.*, 1955, **46,** 292–306. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

In energy balance trials with 2 sheep, stable values for losses of energy were obtained after 72 hours' starvation. When feed was again given stable values were not obtained for about 10 days. From the results it could be shown that energy retention depended on intake. A method of describing plane of nutrition which is independent of body size and the quality of the feed is suggested, from which net energy values can be predicted for all planes of nutrition when the value for one plane is known. A simple scheme for feeding livestock taking into account the decline in net energy with rise of plane of nutrition is described. Energy losses in faeces, urine and as heat tended to rise as feed intake increased, and losses in methane fell, and it was not thought possible to estimate net energy from any one of these values.—T. D. Bell.

2445

FRANÇOIS, A. C., LEROY, A. M. and ZELTER, S. Z. Processus digestifs des ruminants. 3. Étude in-vitro de quelques phénomènes de digestibilité associative. [**Digestive processes in the ruminant. 3. Study *in vitro* of phenomena of associative digestibility.**] *Ann. Zootech.*, 1955, **4,** 103–110. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

For part 2 see Abst. 5325, Vol. 24.

By the technique previously described the formation of lactic and volatile fatty acids in the rumen during the digestion of pure starch, cellulose and soluble sugars, green fodder, and lucerne hay alone, or with raw or cooked potatoes, fodder beet or beet molasses was studied. Lactic acid was produced from soluble sugars, beet and molasses, but not from starch, potato or green fodder. The combination of hay and beet or molasses tended to increase the formation of volatile fatty acids at the expense of lactic acid. No lactic acid was produced with hay alone.—T. D. Bell.

2446

SIECK, K. H. Veränderungen der Zellwandbestandteile von Rübenblatt durch die künstliche Trocknung und ihr Einfluss auf Stoffwechselvorgänge bei Schafen (Verdaulichkeit und Energieausnutzung.). [**Changes in cell-wall components of the beet leaf by artificial drying and their effect on metabolic processes in sheep (digestibility and use of energy).**] Extract from *Thesis*, Göttingen, 1955, pp. 4.

Losses in fresh beet leaves by artificial drying were, per cent., dry matter 17·69, organic matter 12·72, crude protein 24·9 and energy 16·4. The digestibility of fresh and artificially dried leaves (Troblako) for sheep was studied. The percentage losses of digestibility after drying were for organic matter 9 to 10, crude fibre 17 to 20, cellulose 13 to 15, pectic acid 4, lignin 30 to 60, and pentosans 0, and the digestible energy fell by 9 to 12 per cent. There appeared to be no relation between digestibility of cell-wall components and that of organic matter. Soaking did not reverse the effect of drying.—D. Duncan.

2447

CHARLET-LERY, G. and LEROY, A. M. Étude comparée de la digestibilité du son de froment par diverses méthodes. [**Comparative study of the digestibility of wheat bran by different methods.**] *Ann. Zootech.*, 1955, **4,** 111–120. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

The percentage digestibility of wheat bran and lucerne hay was estimated in trials with sheep and cattle. The standard method in which the digestibility of the hay was estimated directly and that of bran, in different proportions in the ration, by difference was compared with a method in which allowance was made for the possible variation in digestibility of the hay due to the presence of the bran in the mixed ration. The two methods gave results in good agreement with one another and with values published in the literature.

T. D. Bell.

2448

BALCH, C. C., MURDOCH, J. C. and TURNER, J. **The effect of chopping and lacerating before ensiling on the digestibility of silage by cows and steers.** *J. Brit. Grassland Soc.*, 1955, **10,** 326–329. [Nat. Inst. Res. Dairying, Univ. Reading.]

Silage was made after chopping, lacerating or no treatment of the grass from a timothy and meadow fescue sward. The 3 silages were used in digestibility trials with Shorthorn cows 4·5 to 9 years old and yearling steers. There was greatest loss of N-free extract from the untreated silage, and least from the chopped. The percentage digestibility of all proximate constituents was highest in the chopped silage, followed by the lacerated and then the untreated. Starch equivalents, calculated from the digestible nutrients of the silages, were 50, 47 and 45 in the chopped, lacerated and untreated silages, respectively. Between the digestibility coefficients found with cows and steers there was

good agreement, but for N-free extract they were slightly higher with cows, and higher still for crude fibre. This was thought to be a reflection of the age of the animals rather than the sex.

T. D. Bell.

2449

LONG, T. A., NELSON, A. B. and MACVICAR, R. **Effect of grinding and pelleting upon digestibility of a ration by lambs.** *J. Animal Sci.*, 1955, **14**, 947–950. [Dept. Animal Husb., Oklahoma Agric. Exp. Stat., Stillwater.]

In 3 digestibility trials with 12 wether lambs, grinding of a ration of hay, maize, cottonseed meal and molasses was found to reduce the apparent coefficients of digestibility of organic matter, crude fibre, crude protein and N-free extract, and pelleting of the ground ration was found to increase these digestibility coefficients almost to those of the normal ration before grinding.—J. C. Gill.

2450

DAVIS, R. F., TRIMBERGER, G. W., TURK, K. L. and LOOSLI, J. K. **Feeding value and digestibility of cane molasses nutrients for dairy heifers.** *Cornell Univ. Agric. Exp. Stat. Bull.* No. 914, July 1955, pp. 27.

Results from 2 trials with 104 yearling dairy heifers in all showed that satisfactory growth was maintained when cane molasses replaced maizemeal in the ration on an equal total digestible nutrient basis. In 3 digestibility trials it was found that when much molasses was given the digestibility of the protein in the ration was depressed. When urea and molasses were given together the utilisation of the N.P.N. was less than when urea was given with maizemeal or with maizemeal and molasses. It is concluded that cane molasses is an excellent feed for dairy cattle provided it is given with roughage of good quality and an ample supply of protein.—J. N. Aitken.

2451

DIJKSTRA, N. D. De verteerbaarheid en voederwaarde van guvitine. [**Digestibility and feeding value of Guvitine.**] *Landbouwk. Tijdschr.*, 1955, **67**, 734–736. [Rijkslandbouwproefstat., Hoorn.] English summary.

Guvitine is a by-product of the manufacture of glue and size from guar seed (*Cyamopsis psoralioides* or *C. tetragonolobus*). Preliminary trials showed that cattle would eat 2·5 lb. per head daily for a week. Digestibility trials were made with 3 wethers given 600 g. cubed dried clover and 600 g. Guvitine daily, in 2 portions. The sample used had 14 per cent. moisture and, in per cent. of dry matter, crude protein 55·5, true protein 52·1, crude fibre 8·5, other carbohydrates 30·6 and ash 5·4. Mean coefficients of digestibility were all 80 per cent. or over except N-free extract 79·7 and ash 66·1. Guvitine contains so little fat that it is negligible. The starch equivalent is computed as 68·6 on dry matter or 59 on the material as used. It resembles that of extracted cottonseed cake, which has a similar digestible protein content.

I. Leitch.

2452

CHARLET-LERY, G., LEROY, A. M. and ZELTER, S. Z. Digestibilité chez le porc des constituants d'une farine de luzerne artificiellement déshydratée. [**Digestibility by the pig of the constituents of a lucerne meal artificially dried.**] *Ann. Zootech.*, 1955, **4**, 121–127. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

Digestibility trials with 3 pigs from $3\frac{1}{2}$ to $7\frac{1}{2}$ months old, 45 to 150 lb. liveweight, were made with dried lucerne meal as 20 or 35 per cent. of the ration. The lucerne meal had 14·5 per cent. crude fibre and 29·9 per cent. crude protein. At the lower level the percentage digestibility of the crude protein was not affected by the level of lucerne meal in the ration, but all other constituents were slightly improved. The percentage digestibilities at 20 and 35 per cent. levels were: dry matter 78·1 and 66·0; organic matter 77·9 and 66·6; crude protein 69·9 and 70·0; crude fibre 76·1 and 52·7; N-free extract 86·3 and 79·9. The average feeding value of the lucerne meal was 0·79 feed unit per kg., with 20·0 g. protein per 100 g. Towards the end of the trials, at the higher level, some vomiting and reduction of feed intake occurred, which was thought to be due to the saponins in the lucerne meal, but it was not possible to analyse samples for this constituent. It was concluded that dried lucerne meal could safely be included up to 35 per cent. of the ration, provided that the saponin content was not too high.

T. D. Bell.

2453

KRUPKA, J., PLISZCZYŃSKI, Z. and SKULMOWSKI, J. Przydatność i zastosowanie metody wskaźnikowej przy oznaczaniu współczynników strawności dla trzody chlewnej (współczynniki strawności pasty rybiej i mąki grzybowej). [**The suitability of the indicator method for determining digestibility coefficients in pigs. Digestibility coefficients for fish pastes and mushroom meal.**] *Rocz. Nauk rol.* [*B*], 1955, **69**, 195–210. [Inst. Zootech., Dzial Żywienia Zwierząt, Oddział Paszoznawstwa.] Russian and English summaries.

The percentage digestibility of fish paste and mushroom meal was estimated in an experiment with 2 pigs. For fish paste and mushroom meal, respectively, the percentage digestibility of organic matter was 83·39 and 89·61, crude protein 78·68 and 53·91, true protein 99·52 and 66·34, N-free extract 91·74 and fibre 84·99: the last two figures refer to mushroom meal only.

As an indicator Cr_2O_3 was suitable, but SiO_2 was not. The best results were obtained by estimating digestibility of a basal ration with and without the feed under investigation, and calculating digestibility by difference. The small number of pigs used was not sufficient for accurate results. (From summary.)—T. D. Bell.

2454

BOLTON, W. **The digestibility of the carbohydrate complex by birds of different ages.** *J. Agric. Sci.*, 1955, **46**, 420–424. [Poultry Res. Centre, West Mains Rd., Edinburgh 9.]

The digestibility of starting, growing and laying mashes was estimated with chickens 2 to 5 weeks old and 5 to 10 weeks old and pullets in their first laying summer. The digestibility of the carbohydrates was estimated by the conventional method and from the individual constituents. By the conventional method 5 per cent. digestibility was found for fibre, but when allowance was made for the different composition of the substances estimated in the feed and the faeces, it could be shown that sugar and starch were completely digested, but lignin and cellulose not at all. Crude protein and ether extract were each about 87 per cent. digestible. It is shown how the nutritive ratio of a ration can be estimated from analytical data. The adjustments to protein content necessary when fat is added to the ration are described.

T. D. Bell.

2455

KUMANOV, S. Prouchvaniya na lucernovite otsevki kato furazh. [**Waste lucerne seeds as fodder.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia*, 1953–54, **4/5**, 7–14. Russian summary.

When lucerne seeds are cleaned the waste consists of small and broken lucerne seeds and seeds of dodder and other weeds. The annual output of such waste in Bulgaria is estimated at 250,000 to 300,000 kg. The crude protein content is 30 per cent. on a dry matter basis, nearly equal to that of peas or vetches. The mean values for other constituents, per cent., were fat 8, fibre 16 and minerals 6·43.

With sheep the coefficients of digestibility were crude protein 55, N-free extract 71, fat 82 and fibre 55 per cent. The mixture is thus a valuable protein feed, but it must be thoroughly ground to prevent the spread of dodder. (From summary.)

D. Duncan.

2456

LARIN, I. V. Kormovye rasteniya senokosov i pastbishch SSSR. [**Fodder plants of the meadows and pastures of the U.S.S.R.**] *Priroda*, 1955, No. 7, 99–103. [Leningrad Agric. Inst.]

Of the rather more than 16,000 species of flower- and spore-bearing plants (not counting the mosses), representing 163 families, in the U.S.S.R., information exists, of one kind or another, regarding the nutrient properties of almost 5000 species, belonging to 135 families. About one-third of the plants studied are characterised only in a general way as "eaten" or "not eaten" by domestic animals. The relation of cattle, sheep, horses, camels and deer to a number of plants has been more or less completely clarified. There is, however, very little information on which wild plants are eaten by pigs, rabbits, birds and wild animals.

Many plants have been found to be not lower in their feed value than Leguminosae and higher than Gramineae. Thus on an "eaten" basis the nutrient value of Algae and Salicaceae was 96 and 94 per cent., respectively, compared with 90 and 92 per cent., respectively, for Gramineae and Leguminosae. The preference of animals for certain plants is said to be a better evaluation of their nutrient value than theoretical evaluations according to their digestibility. Cattle eat either readily or sufficiently well most plants of the following U.S.S.R. families either in pastures or as hay: Gramineae, Leguminosae, Cyperaceae, Salicaceae (leaves), Polygonaceae, Cruciferae, Urticaceae, Caryophyllaceae, Rosaceae and Equisetaceae.

Gramineae occupy the first place and produce 25 per cent. of the yield of pastures and meadows, Compositae the second place. In forest, forest-steppe and steppe zones Gramineae are the principal components of the grassland, in semi-arid regions and deserts Compositae.

H. Scherbatoff.

2457

PALTRIDGE, T. B. **Studies on sown pastures for South-Eastern Queensland.** *Commonwealth Sci. and Indust. Res. Organiz., Australia, Bull.* No. 274, 1955, pp. 108. [Melbourne.]

Three plant species were studied: *Paspalum scrobiculatum* var. *commersonii*, *Medicago sativa* (lucerne) and *Phaseolus lathyroides*. The nutritive value of *Paspalum* was ascertained from sheep grazing trials. Bodyweight increments were apparently related to the moisture content of the herbage. Starch equivalent and digestible protein content of the grass and lucerne were calculated from chemical analyses. Management of the 3 species to provide grazing throughout the year is discussed.—J. L. Corbett.

2458

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD. **Grassland management.** *Bull.* No. 154, 1955, pp. iv + 67. H.M.S.O., London. Price 3s. net.

The general principles of grassland management are discussed. These include cultivation, fertility and manuring, establishment, the attributes of different types of pasture and the control of

grazing. They are considered in relation to soil and rainfall and to the special needs of the livestock on mixed cattle and sheep farms, general and arable dairy farms, feeding farms and hill-sheep and hill-cattle grazings.—J. L. Corbett.

2459
LENKEIT, W. Die Bedeutung der künstlich getrockneten Futtermittel in der Leistungsfütterung. [**Significance of artificially dried feeds in intensive feeding.**] *Arch. deutsch. Landwirtsch. Gesellsch.*, **10**, 121–133.

2460
MCCORMACK, P. F. **Mineral supplements for farm livestock.** *J. Dept. Agric. S. Austral.*, 1955, **59**, 3–11.

2461
GOETSCH, D. D. **The effects of feeding and implanting estrogenic substances in ruminants.** *J. Amer. Vet. Med. Assoc.*, 1955, **127**, 531–533. [Dept. Physiol., Kansas State Coll., Manhattan.]

See also Absts. 1513–15, 1534, 2062.

HORSES

2462
CHASHKIN, I. and MIRONENKO, M. Molochnaya produktivnost' kobyl Kirgizii. [**The milk production of mares in Kirgizia.**] *Konevodstvo*, 1955, **25**, No. 6, 19–23.

There was no noticeable difference in the composition of milk from mares of the different breeds found in Kirgizia. The Newkirgiz mare's milk was poorer than that of others in fat, but richer in vitamin C, carotene, sugar and protein. The high content of vitamin C and carotene in mare's milk makes it a valuable food. Its vitamin content is considerably higher than that of cow's milk, carotene content only 0·120 to 0·381 and vitamin C content 20 to 23 mg. per litre, whereas in mare's milk the average carotene content was 0·57 to 0·69 and the vitamin C content 97·8 to 135 mg. per litre, the last figures for each being that for the Newkirgiz mare's milk.

According to its chemical composition mare's milk was at its best during the third month of lactation, corresponding to the flush of grass on the high mountain pastures. The vitamin C content of the Newkirgiz mare's milk varied from 123 to 151 mg. per litre and did not depend on the period of lactation, as the highest content was in the third and sixth months (July and October) and the lowest in the first and fourth (May and August). Starting from August the vitamin A content dropped sharply. The best koumiss was produced in July, when it had a content of 8·6 per cent. of volatile acids which determine its flavour.

H. Scherbatoff.

CATTLE

GROWTH AND FATTENING

2463
KRÜGER, L. and LÜSSE, E. Aufzucht und Mast von Kälbern mit verschieden hohen Gaben Vollmilch. [**Rearing and fattening calves with different amounts of whole milk.**] *Futter u. Fütterung*, 1955, No. 52, pp. 4. [Inst. Tierzucht. Milchwirtsch., Justus Liebig Hochsch., Giessen.]

A number of experiments on the rearing of calves of both sexes are briefly reported, with tables of daily weight gains and quantities of milk used. The numbers of animals in the groups ranged from 2 to over 30.

In the first series there were 2 experiments on the rearing of calves to a slaughter weight of under 100 kg., or to between 120 and 130 kg., without concentrates or hay, *i.e.*, with whole milk replaced at different stages by skimmed milk, either fresh, sour or dried reconstituted, or skimmed milk with 2 per cent. added fat. The best daily gains were in a group changed over during the second week of life to skimmed milk plus 2 kg. whole milk daily. Very good daily gains and carcase quality were obtained also by changing over in the third week of life to skimmed milk with added fat plus 2 kg. whole milk daily. Rearing on whole milk is not economic beyond 90 kg. (South Germany) or at most 120 kg. (North Germany).

In the second series there were 4 experiments, on the rearing of calves to the 13th, 16th, 20th and 26th week of life, with concentrates and hay as well as whole and skimmed milk in varying proportions. The tables include feed costs per kg. weight gain. These experiments are being continued to later stages of growth. Satisfactory gains were obtained with only 51 kg. whole milk

and a milk substitute (dried skimmed milk 45 and finely ground concentrates 55 per cent.) given in liquid form but the cost was high. Costs were remarkably low for one group of bull calves given 121 kg. whole milk and 201 kg. skimmed milk with a concentrate containing 40 per cent. beet slices; daily gains were below normal but the animals were healthy. Concentrates and hay are not recommended for calves to be slaughtered at from 80 to 120 kg., as the meat is only of second quality. In further experiments with heifer calves, gains, but also costs, increased with the amount of whole milk given. It is suggested that 350 kg. whole milk and the same of skimmed milk will suffice to bring heifer calves to a weight of 180 to 200 kg. by 6 months, and preliminary results indicate that giving very little whole milk need not adversely affect lactation performance. In general, much depends on the quality of the milk and of the hay and concentrates given, and avoidance of digestive disturbances is essential.

W. M. Deans.

2464

WHITING, F. and CLARK, R. D. **Raising dairy calves with a limited amount of milk.** *Canad. J. Agric. Sci.*, 1955, **35**, 454–460. [Exp. Farm, Lethbridge, Alta.]

Three comparable groups of 11 Holstein calves each were used. Whole milk was given at the rate of 10 per cent. of bodyweight for 21 days; it was then gradually reduced and finally withdrawn at 30 days. From 4 to 16 weeks of age the calves in group 1 received skimmed milk to a maximum of 15 lb. per head daily. In addition, the calves in this group received a concentrate mixture of oats 68, barley 10, wheat bran 10, linseed meal 10, salt 1 and bonemeal 1 per cent. to a maximum of 5 lb. daily. The calves in groups 2 and 3 received no milk after 30 days of age, but from 1 week of age they were offered a concentrate mixture of oats 32, barley 5, wheat 10, wheat bran 10, linseed oilmeal 10, soya bean meal 17·5, alfalfa meal 5, molasses 8, and minerals 2·5 per cent. The mixture contained added vitamins A and D and riboflavin. Aureomycin and vitamin B_{12} also were given to calves in group 3. After 16 weeks of age all calves received alfalfa hay or pasture and a grain mixture to 1 year of age. Bodyweights, heart girth and height at withers were recorded.

Calves receiving skimmed milk were heavier at 16 weeks than calves in the other groups. The addition of aureomycin had no effect on bodyweight. There was no significant difference between the groups at 1 year of age. It is concluded that heifer calves can be raised successfully from 1 month of age without the use of animal protein.—J. N. Aitken.

2465

ROY, J. H. B., SHILLAM, K. W. G. and PALMER, J. **The outdoor rearing of calves on grass with special reference to growth rate and grazing behaviour.** *J. Dairy Res.*, 1955, **22**, 252–269. [Nat. Inst. Res. Dairying, Univ. Reading.]

Five male Shorthorn calves born in February and March 1953 and 3 groups of 4 born in each of the months February, March and April 1954 were used in 2 experiments. All calves were put out of doors on permanent pasture at birth and received approximately 45 gal. whole milk during the first 8 weeks. Except for a small amount of dried grass offered in the first experiment, pasture grass was the sole diet from 8 to 26 weeks of age. The growth rates of the calves compared favourably with those of calves reared indoors in the normal way. There was no significant effect of month of birth on growth rate. Temperatures as low as 17° F. had little effect on the wellbeing of the calves as judged by the amount of scouring. Although trichostrongyle egg counts of faeces were high in some calves, the growth of the calves was not depressed. It was thought possible that exposure to worm infestation enabled the calves to build up resistance at an earlier age than would be possible under more conventional methods of rearing. The grazing behaviour of the calves is discussed in detail.

J. N. Aitken.

2466

PAJĄK, J. and JASIOROWSKI, H. Doświadczenia nad zimnym wychowem cieląt. [**Experiments on cold rearing of calves.**] *Rocz. Nauk rol.* [*B*], 1955, **69**, 211–240. [Zakład Szczegółowej Hodowli Zwierząt SGGW.] Russian and English summaries.

Three groups of 4 Holstein calves were reared (1) in small individual sheds with an outside run, (2) in runs with a shed closed on 3 sides and (3) in a closed cattle barn, the control group. During the experiment the minumum external temperature fell to — 17° C.; in the sheds it fell to — 9° to — 7° while in the cattle barn it was 1° C. All groups received the same feed. During a 6-month period calves in the 2 experimental groups increased their weight 5½ times; those in the control group increased their weight only 3·8 times. Per kg. weight gain the experimental groups consumed about 4·4 oat units (590 g. digestible protein) and the control group 5·6 oat units (707 g. digestible protein). (From summary.)—J. S. Thomson.

2467

KOSTOV, S. and ZAHARIEV, Z. Otglezhdane na teletata pri niska temperatura na otkrito pod naves. [**Rearing calves in sheds in low temperatures.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia*, 1953–54, **4/5**, 271–290. Russian summary.

2468

PICCHI, G. Accrescimenti ponderali nei vitelli di razza marchigiana e produzione di latte materno. **[Growth in weight of calves of the Marchigiana breed and maternal milk-yield.]** *Zootec. Vet.*, 1955, **10,** 419–426. [Ist. Zootec. Gen., Univ. Camerino.] English, French and German summaries.

The average birthweight of 9 Marchigiana calves, including 2 twin bull calves which were 25 lb. lighter than the others, was 95·5 lb. During suckling for 90 days the average daily liveweight increase was 1·92 lb. The average milk intake was 11·75 lb. daily for the first 2 months, and 7·83 lb. during the last. During the third month a supplement of crushed beans was given.

The growth rate of the calves was not considered satisfactory for such an early maturing breed. The poor performance was blamed on the milk yield of the dams, which did not supply sufficient nutrients for the calves to realise their inherent capacities. Confirmation was obtained in the observation that shortly after supplementation began growth rates increased. In the area under investigation the retarded growth means great loss to the farmer, since most calves are sold at 5 to 6 months old, and would not have time to make up any leeway lost from birth to weaning.—T. D. Bell.

2469

PRITCHARD, G. I., RIDDELL, W. H. and DURRELL, W. B. **The effect of different levels of dietary oxytetracycline on the growth of young dairy calves.** *J. Animal Sci.*, 1955, **14,** 1011–1014. [Dept. Dairy Husb., Vermont Agric. Exp. Stat., Burlington.]

Giving young calves oxytetracycline (terramycin) at daily rates of 15 or 60 mg. per 100 lb. bodyweight did not result in a significant increase in rate of liveweight gain over controls. It was concluded that the lack of response was probably due to the reduction of pathogenic organisms in the station herd as a whole by the continuous use of antibiotics.—J. N. Aitken.

2470

GREEN, D. F. **Urea feeding.** *North Amer. Vet.*, 1955, **36,** 733–736; 827–833. [Nitrogen Div., Allied Chemical and Dye Corporation, New York.]

2471

KADIISKI, E. and ZAHARIEV, Z. Sravnitelen opit za ugoyavane na teleta i malacheta. **[Comparative study on fattening calves and buffalo calves.]** *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia*, 1953–54, **4/5,** 291–311. Russian summary.

The 2 groups each consisted of 4 castrated males and 1 female; the cattle, of local Sofia breed, were 12 to 14½ months old and the buffaloes 13 months, and their mean initial weights were 244·6 and 223·4 kg., respectively. After a short preparatory period they were fattened in stalls from October to January on a ration of meadow hay, succulent fodder and a small quantity of concentrates.

During 113 days of fattening the cattle gained 98·4 kg. and the buffaloes 80 kg., mean daily gains of 871 and 708 g. For each kg. liveweight gain the cattle needed 7·31 fodder units and 629 g. digestible protein and the buffaloes 7·82 units and 748 g. protein.

Their carcase weights were 56·85 and 52·20 per cent. of liveweight. On chemical analysis the carcases contained 10·51 and 18·17 per cent. fat. The bone contents were 18·33 and 18·66 per cent. (From summary.)—D. Duncan.

2472

NELMS, G. and BOGART, R. **Some factors affecting feed utilization in growing beef cattle.** *J. Animal Sci.*, 1955, **14,** 970–978. [Dept. Animal Husb., Oregon State Coll., Corvallis.]

Data from 43 purebred Aberdeen-Angus and Hereford bull and heifer calves were analysed statistically. The within-lines and within-sex effects of birthweight, age at reaching 500 lb. liveweight, and daily gain from 500 to 800 lb. on feed conversion efficiency were determined. Calves which were heavier at birth were more efficient during the period of the test, *i.e.*, 500 to 800 lb. liveweight. During this period bulls decreased in efficiency more rapidly than heifers. Calves which reached 500 lb. at the youngest ages were more efficient than older calves when allowance was made for maintenance. Calves making the highest rate of gain were more efficient than those growing less rapidly.—J. N. Aitken.

2473

SIMONE, M., CARROLL, F., HINREINER, E. and CLEGG, M. T. **Effect of corn, barley, stilbestrol and degree of finish upon quality of beef.** *Food Res.*, 1955, **20,** 521–529. [Dept. Food Technol., Univ. California, Davis.]

The effect on beef quality of steers of finishing them on maize instead of barley, giving a low instead of a high level of concentrates and implanting them with stilboestrol was determined by scoring, for flavour, juiciness and tenderness, samples from representative rib and round roasts. Round roasts from the low-level concentrate group frequently scored less than those from the other groups, but there were no marked differences among the rib roasts from these animals. There

was little variation in any of the measures of eating quality among roasts from steers given barley or maize or implanted with stilboestrol. Eating quality of meat was not highly correlated with its fat content, calculated from sp. gr. measurements.—T. R. Preston.

2474

CHESHMEDZHIEV, B., PETROV, K. and KONSTANTINOV, G. Oborno ugoyavane na volove chrez krovopuskane : opiti s cveklovi ryazanki i spirtovarska kasha. [**Fattening oxen with the aid of bloodletting : studies on fattening with oilcake and brewer's grains.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia*, 1953–54, **4/5,** 15–30. Russian summary.

On 2 types of diet, one based on oilcake and the other on brewer's grains, roughage and some concentrates, the liveweight gains of cattle were improved when the cattle were bled. In the first experiment the cattle, old working oxen aged from 8 to 12 years, were bled twice with an interval of 45 days, the quantities taken being 1·2 and 2 per cent. of the bodyweight. On equal quantities of feed the bled cattle gained in 3 months on the average 933 g. daily and controls 811 g., and the mean intakes were 10·73 and 12·34 fodder units per kg. liveweight gain. Their carcases weighed 52·81 and 51·94 per cent. of liveweight and the yields of fat were 32·2 and 24 kg. The meat contained 6·7 and 5·4 per cent. of interstitial fat and 72·92 and 73·92 per cent. water. There was no difference in melting-point, refraction or iodine number of the fat.

Similar results were obtained with oxen fattened for 2½ months on the ration based on brewer's grains. Mean daily weight gains were 773 g. for bled and 626 g. for control animals. They killed out at 51·33 and 51·08 per cent. of liveweight, respectively. Bleeding temporarily raised the alkali reserve and lowered serum Ca. Temperature, pulse, respiration and rumination showed no important ill effect. (From summary.)

D. Duncan.

2475

MATSUSHIMA, J., DOWE, T. W., COMAR, C. L., HANSARD, S. L. and VISEK, W. J. **The effect of particle size on the utilization of bone meal and limestone by beef cattle.** *J. Animal Sci.*, 1955, **14,** 1042–1049. [Nebraska Agric. Exp. Stat., Lincoln.]

In 2 trials groups of growing beef cattle given coarsely ground limestone and bonemeal utilised the Ca and P as well as those receiving the minerals in the finely ground form. This conclusion was supported by data from a third trial in which a radio-isotope technique was used.

J. N. Aitken.

2476

BURROUGHS, W., CULBERTSON, C. C., CHENG, E. HALE, W. H. and HOMEYER, P. **The influence of oral administration of diethylstilbestrol to beef cattle.** *J. Animal Sci.*, 1955, **14,** 1015–1024. [Iowa Agric. Exp. Stat., Ames.]

The effect of oral administration of stilboestrol, from 2·75 to 20 mg. daily, to yearling steers and heifers was studied in 5 experiments on 120 steers and 24 heifers in all, divided into groups of 8 to 10 animals each. High-grain fattening rations, high-roughage growing rations and rations intermediate in grain and roughage content were used. Rate of liveweight gain and efficiency of feed conversion of both steers and heifers were increased at all levels of stilboestrol, irrespective of the type of ration. Stilboestrol was as effective at the end of the trials as at the beginning. Undesirable side effects were not apparent.—J. N. Aitken.

2477

KLOSTERMAN, E. W., CAHILL, V. R., KUNKLE, L. E. and MOXON, A. L. **The subcutaneous implantation of stilbestrol in fattening bulls and steers.** *J. Animal Sci.*, 1955, **14,** 1050–1058. [Ohio Agric. Exp. Stat., Wooster.]

In dry-lot fattening trials, bulls made more rapid and economical liveweight gains, produced lower grade carcases and yielded more edible meat (boneless meat with a maximum of ⅜ in. fat on any surface) than steers. Implantation of stilboestrol significantly increased liveweight gains of bulls and steers. There was a significant interaction between castration and hormone implantation. Stilboestrol increased the grade and reduced the edible meat yield of bull carcases, but reduced the grade and and increased the edible meat yield of steer carcases. Castration about the middle of the feeding period greatly reduced weight gain and produced carcases similar to those from bulls.

T. R. Preston.

2478

BENNETT, J. A. and MATTHEWS, D. J. **Performance testing studies with beef cattle.** *Utah Agric. Exp. Stat. Bull.* No. 377, June 1955, pp. 15.

The data were obtained from a performance test on 124 Hereford and Shorthorn calves by 6 Hereford and 3 Shorthorn bulls. All animals were fed to appetite from 8 months of age for 168 days. Bodyweights and feed intakes of each animal were recorded. Statistical analysis of the data showed highly significant differences between sire offspring groups in rate of gain and efficiency of feed utilisation. Bull calves made faster weight gains and showed better feed conversion efficiency than heifer calves. Animals which were heavier at the start of the test were also heavier at the end.

A supplementary study with 144 beef steers of Shorthorn, Angus, and Hereford breeding was made to determine the value of body measurements as a basis for estimating dressing percentage. The measurements were height at withers, heart girth, paunch girth and bodyweight. The multiple correlation was highly significant (0·4757) but the coefficient of determination was low, indicating that the 4 body measurements accounted for only 23 per cent. of the variability in dressing percentage. It was concluded that these measurements would not accurately predict dressing percentage or give an indirect measure of percentage fat in the live animal.—J. N. Aitken.

2479

PATTERSON, R. E., CARTWRIGHT, T. C., JONES, J. H. and BAYLES, J. J. **Performance testing of beef breeding stock.** *J. Animal Sci.*, 1955, **14,** 1034–1041. [Texas Agric. Exp. Stat., College Station.]

2480

GREEN, W. W., JESSUP, G. L. (Jr.) and WHITE, F. E. **Intercorrelations of weights of wholesale cuts of beef carcasses.** *J. Animal Sci.*, 1955, **14,** 1059–1067. [Dept. Animal Husb., Univ. Maryland, College Park.]

A study of relations between liveweights of 50 steers and slaughter grade and weights of wholesale cuts of their carcases revealed significant correlations between liveweight and weights of wholesale cuts, and within weights of wholesale cuts. Slaughter grade was correlated only with weight of flank and of short plate.—T. R. Preston.

2481

REGENSBURGER, G. Contributo alla valutazione del peso vivo dei bovini in relazione ad alcune dimensioni somatiche. 1. 2. [**Estimation of liveweight of cattle in relation to some body measurements. 1. 2.**] *Ann. Sper. agrar.*, 1955, **9,** 571–603; 825–853. [Ist. Sper. Zootec., Rome.] English summary.

1. Two methods of estimating liveweight of cattle were compared with the true weight found with a scale. The methods were to measure the chest girth, and the distance on one side from the centre of the sternum to the mid-point of the back and thence to the median point between the buttocks, below the hip-bone. This latter measurement is known as Crevat's measurement. When a Crevat's tape is used the linear measurement is automatically converted to the liveweight. Altogether over 1300 Black Pied Dutch cattle from 1 month old upwards and cows in late pregnancy were measured. Crevat's method gave better results than chest girth, but neither method was thought accurate enough for practical use.

2. From the weights and chest girths of 1352 Black Pied Dutch and small numbers of Red Pied Dutch, Brown Swiss and Simmenthal cattle, it was calculated that the relation between chest girth and liveweight could be expressed by the equation $P = 0{\cdot}00055\ T^{2{\cdot}63}$, where P = liveweight in kg. and T = chest girth in cm. In this way liveweight could readily be estimated from a simple measurement with sufficient accuracy for such practical purposes as evaluating feed requirements. The equation refers to animals in a good state of nutrition. In pregnant cows some adjustment would have to be made.—T. D. Bell.

2482

LARKIN, R. M. **Observations on the grazing behaviour of beef cattle in tropical Queensland.** *Queensland J. Agric. Sci.*, 1954, **11,** 115–141. [Cattle Husb. Branch, Div. Animal Indust.]

Grade Shorthorn steers were studied. Pastures varied in quantity and quality but the amount of grazing available was always more than adequate. During hot weather daytime grazing was reduced; the animals spent long periods standing in shade and little time lying down. Though night grazing time was increased in compensation, the net result was a decrease in total grazing time.

J. L. Corbett.

2483

DOWLING, D. F. **The thickness of cattle skin.** *Austral. J. Agric. Res.*, 1955, **6,** 776–785. [Div. Animal Health, Sect. Animal Genetics, C.S.I.R.O., Univ. Sydney.]

Skin thickness of European and Zebu cattle was measured. There was a difference between breeds and between sites of sampling. Age did not affect skin thickness, but it was greater in well nourished animals. The skin of the Zebu was thicker than that of the Angus, Shorthorn or Jersey, but not as thick as that of the Friesian, Hereford or Devon, which suggested that thick skin is not essential for heat tolerance. The papillary layer in the Zebu was thinner than in the European breeds and the glands were more densely dispersed. The relationship between skin thickness and heat tolerance is discussed, and the methods of measurement are described.—T. D. Bell.

See also Absts. 1867, 1887.

MILK PRODUCTION

2484

PERUCHON DE BROCHARD, J. Revision des formules types modernes alimentaires pour vaches laitières. [**Revision of typical modern feed formulae for dairy cows.**] *Rev. d'Oka*, 1955, **29,** 94–97.

The requirements of cows yielding up to 10 litres of milk (2·2 gal.) can be met with homegrown

feedingstuffs. Above that concentrates are necessary to supply the protein and energy required without increasing the bulk beyond the capacity of the animal.

Antibiotics are advantageous for calves before weaning.—T. D. Bell.

2485

MACKINTOSH, J. **The feeding of dairy cows.** *Minist. Agric. Fish. Bull.* No. 42, 1955, pp. iv + 46. H.M.S.O., London. Price 2s. 6d. net.

This new edition is on the same plan as the earlier edition but the text has been revised in the light of recent experimental work. Perhaps the most important innovation is the recommendation that the allowance of protein equivalent for milk production should be reduced from 0·6 to 0·5 lb. per gal. Attention is drawn to the changes which have taken place over the past 15 years in the supplies of different feeds available for the winter feeding of dairy herds. Because of the high cost of concentrates there is great need for a higher proportion of the feed for the dairy herd to be grown at home. The place of homegrown feeds, particularly grass and its products, in the rationing of the herd, is outlined. The sections of the bulletin dealing with the role of the main feed constituents, the composition of feeds, feeding standards, selection of rations, palatability, winter and summer feeding and costs are adequate and simply written. A ration ready reckoner is included in a list of 7 useful tables. This bulletin will form a valuable guide to the dairy farmer.

J. N. Aitken.

2486

BALCH, C. C., BALCH, D. A., BARTLETT, S., BARTRUM, M. P., JOHNSON, V. W., ROWLAND, S. J. and TURNER, J. **Studies of the secretion of milk of low fat content by cows on diets low in hay and high in concentrates. 6. The effect on the physical and biochemical processes of the reticulo-rumen.** *J. Dairy Res.*, 1955, **22,** 270–289. [Nat. Inst. Res. Dairying, Univ. Reading.]

For part 5 see Abst. 4315, Vol. 25.

Two Shorthorn cows with fistulae were used in an experiment which lasted 27 weeks. The experiment was divided into 5 periods. The rations given during each period were as follows: weeks 1 to 7, both cows received 16 lb. hay and 20 lb. concentrates; weeks 8 to 13, the hay was reduced to 2 lb. and the concentrates increased to 24 lb.; weeks 14 to 19, as in the previous period with the addition of 5 lb. dried straw pulp (concentrates reduced to 20 lb. in week 15); in weeks 20 to 21 the straw pulp was removed from the diet; in weeks 22 to 27 the ration was gradually changed to 18 lb. hay and 10 lb. concentrates. There was a great reduction in the fat content of the milk with the introduction of the low-roughage diet. The addition of straw pulp brought no recovery. While the fat content was depressed there was an increase in the percentage solids-not-fat. There was a decrease in the volatile acid values and an increase in the iodine value of the milk fat.

From the results of digestibility trials it was shown that there was a great decrease in the digestibility of the fibrous carbohydrate with the exception of the pentosans-not-in-cellulose fraction. From analysis of the digesta leaving the reticulo-rumen it was estimated that 90 per cent. of the digestion of starch and 45 to 60 per cent. of the digestion of fibrous carbohydrate, excluding the pentosans-not-in-cellulose fraction, took place in the reticulo-rumen. The falls in milk fat content were associated with diets which lacked the physical property of fibrousness and contained large amounts of starch, 6·2 to 7·4 lb.

When the low-hay diet was given there was a reduction of 50 per cent. in the blood serum lipid fraction. Recovery was complete when dried straw pulp was added to the ration. As there was no concomitant recovery of milk fat content during this period, it was concluded that the fall in fat content of the milk was not due to the decrease in serum lipid concentration.

The weight of acetic acid in the reticulo-rumen was much reduced when the low-hay diet was given. There was little variation in the weight of propionic acid. It was considered probable that as less acetic acid was available when low-roughage diets were given, less was absorbed through the reticulo-rumen wall, and since acetic acid is known to be a precursor of the saturated fatty acid fraction of milk fat, its deficiency may have been the cause of the low fat percentage.—J. N. Aitken.

2487

LAKKE GOWDA, H. S., KEHAR, N. D. and AYYAR, N. K. **Studies on phytic acid phosphorus metabolism in ruminants. 1. Distribution of phytic-acid phosphorus and total phosphorus in some of the common Indian cattle feeds. 2. Influence of high, low and medium levels of ingestion of phytic-acid phosphorus on calcium, phosphorus and magnesium metabolism.** *Indian J. Med. Res.*, 1955, **43,** 603–608; 609–616. [Indian Vet. Res. Inst., Izatnagar.]

1. In general, total P in the dry matter and the proportion of P present as phytate were greatest in oilcakes and cereal by-products and least in cereal straws. Grasses contained an intermediate amount of total P and phytate P.

In plant material at different stages of growth the total P in the dry matter decreased with advancing maturity and the proportion present as phytate generally increased. Irrigation increased

the total P content in the dry matter and decreased the proportion present as phytate.

2. Buffalo bulls were given rations containing different amounts of total and phytate P and the degree of hydrolysis of phytate in the digestive tract and balances of P, Ca and Mg were estimated for each ration.

The degree of hydrolysis of phytate varied among rations from 83 to 41 per cent. A high degree of hydrolysis was associated with a large intake of total and phytate P of which only a small proportion was provided in paddy straw, and a small degree of hydrolysis was associated with a small intake of total and phytate P of which a relatively large proportion was provided in paddy straw.

The P balance was positive on all rations. The amount retained was closely correlated with total and phytate P intake, and loosely correlated with the degree of phytate hydrolysis. Ca and Mg balances were negative in animals on the ration containing a large amount of total and phytate P and positive in animals on the ration containing smaller amounts of total and phytate P.—R. Hill.

2488

KRÜGER, L., MÜLLER, W., GINKEL, E. and SCHULZE, G. Über Futteraufnahme und Verzehrleistungen bei Milchkühen. 2. Untersuchung spezieller Einflüsse auf die Grösse des Futterverzehrs. [**Feed intake and consumption in milk cows. 2. Special influences on the magnitude of feed consumption.**] *Züchtungskunde*, 1955, **27**, 143–153. [Inst. Tierzucht, Justus Liebig Hochsch., Univ. Giessen.]

For part 1 see Abst. 1201, Vol. 26.

Ten cows soon after calving were offered rations which supplied their calculated nutrient requirements for maintenance and milk yield plus enough for another 10 kg. milk daily. The mean intake of the cows ranged from 17·0 to 19·1 kg. dry matter. Eight days after calving the difference between calculated requirement and intake, in terms of production value, was — 1·0 kg. milk, but after 40 days it was + 3·7, after 65 days + 4·9, after 99 days + 5·6 and after 111 days + 10·5 kg. milk. The bodyweight of the cows fell in the time between calving and the peak of lactation and then rose again. Reserves must have been depleted in early stages of lactation. It is concluded that intake was limited not by physiological requirements, but by mechanical conditions.

A series of studies on feed preferences showed that by attention to individual preference and to palatability as affected by stage of growth of the crops and their contamination by weeds, cows can be made to take the greatest proportion of their feed as homegrown bulk feeds and so save expensive concentrates.

The effects of the crude fibre content of the ration were studied in 7 cows giving 10 to 15 kg. milk daily. The best results were obtained with a crude fibre content of 18 to 18·5 per cent.; above this, milk yield fell. The dry matter intake did not fall until the crude fibre content was raised to 28 per cent., but then it fell sharply; the crude fibre intake did not exceed 4·2 kg. daily.

The cows which ate most quickly had with few exceptions the highest intakes. "Fodder volume" for intake and "fodder volume per minute" for rate of eating are more useful criteria than dry matter.—D. Duncan.

2489

PRESTHEGGE, K. Forhold som virker inn på fettinnholdet i mjølk—og vurdering av mjølkefettet som grunnlag for korreksjon av avdråtten. [**Circumstances that affect the fat content of milk and the value of milk fat as a basis for correcting milk yield.**] *Tidsskr. norske Landbruk*, 1955, **62**, 293–307.

Statistical and experimental studies of the relations of fat, protein and lactose in cow's milk are briefly reviewed with reference chiefly to Scandinavian work. Data from milk recording, on the effects of management and of feeding, including the effect of fibre and of specific feeds, *e.g.*, fish oil, are discussed. Formulae for correction to a uniform basis, which in practice is a uniform energy value, are compared, and finally differential prices for milk based on fat content are discussed in relation to the modern movement from butter production to consumption as milk and cream. Everything considered, the energy basis is as fair as any and 4 per cent. milk a useful criterion both for payment and for selection in breeding, where it safeguards against undue emphasis on fat with relative sacrifice of other components, especially protein, which is now valued much more highly than it was.

The list of references may be got from Fóringsforsøkene, N.L.H., Vollebekk, Norway.

I. Leitch.

2490

DAVYDOV, S. G., LEBEDEV, M. M. and BARANOVA, D. I. Povyshenie zhirnomolochnosti ostfrizskogo skota putem mezhporodnogo skreshchivaniya i napravlennogo vospitaniya. [**Improvement of the fat content of milk of East Friesian cattle by crossbreeding and controlled rearing.**] *Izv. Akad. Nauk SSSR Ser. Biol.*, 1955, No. 4, 84–94. [Pushkin Sci. Res. Lab. Agric. Animal Propagation.]

Three groups of crossbred calves were fed on milk of different fat content. Group 1 had milk with a fat content of 3·2 to 3·3 per cent. (normal fat content), group 2 with about 5 per cent. (fat content increased artificially) and group 3 with 2

to 2·5 per cent. (fat content decreased by separation). All groups received the same amount of hay and succulent fodder. The control and high-fat groups were also given 152 to 156 kg. concentrates each during the first 6 months, with a high content of soya cake, oatmeal and bran.

Group 2 developed better than the other 2 groups in both general build and liveweight. They developed into cows producing milk with greater fat content than that of their dams, and although the fat content in this group varied between 3·33 and 3·97 per cent. and in the control group between 2·86 and 3·75 per cent., there was a greater number of cows in group 2 producing milk with a high fat content than in the control group. In the low-fat group there was less variation in the fat content of the milk, all the cows producing milk with a fat content of 3 to 3·2 per cent. Experiments with crossbred and purebred calves showed that crossbreds reacted more strongly to changes in feeding than did the purebreds. It was also found that reducing either the quantity or the quality of the feed given to young animals inevitably led to reduction of the fat content of milk later produced by these animals.—H. Scherbatoff.

2491

PERRIN, D. R. **Milk composition studies in the hormonal induction of lactation using identical twin dairy cattle.** *N.Z. J. Sci. Technol.* [*A*], 1955, **37**, 88–92. [Ruakura Animal Res. Stat., Hamilton.]

Lactation was induced in 1 member of each of 4 pairs of identical twin heifers by treatment over 120 days with diethylstilboestrol and progesterone in the ratio 1000 : 1. The remaining 4 heifers were brought into lactation in the normal way. The initial secretions of the treated animals were similar in composition to colostrum. The milk of treated animals had higher percentages of protein and fat. There was little difference in the contents of lactose, ash, chloride, Ca and P. Total yields were less than half those of the control twins.

J. N. Aitken.

2492

HARING, F. and KUBLITZ, M. Beifutter für Milchkühe auf der Weide. Kakaoschalen, Sauerkartoffeln und vielseitiges Kraftfuttergemisch. [**Supplements for milk cows on pasture. Cocoa shells, potato silage and balanced concentrate mixture.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10**, 211–223. [Inst. Tierzucht, Univ. Göttingen.]

Means of counteracting the unexplained fall of fat percentage in milk when cows are on pasture in northwestern Germany are discussed. Cocoa shells, with a protein to starch ratio of 1 : 9·6 and a crude fibre content of 15 or 16 per cent., form a good supplement to young pasture grass; they are not used for cattle feeding in Germany and 10,000 tons a year are either exported at a very low price to other countries for this purpose or are used in other ways. Varying results with high-carbohydrate feeds have been reported; home-produced potato silage low in ballast, with a protein to starch ratio of 1 : 15·3, was available. A trial was made with 3 groups of 7 Black Pied Lowland cows of the same average age, milk yield and stage of lactation. During a pre-period of 14 days covering transition from stall feeding to pasture, group 1 had, daily, ground oats 250, dried beet slices 500 and unextracted cocoa shells (composition given) 145 to 1000 g., group 2 oats and slices as above, with up to 2·5 kg. potato silage, and the control group had then and throughout the experiment only oat and wheat straw as supplements to pasture. For the next 14 days groups 1 and 2 got oats and slices as before and 1·5 kg. cocoa shells or 3 to 3·75 kg. potato silage. For 28 days after that, group 1 was offered 1·75 to 2·175 kg. cocoa shells and group 2 had ground oats 0·35 to 0·7 kg., slices 1·0 to 2·0 kg., and potato silage 2·5 kg. gradually replaced by up to 0·3 kg. of a concentrate mixture of the following percentage composition: a 1 : 1 mixture of cod-meal and fishmeal 41, meatmeal 23·5, soya meal 12·0, cod liver and liver oil 10·0, ground bone 6·0, dried yeast 5·0, $CaCO_3$ 2·5. Finally, for 16 days group 1 had pasture only and group 2 had the same as in the third period. The pasture (botanical composition given) was well managed permanent grass, grazed at fully hand height, a fresh section being provided daily by electric fencing. Milking was in stall, by machine, to avoid disturbance due to changing over to hand milking.

The cows did not hesitate to eat the potato silage or the concentrate. They took a day or two to get used to the cocoa shells and would not take the full amounts intended, most of them not more than 1·1 kg. daily. As usual, the fat percentage of the milk rose in all 3 groups during the first week on pasture, but the rise in group 1, from 3·8 to 4·8, was over twice those in the other groups and, unlike them, was maintained until the cocoa shells were stopped. Potato silage by itself had no effect; the concentrate gave a slight improvement. On the other hand, on cocoa shells the milk yield fell, at first steeply and then more gradually. Potato silage again had no effect and the concentrate gave a slight improvement. The total amount of milk fat produced was much the same for all 3 groups. The cows on cocoa shells gained weight more rapidly at the outset than the controls, probably owing to the constipating effect of the cocoa shells. No ill effect resulted from any of the supplements. From the narrow point of view of returns from milk sales, the supplements were not economic.—W. M. Deans.

2493

DICKEY, H. C. **Dried potato pulp for dairy cattle.** *Maine Agric. Exp. Stat. Bull.* No. 539, May 1955, pp. 7.

The dried potato pulp had the following percentage composition: water 12·29, protein 8·44, fat 0·40, fibre 5·30, N-free extract 69·4 and minerals 4·17. The results from a double reversal trial with 4 pairs of milking cows showed that its value for milk production was equal to that of yellow hominy feed. It is concluded that when given with good hay and silage to make up the vitamin deficiency, and in mixtures containing enough fat, the pulp is a satisfactory concentrate for dairy cows.—J. N. Aitken.

2494

SAHAI, K., JOHRI, P. N. and KEHAR, N. D. **Effect of feeding alkali and water-treated cereal straws on milk yield.** *Indian J. Vet. Sci.*, 1955, **25,** 201–212. [Div. Animal Nutrit., Indian Vet. Res. Inst., Izatnagar, U.P.]

2495

LOGAN, V. S. **Grass silage in dairy cattle rations.** *Canada Dept. Agric. Publ.* No. 929, February 1955, pp. 11. [Animal Husb. Div., Exp. Farms. Serv., Ottawa.]

2496

IVANOV, P. and ZAHARIEV, Z. Hranene na bivolici i malakini sos slama, obrabotena s var. [**Feeding buffalo cows and heifers with salts prepared from lime.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia,* 1953–54, **4/5,** 223–229. Russian summary.

2497

MAINARDI, B. and DORDONI, G. Le variazioni della produzione lattea in rapporto all'età nelle bovine pezzate nere del cremonese. [**Variations in milk production with age in Friesian cattle in Cremona.**] *Riv. Zootec.*, 1955, **28,** 267–271.

The records of 310 Friesian cows showed that the greatest yield was in the fifth lactation. The difference between lactations was not so great as in the Brown Swiss, which is the other breed most used in the province of Cremona. The yield of the Friesians was higher than that of the Brown Swiss, but they did not remain good milkers for as long.—T. D. Bell.

2498

AGARWALA, O. P. and SUNDARESAN, D. **Influence of frequency of milking on milk production.** *Indian J. Dairy Sci.*, 1955, **8,** 94–99. [Dept. Animal Husb., Agric. Inst., Allahabad, U.P.]

This study was made over a 100-day experimental period with 6 cows. One half of the udder of each cow was milked 3 times a day and the other half twice a day for 25 days, and the treatments were reversed during the next 25 days. This procedure was repeated twice during the trial. It was concluded that the production of cows giving on the average 14 lb. milk daily could be increased by 8·4 per cent. by milking 3 times daily.

J. N. Aitken.

2499

AGARWALA, O. P. **Heritability estimates and correlations of some economic traits in buffalo herd.** *Indian J. Dairy Sci.*, 1955, **8,** 89–93. [Agric. Inst., Allahabad, U.P.]

The buffaloes were of the Murrah breed. A statistical analysis of 58 daughter-dam pair records was made. Heritability estimates for percentage butterfat, total butterfat production in 305 days and age at first calving were, respectively, 26, 6 and 24 per cent. Estimates of phenotypic correlations between different traits were not statistically significant. There was no evidence that production was positively correlated with size.—J. N. Aitken.

2500

VAN DER KLEY, F. K. and VAN DER PLOEG, H. Graasgewoonten en voedselopname van Nederlandse rundertweelingen. 1. De graasgewoonten. [**Grazing habits and amount eaten by Netherlands monozygous twin cows. 1. Grazing habits.**]

VAN DER KLEY, F. K. 2. Voedselverbruik en beweidingssysteem. [**2. Grass consumption in relation to grazing management.**] *Landbouwk. Tijdschr.*, 1955, **67,** 609–619; 620–627. [Afd. Graslandcult., Landbouwhogesch.] English summary.

1. The study was made on 4 pairs of identical twin cows with records at 5-min. intervals for 2 days at intervals throughout the grazing season. Roughly 500 min. daily were spent grazing and the same time ruminating. When the day was so short that enough feed was not eaten, the cows grazed about midnight. Two comparable leys, one chiefly of *Dactylis glomerata*, the other of *Lolium perenne*, were grazed at lengths 14 or 11, 17 or 13, 22 or 18 and 40 or 33 cm. Variation within pairs and between pairs was greater than expected. On the average there was little difference between the leys, and 1 kg. dry matter (D.M.) required 20 min. grazing. Total D.M. daily ranged from about 8 to over 23 kg. At low total intakes of D.M. the longer cocksfoot was more quickly eaten than the shorter ryegrass. Optimum length was about 8 in. (21 cm.). Per kg. crude fibre, cocksfoot required 15 min. longer rumination than ryegress.

2. It is calculated that in the grazing of Netherlands pastures 20 per cent. of starch equivalent and 35 per cent. of digestible crude protein is lost. Most of this is loss from overeating; stricter rationing by close folding is recommended. Other losses are due to damage by trampling and by soiling, the latter involving also waste of manure unless it is spread regularly.—I. Leitch.

2501

McDowall, F. H., Patchell, M. R., Hurst, F. and Kelsey, J. M. **Effect of treatment of dairy pastures with BHC and DDT on the flavour and composition of milk, cream, and butter.** *N.Z. J. Sci. Technol.* [*A*], 1955, **37,** 146–155. [Dairy Res. Inst. (N.Z.), Palmerston North.]

Treatment of dry pastures with 2 lb. benzene hexachloride (BHC) containing not less than 99 per cent. γ-isomer (lindane), or with 2 lb. *pp*-DDT per acre did not taint milk, cream or butter provided a period of 3 weeks was allowed to elapse before grazing. Treatment with commercial BHC containing 10 per cent. γ-isomer at 20 lb. per acre caused a slight taint in milk, butter and cream. Treatment of wet pastures with both insecticides and with immediate grazing caused tainting. It was concluded that there was little likelihood of cheese and butter being contaminated with the insecticides provided the pastures were treated when dry and a 3-week interval was allowed before grazing.—J. N. Aitken.

2502

Rigor, T. V. **Dairy cattle feeding problems in the Philippines.** *Philippine J. Animal Indust.*, 1954, **15,** 81–86. [Bur. Animal Indust., Manila.]

The supply of feed for dairy cattle in the Philippines is inadequate and irregular; sometimes the cows have to be kept on pasture alone, and sometimes on concentrates. It is shown that milk production drops towards the end of the rainy season, and rises again only at the beginning of the next rainy season. Improved pasture and forage production are necessary, and schemes with this end in view have been started. The milk yield of imported breeds cannot be expected to be high when feeding is inadequate and climate unsuitable. The protein requirement of dairy cows is discussed in relation to the short supply of protein feeds.

T. D. Bell.

2503

Shepherd, J. B., Wiseman, H. G., Ely, R. E., Melin, C. G., Sweetman, W. J., Gordon, C. H., Schoenleber, L. G., Wagner, R. E., Campbell, L. E., Roane, G. D. and Hosterman, W. H. **Relative merits of four methods of harvesting and preserving alfalfa forage for dairy feed.** *U.S. Dept. Agric. Circular* No. 963, July 1955, pp. 16.

See Abst. 241, Vol. 25.

2504

Bettini, T. M. Come alleviare gli effetti del caldo sui bovini nel mezzogiorno. [**How to alleviate the effects of mid-day heat on cattle.**] *Riv. Zootec.*, 1955, **28,** 252–254.

Heat regulation in animals and the effect of temperature and humidity are discussed. The effect of climatic stress on bodyweight, feed and water intake and milk production are described. Practical methods tried in Sardinia consisted in protecting the existing shelters from solar radiation by a second roof which shaded the sides and top and reduced the light inside, and providing electric fans to increase air movement. Clipping the animals also helped.—T. D. Bell.

See also Abst. 1917.

REPRODUCTION

2505

Tribe, D. E. and Cumming, R. B. **Nutrition and fertility in the bull.** *Vet. Rev.*, 1955, **1,** 69–81. [Sch. Vet. Sci., Univ. Bristol.]

SHEEP

2506

Repp, W. W., Hale, W. H. and Burroughs, W. **The value of several non-protein-nitrogen compounds as protein substitutes in lamb fattening rations.** *J. Animal Sci.*, 1955, **14,** 901–908. [Iowa Agric. Exp. Stat., Ames.]

In 3 feeding trials with 253 lambs as much as 50 per cent. of the protein N of the ration was replaced by non-protein nitrogen compounds. Urea, ammonium acetate, ammonium propionate, ammonium formate and propionamide proved about equal in feeding value and formamide inferior to all. In one trial with 50 per cent. N replaced, lambs given these compounds made lower weight gains than those on conventional protein, but with 15 and 30 per cent. N replaced lambs given propionamide and urea made gains equal to those on conventional protein. From 2 to 3 weeks were required for lambs to adapt themselves fully to the compounds used, and this was in agreement with studies *in vitro* in which more ammonia N was released from rumen micro-organisms from

lambs previously receiving propionamide than from those from lambs not so fed.—J. C. Gill.

2507

MEISKE, J. C., VAN ARSDELL, W. J., LUECKE, R. W. and HOEFER, J. A. **The utilization of urea and biuret as sources of nitrogen for growing-fattening lambs.** *J. Animal Sci.*, 1955, **14,** 941–946. [Dept. Animal Husb., Michigan State Coll., East Lansing.]

To a basal ration with only 7 per cent. crude protein, a supplement of urea, biuret, crude biuret containing 41 per cent. biuret and 46 per cent. urea, or soya bean oilmeal was added to raise the crude protein level to 9 per cent. The rations were given to 5 groups of lambs, average liveweight 75 lb., for 73 days. All supplements significantly improved rate of gain and efficiency of feed conversion. There was no significant difference between supplements. Carcase grades in all groups were similar.

When 2 lambs were given a drench of urea weekly, signs of toxicity appeared when the level of urea reached 25 g. per 100 lb. bodyweight. Biuret at the rate of 31 g. per 100 lb. bodyweight did not produce signs of toxicity.—T. D. Bell.

2508

IVANOV, I., RIZVANOV, K. and RALCHEV, G. Upotreba na acidofilna kultura pri hraneneto na agneta. [**Use of acidophilous cultures in feeding lambs.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia,* 1953–54, **4/5,** 175–182. Russian summary.

Of 2 groups of 10 lambs about 15 days old, one received with their feed 4 or 5 g. daily of a culture of *Lactobacillus acidophilus* providing 40 to 60 million acidophilous bacteria. After 45 days the experimental lambs weighed on the average 22·62 kg. and controls 20·82 kg. The faeces of the former contained more lactic acid bacteria and few coliform bacilli or putrefactive bacteria. (From summary.)—D. Duncan.

2509

KUMANOV, S., KANEV, S. and IVANOV, I. Opit za opredelyane na kromni normi za doini ovce ot mestnata starozagorska ovca. [**Establishment of feeding standards for lactating ewes of the local Stara Zagora sheep.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia,* 1953–54, **4/5,** 61–67. Russian summary.

2510

BONELLI, P. Coefficienti di normalizzazione della produzione lattea nella pecora sarda. [**Coefficients for standard milk production in the Sarda sheep.**] *Riv. Zootec.*, 1955, **28,** 293–296. [Ispettorato Provinciale Agric., Cagliari.]

The records of 2400 lactations of 300 ewes in the Sarda flock book were examined. It was shown that significantly greater milk yields were obtained from ewes which dropped their first lamb between 12 and 15 months of age than from those lambing for the first time at 2 years of age. It was also shown that the age in years of the ewe was a greater cause of variation in yield than the number of the lactation. The greatest yield was obtained at 5 years of age. From 3 to 7 years there was no significant difference between yields, but ewes younger than 3 and older than 7 gave significantly smaller yields. Coefficients for correcting milk yield for age in order to compare performances are given : 1·867, 1·310 and 1·135 for ewes 1, 2 and 8 or more years old, respectively. The coefficients are higher than have been found for other breeds reported in the literature. At present Sarda sheep are kept in a wild or semi-wild state, and when management has been improved some revision of the coefficients will be necessary.—T. D. Bell.

2511

COOP, I. E. and CLARK, V. R. **The influence of method of rearing as hoggets on the lifetime productivity of sheep.** *N.Z. J. Sci. Technol.* [*A*], 1955, **37,** 214–228. [Canterbury Agric. Coll., Lincoln.]

In a trial with 112 ewes half were reared on a high plane from birth to one year and half on a low plane. At one year of age the average liveweight difference was 30 lb. ; the ewes were then run together. In a second trial with 116 ewes differential feeding extended from 4 to 18 months of age, at the end of which the average liveweight difference was 37 lb. and the ewes were again run as one flock. The effects of these treatments on lifetime performance as ewes were studied.

Though the hoggets reared on the high plane produced an extra 2 lb. wool during the rearing period they were not superior to the ewes reared on the low plane in subsequent wool production. There was no difference between groups in milk production. High plane rearing resulted in about 1 per cent. less ewe mortality, 2 to 3 per cent. fewer barren ewes, 2 to 3 per cent. more lambs and an increase in the productive life of the ewe of 3 to 6 months as measured by the rate of attrition of incisor teeth.—J. C. Gill.

2512

MARTEM'YANOV, B. A. Gustota shersti polutonkorunnykh pomesnykh yagnyat v zavisimosti ot urovnya ikh kormleniya v podsosnyi period. [**The thickness of the wool of semi-fine-wooled crossbred lambs in relation to the level of feeding during suckling.**] *Izvest. Timiryaz. Sel'skokhoz. Akad.*, 1954, No. 3, 119–128.

Of the 2 groups of 10 lambs each under experiment, the first was kept in the flock under ordinary conditions. When penned, each ewe belonging to this group received a daily ration of 2 kg. hay and 1 to 1·5 kg. grass silage ; the lambs were not given any extra feed except hay. The second group was fed more intensively. The average daily ration for each ewe of the second group was, when penned, 2·5 kg. hay, 1·5 kg. silage and 350 to 400 g. concentrates. The lambs in this group were given concentrates and succulent fodder. Towards the end of the experimental period each lamb in the second group was receiving on the average 300 to 500 g. concentrates daily, consisting of oatmeal, bran, linseed and sunflower cakes, also succulent fodder in the form of beet, potatoes and silage, on the average up to 1 kg. of each daily. During the whole experimental period the lambs in this group received on the average as supplements 24·6 feed units and 2559·3 g. digestible protein, and the ewes 35·1 feed units and 6389 g. digestible protein.

The higher level of feeding had a considerable effect in increasing the breadth and length of the lambs, but had less effect on their height. Their liveweight was increased and the improvement in the build of their bodies was accompanied by corresponding changes in the structure of their skin and distribution of the hairs [? wool]. The lambs' skin was 688 μ. thicker in the second group than in the first, this being 34·3 per cent. in favour of the lambs of the first group. The total number of " hairs " per sq. mm. was not affected by the extra feed, but the " down hairs " increased considerably in lambs up to 4 months old, particularly in the lambs of the second group on intensified feeding. At 120 days the lambs of the second group were more mature than the lambs of the first.—H. Scherbatoff.

2513

EL-SHEIKH, A. S., HULET, C. V., POPE, A. L. and CASIDA, L. E. **The effect of level of feeding on the reproductive capacity of the ewe.** *J. Animal Sci.*, 1955, **14,** 919–929. [Dept. Genetics, Univ. Wisconsin, Madison.]

Reproductive capacity of a group of 40 ewes fed on roughage and grain was compared with that of a group fed on roughage only. Half of each group were slaughtered 3 days *post coitum* and the other half at 40 days *post coitum*. Ovulation rate, number of follicles 2 mm. or over in diameter and fertilisation rate were higher and follicles were larger in the group having grain, but embryo survival rate was lower. Uteri were significantly larger at 3 days *post coitum* and horns significantly heavier at 40 days *post coitum*. At 40 days, embryo length and weight, amnion weight, amniotic fluid weight, chorionic fluid weight and size of amnionic vesicle did not differ between the groups, but chorion weight was significantly higher in the group having grain. Embryo and embryonic membranes and fluid weights were greater for singles than for twins. At least 12 per cent. of the embryos migrated from one uterine horn to the other.—J. C. Gill.

2514

NEDKVITNE, J. J. Luta halm er godt sauefôr. **[Alkali-treated straw is good feed for ewes.]** *Sau og Geit*, 1955, No. 5, 93–94.

Sheep readily eat pre-digested straw, and since it has excess alkali, it may suitably be given with A.I.V. silage. For breeding ewes the following rations are suggested: during the " flushing " season, hay 0·5, silage 1·0 and straw 2·0 kg., herring meal 75 g. and barley- and oatmeal 75 g. The hay and cereal are omitted for the next 7 weeks and the straw is raised to 3·5 kg. ; for the last 7 weeks hay is restored, straw reduced to 2·5 kg. and herring meal gradually increased to 100 g. During lactation the ration should be hay 1·0, silage 2·0 and straw 3·0 to 4·0 kg., herring meal and cereal increasing from 100 to 200 g. daily. Straw may be given to lambs also, with hay, silage and herring meal, in amounts up to 2·5 kg. daily.
I. Leitch.

2515

MOULE, G. R. **The supplementary feeding of sheep in Queensland. 2. What does the sheep do with the feed it eats ? 3. How does the amount of feed influence wool growth in young sheep ? 4. How does the plane of nutrition affect adult sheep ?** *Queensland Agric. J.*, 1955, **80,** 327–330 ; **81,** 21–28 ; 119–123.
For part 1 see Abst. 1244, Vol. 26.

2516

HALE, W. H., HOMEYER, P. G., CULBERTSON, C. C. and BURROUGHS, W. **Response of lambs fed varied levels of diethylstilbestrol.** *J. Animal Sci.*, 1955, **14,** 909–918. [Iowa Agric. Exp. Stat., Ames.]

Wether lambs given about 2 mg. diethylstilboestrol per head daily by mouth gained 22 per cent. more weight than controls similarly fed, and their carcases did not differ in quality. Quality appeared to be impaired when larger amounts were given. When 3·6 mg. diethylstilboestrol was given per head daily in trials with groups of 20 wethers each, rates of gain were not so high as at the lower levels. Severe signs of toxicity seen in stilboestrol-implanted lambs did not appear in any of the lambs, but enlargement of the prepuce, mammary development and oedema of the anal area were noted to a degree associated with the level of stilboestrol.
J. C. Gill.

2517

JORDAN, P. S., JORDAN, R. M. and CROOM, H. G. **Effect of stilbestrol, progesterone-estradiol implants and oral administration of stilbestrol on fattening lambs.** *J. Animal Sci.*, 1955, **14,** 936–940. [Minnesota Agric. Exp. Stat., St. Paul.]

In trials with 110 fattening lambs, implantation of 12 mg. stilboestrol significantly increased rate of liveweight gain but reduced carcase grade and yield. Lambs implanted with 250 mg. progesterone and 10 mg. oestradiol gained significantly faster than controls and their carcases were equal in grade and yield to those of the control lambs. Stilboestrol given by mouth to lambs at levels of 0·1, 0·5 and 1·5 mg. per lamb daily did not increase rate of gain. Carcases of lambs given 0·1 or 0·5 mg. were of a higher grade than the controls and those of lambs given 1·5 mg. were equal in grade to the controls.—J. C. Gill.

2518

MILLER, W. B. and MCHUGH, J. F. **Fat lamb investigations at Rutherglen Research Station.** *J. Dept. Agric., Victoria,* 1955, **53,** 385–392; 426–431.

Trials over the last 18 years are reported. On the improved pastures in use it was profitable to produce fat lambs. The best ewes were first cross Border Leicester × Merino, and the best rams were Dorset Horn. It was shown that it was profitable to mate the ewes a month earlier than is customary, so that the lambs were ready for market before prices fell.—T. D. Bell.

2519

FRASER, A. **The Scottish sheep industry to-day: a critical review.** *Trans. Roy. Highl. Agric. Soc. Scot.* (1954), 1955, **66,** 23–34.

See also Abst. 2168.

PIGS

2520

VERA CRUZ, N. **Raising pigs artificially at Alabang Stock Farm.** *Philippine J. Animal Indust.*, 1954, **15,** 31–38. [Bur. Animal Indust., Manila.]

A litter of 9 pigs was reared for the first 5 weeks on a synthetic milk replacement, Terralac, after suckling for 2 days; a control litter was suckled. Both were reared to 8 weeks of age, and were given access to a starter meal after the first week.

At weaning there was no difference in liveweight between the groups. No pig in the experimental litter died, but in the control litter one died after 1 week and one after 2 weeks. The artificial rearing was successful, but very much more costly than natural rearing. The sow from which the experimental litter was removed dried up within a few days, and was ready for mating 19 days after farrowing.—T. D. Bell.

2521

GEORGIEV, I., SYAROV, I. and RIZVANOV, K. Prouchvane vliyanieto na bolgarskoto (*Lactobacterium bulgaricum*) i acidofilnoto kiselo mlyako (*Lactobacterium acidophilum*) vorhu razvitieto na praseta bozainicheta. **[The effect of milk soured with *Lactobacillus bulgaricus* and *Lactobacillus acidophilus* on the growth of sucking pigs.]** *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia,* 1953–54, **4/5,** 353–370. Russian summary.

Supplements of both types of sour milk improved the growth of sucking pigs, but *Lactobacillus acidophilus* was especially valuable. (From summary.)—D. Duncan.

2522

LEWIS, C. J., CATRON, D. V., COMBS, G. E. (Jr.), ASHTON, G. C. and CULBERTSON, C. C. **Sugar in pig starters.** *J. Animal Sci.*, 1955, **14,** 1103–1115. [Dept. Animal Husb., Iowa Agric. Exp. Stat., Ames.]

In a series of experiments with pigs weaned at an early age, starter mixtures containing sugar or oat groats were offered free choice. Of mixtures with sugar a preference was shown for that with 20 per cent.; the percentage of oat groats did not affect choice. When meal, crumbles and pellets were compared the preference was for crumbles, closely followed by pellets; very little meal was eaten. Pigs preferred pellets in which the sugar was combined to those which had a sugar coating. Sugar incorporated in pellets or meal significantly improved efficiency, and pelleting also improved efficiency: in combination the effect was additive. The rate of gain and consumption of starter were improved by sugar. This effect was greatest during the first 5 weeks of life.—T. D. Bell.

2523

NOTZOLD, R. A., BECKER, D. E., TERRILL, S. W. JENSEN, A. H. **Saccharin and dried cane molasses in swine rations.** *J. Animal Sci.*, 1955, **14,** 1068–1072. [Illinois Agric. Exp. Stat., Urbana.]

The addition of saccharin to a practical ration for weanling pigs at the rate of 0·03 or 0·1 per cent. had no effect on feed consumption, growth rate or efficiency of feed conversion. Dried cane molasses at the rate of 7·2 per cent. likewise failed to affect either growth or feed efficiency but coul

be used as a source of energy without harmful effect. In a free choice trial of palatability lasting for 55 days pigs showed a preference during the first half of the experiment for maize treated with 0·05 per cent. saccharin over untreated maize or a supplementary feed.—J. S. Thomson.

2524

BECKER, D. E., JENSEN, A. H., TERRILL, S. W. and NORTON, H. W. **The methionine-cystine need of the young pig.** *J. Animal Sci.*, 1955, **14,** 1086–1094. [Illinois Agric. Exp. Stat., Urbana.]

Weanling pigs fed on a synthetic diet containing soya bean protein 12·6, methionine 0·15 and cystine 0·17 per cent. did not grow satisfactorily. The addition of 0·1 or 0·2 per cent. cystine had no effect. Supplements of 0·1 per cent. methionine produced satisfactory growth, but total levels of 0·45 or 0·55 per cent. inhibited growth. The methionine requirement could be partly satisfied by DL-α-hydroxy-γ-methylmercaptobutyric acid. Antibiotics in the diet improved growth and efficiency of gain but did not influence the methionine-cystine requirement of the pig.—A. Hepburn.

2525

LENKEIT, W., GÜTTE, J. O. and STREUTER-PETERMÖLLER, A. Langfristige Untersuchungen zum äusseren und inneren Stoffwechsel des graviden und laktierenden Schweines. 2. Der Ablauf der N-Bilanz vom Ende der Gravidität bis zum Ende der Laktation bei gleichbleibender Ernährung. [**Prolonged studies of external and internal metabolism of pregnant and lactating sows. 2. Course of N balance from the end of pregnancy to the end of lactation, diet being unaltered.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 228–237. [Inst. Tierphysiol., Univ. Göttingen.]

For part 1 see Abst. 1248, Vol. 26.

Three studies were made on 1 sow, 2 on another and 1 on a third. The sows received the same ration from the end of pregnancy to the end of lactation, except that 2 consecutive studies were made on the first sow before and after a change of ration on the twelfth day of lactation. The litters contained from 5 to 11 pigs and the number of times of suckling daily was proportional to the size of the litter. The rations provided from 305 to 977 g. crude protein daily and N balances were estimated; the conversion factors used were 6·25 for feeds and faeces and 6·37 for milk.

The coefficient of digestibility for each ration varied in the course of a lactation within ± 2 per cent. The N content of the milk fell sharply and then slowly in the first 11 to 15 days of lactation and then rose slowly until the end of lactation. There was little influence of feeding on the protein content of the milk, but the milk yield was greater the higher the protein intake. Urine output was greatest in the early stages.

The N balance was always strongly negative at the beginning of lactation, whatever the protein intake or the milk yield, and it even appeared that the higher the protein intake, the more body protein was broken down. The balance approached equilibrium at about the 30th day of lactation.

It is suggested that the course of the N balance during lactation may be influenced by the ration given during pregnancy.—D. Duncan.

2526

BARBER, R. S., BRAUDE, R. and MITCHELL, K. G. **Effect of adding copper to the diet of suckling pigs on creep meal consumption and liveweight gain.** *Chem. and Indust.*, 1955, No. 48, 1554. [Nat. Inst. Res. Dairying, Univ. Reading.]

Previous work (*Chem. and Indust.*, 1953, 871) had shown that a creep meal containing added $CuSO_4$, 25 g. per 100 lb. meal, was more palatable to suckling pigs than the unsupplemented meal and that they ate it in preference. The present note describes an experiment with litters reared indoors, or outdoors on grass, to test the effect of the supplemented meal on growth and meal consumption. In the indoor litters there was little difference at 8 weeks in either weight gain or meal consumption between the control and the experimental group; this was also found in the outdoor groups, although weight gain was higher and meal consumption about twice as high as in the indoor groups. It is suggested that the level of Cu supplementation was not high enough to induce the pigs to consume more of the supplemented meal.—J. S. Thomson.

2527

BOWLER, R. J., BRAUDE, R., CAMPBELL, R. C., CRADDOCK-TURNBULL, J. N., FIELDSEND, H. F., GRIFFITHS, E. K., LUCAS, I. A. M., MITCHELL, K. G., NICKALLS, N. J. D. and TAYLOR, J. H. **High-copper mineral mixture for fattening pigs.** *Brit. J. Nutrition*, 1955, **9,** 358 – 362. [Riseholme Farm Inst., near Lincoln.]

Coordinated trials at 8 centres are reported. Pigs 10 weeks old were grown and fattened to bacon weight. Control pigs got the meal which was usually given at each centre, and experimental groups were given a mineral supplement supplying 250 p.p.m. Cu. Growth rates for control and experimental pigs were 1·40 and 1·48 lb. daily, a statistically significant difference. Efficiency of feed conversion also was improved by the Cu supplement, but not significantly. There was no difference in carcase quality. The reason for the

effect of the Cu is discussed and the need for further investigation of the composition of the pig meat is suggested.—T. D. Bell.

2528

BARBER, R. S., BRAUDE, R. and MITCHELL, K. G. **Antibiotic and copper supplements for fattening pigs.** *Brit. J. Nutrition*, 1955, **9**, 378–381. [Nat. Inst. Res. Dairying, Univ. Reading.]

Previous work on the beneficial effect on growth of pigs of a mineral supplement high in copper (see Abst. 5864, Vol. 25 ; and preceding Abst.) has been extended to compare this effect with that of antibiotics. Five groups of 6 pigs, 10 to 11 weeks old, were given a control basal ration to which additions were made of a mineral mixture high in copper, Aurofac 2A, a combination of these, or copper sulphate alone in an amount equivalent to that in the mineral mixture. All the supplements were equally effective in increasing the rate of gain significantly. The increased rate of growth in the groups receiving the mineral supplement, Aurofac or both was due to an increase in total feed consumption; there was no significant effect on efficiency of feed utilisation. In the group receiving copper sulphate, feed consumption decreased, with a significant improvement in feed utilisation. The different supplements had no effect on carcase grading.—J. S. Thomson.

2529

CHAPMAN, H. L. (Jr.), KASTELIC, J., ASHTON, G. C. and CATRON, D. V. **A comparison of phosphorus from different sources for growing and finishing swine.** *J. Animal Sci.*, 1955, **14**, 1073–1085. [Dept. Animal Husb., Iowa Agric. Exp. Stat., Ames.]

Dicalcium phosphate was compared with bonemeal, soft phosphate with colloidal clay or phosphate from plant sources, all at 2 different levels, in an experiment with 144 crossbred pigs grown and fattened to 200 lb. liveweight. All animals received rations similar in protein, total digestible nutrients and crude fibre content : half of them got antibiotic and half did not.

Soft phosphate gave poorer rates of gain and efficiency of feed conversion and lower breaking strength of femurs than dicalcium phosphate or steamed bonemeal. The fluorine and ash contents of the femur were increased but P in the bone ash and blood serum was not altered. P from plant sources was not utilised as well as inorganic P.

T. D. Bell.

2530

SCHNEIDER, W. Bericht über einen Schweinemastversuch mit einem Bierhefepräparat. [**Pig feeding experiment with a preparation of brewer's yeast.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10**, 252–255. [Inst. Tierernährungslehre, Landw. Hochsch. Hohenheim.]

Rate of gain, efficiency of feed use, slaughtering losses and quality of pork did not differ significantly in 3 groups of 5, 5 and 6 pigs of the Swabian-Halle breed fed from about 30 to 100 kg. on barley to appetite with a home-mixed protein concentrate including 3 per cent. Waldhof fodder yeast, or the same concentrate with, instead, 3 per cent. " BW-Hefe ", said to contain brewer's yeast 47 and bran 53 per cent., or a certified commercial protein concentrate containing 3 per cent. dried yeast. From these findings and consideration of costs it was concluded that the main use of " BW-Hefe " in pig feeding is as a source of B vitamins, not of proteins. It was found to contain vitamin B_1 33 and riboflavin 26·4 mg. per kg. dry matter ; the Waldhof fodder yeast had 25·9 and 46·2 mg., respectively.—W. M. Deans.

2531

FÉVRIER, R. and VACHEL, J. P. Valeur alimentaire des levures. 3. Comparaison de trois levures d'origines différentes. [**Food value of yeasts. 3. Comparison of three yeasts of different origin.**] *Ann. Zootech.*, 1955, **4**, 129–131. [Stat. Recherches Élevage, Centre Nat. Recherches Zootech., Jouy-en-Josas.]

For part 2 see Abst. 2974, Vol. 25.

Yeasts grown on beet, cheese whey or apple residues gave similar growth rates and efficiency in pigs for 7 weeks from weaning, when they supplied similar amounts of protein to rations with about 17 per cent. crude protein. There were considerable differences in the vitamin B_1, riboflavin and nicotinic acid contents of the yeasts, but this did not affect the growth of the pigs.

T. D. Bell.

2532

VAN DER VYWER, B. J., VOSLOO, W. A. and STEENKAMP, D. J. **Sweet, yellow lupin seed meal in rations for bacon pigs and dairy cattle.** *Farming in S. Africa*, 1955, **30**, 451–452. [Stellenbosch-Elsenburg Coll. Agric., Stellenbosch.]

2533

LONGWILL, A. **Fodder beet for pig feeding.** *N.Z. J. Agric.*, 1955, **91**, 245–252.

In each of 2 trials one group of pigs was given 1 gal. skimmed milk and 1 lb. meat- and barley-meal, and one group 1 gal. skimmed milk and 2 lb. meat- and barley-meal daily. All pigs were allowed fodder beet of 20 per cent. dry matter to appetite, and were soon eating about 20 lb. each daily. In the first trial they were fattened from 56 lb. to pork weight of 130 lb. liveweight, and in the second from 110 lb. to bacon weight of 160 lb. In both trials the pigs getting 1 lb. meal grew

slightly faster than those getting 2 lb. meal, and the fodder beet supplied 74 and 73 per cent. of the total digestible nutrients in trials 1 and 2, respectively. For the pigs getting 2 lb. meal the fodder beet supplied 66 and 64 per cent. of the total digestible nutrients.

Preliminary tests showed that a crop of fodder beet and maize intersown was well used by pigs folded on it with electric fences. The value of fodder beet for pigs in New Zealand and the economics are discussed.—T. D. Bell.

2534

KMENT, A. and SEEFELDNER, H. Studien über die Beeinflussung der hormonalen Sterilisation und Mast weiblicher Schweine durch eiweissreiches oder eiweissarmes Futter. [**Effect of protein-rich and protein-poor diet on hormonal sterilisation and fattening of sows.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 193–203. [Physiol. Inst., Tierärztl. Hochsch., Vienna.]

The pigs were 40 female Edelschweine aged 4 to 7 months. Ten were controls and 2 groups of 15 received oestrogen on the seventh day after oestrus, a single intramuscular injection which provided 120 mg. stilboestrol dipropionate and 120 mg. stilboestrol dimethyl ether. The rations contained, respectively, 6, 16 and 3 per cent. protein, but were made up of similar constituents, with potatoes and fodder beet as bulk.

Of the 10 control pigs 6 showed regular oestrus, 2 late oestrus and 2 none. Of those given stilboestrol, 11 on the high and 6 on the low protein intake showed periods of excitement or definite oestrus, though not regularly. Feed intake fell in control pigs during oestrus but not in those given stilboestrol.

There was no significant difference in weight increase between the hormone groups, both of which gained better than controls. The heaviest pigs of the high-protein group, those which weighed initially about 100 kg., made the greatest gains of all.—D. Duncan.

2535

GEORGIEV, I. and SYAROV, I. Prouchvane vliyanieto na beltochno-vitaminnata pasta vorhu razvitieto na otbiti praseta. [**Effect of protein-vitamin pastes on the growth of weaned pigs.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia,* 1953–54, **4/5,** 403–409. Russian summary.

2536

CLAWSON, A. J., SHEFFY, B. E. and REID, J. T. **Some effects of feeding chlortetracycline upon the carcass characteristics and the body composition of swine and a scheme for the resolution of the body composition.** *J. Animal Sci.*, 1955, **14,** 1122–1132. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

Weanling pigs receiving a basal ration of ground maize, soya bean oilmeal, meat scraps, ground alfalfa and iodised salt had slightly but not significantly better growth when given aureomycin. Dressing percentage, proportion of wholesale cuts in the whole carcase, chemical composition of the carcase meat and estimated composition of the whole empty body (see below) were unaffected.

Body water of 29 pigs, estimated by the antipyrine dilution method, agreed fairly well with direct analysis. The sp. gr. of the carcase was highly correlated with the water content of the carcase but not so highly with the water content of the whole empty body. From a study of published data on 127 pigs it was found that the water and fat contents of the whole empty bodies were highly correlated ($r = -0{\cdot}98$) and that the fat could thus be accurately predicted from the water content. The composition of the fat-free body was variable, but the protein and ash contents were remarkably constant. It was hence possible to estimate the total composition and energy value of the body from the water content of the whole empty body.—A. Hepburn.

2537

EVANS, R. E. **Nutrition of the bacon pig. 18. The influence of dietary penicillin on the growth rate, efficiency of food conversion and the nitrogen retention of the bacon pig.** *J. Agric. Sci.*, 1955, **46,** 329–361. [Sch. Agric., Univ. Cambridge.]

For part 17 see Abst. 3931, Vol. 24.

Penicillin increased liveweight gain and efficiency of feed conversion in pigs fed on a well balanced basal diet of barleymeal, fine bran, alfalfa meal and minerals supplemented with white-fish meal but the differences were not statistically significant.

Penicillin had no statistically significant effect on group-fed pigs receiving the basal diet supplemented with extracted decorticated groundnut meal but the feed was more eagerly eaten. Individually fed pigs receiving penicillin had mean daily liveweight increases of 0·95 lb. and a feed consumption of 2·97 lb. per lb. gain compared with the control values of 0·88 and 3·21 lb. over the interval 36 to 90 lb. liveweight. Both differences were statistically significant. Over the whole period from 36 to 190 lb. liveweight the control pigs required 5·3 more days and ate 19 lb. more meal, an increase of 3·4 per cent. Similar results were obtained in another experiment with pigs fed on the same diet. Vitamin B_{12} produced no further improvement.

Penicillin supplied to group-fed pigs receiving the basal diet containing extracted soya bean meal to appetite produced better growth than in the controls at first, but later the growth of the controls was better. Penicillin had no significant effect on individually fed pigs.

Five N balance trials with 20 pigs fed on these diets showed that penicillin with a balanced diet had no effect, whether the protein was of animal or vegetable origin, provided the pigs were rationed in accordance with their liveweight and the diets were palatable.

It was concluded that the improvement of growth rate, efficiency of feed conversion and rate of N retention to be expected from the inclusion of penicillin in the diet was too small to be economically worth while.—A. Hepburn.

2538

LUCAS, I. A. M. and CALDER, A. F. C. **The growth of pigs kept to one level of feeding in two environments, and fed diets with and without an antibiotic.** *J. Agric. Sci.*, 1955, **46**, 307–319. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Growth rate, efficiency of feed conversion, carcase composition and dressing percentage of pigs kept in good and bad piggeries were recorded. The piggeries have been described previously (Abst. 5873, Vol. 25). All pigs were kept on the same medium level of feeding; the ration had 16·3 per cent. protein from weaning at 42 lb. liveweight to 100 lb. liveweight, and 14·2 per cent. from 100 to 200 lb. liveweight. Half the pigs in each piggery had a supplement of penicillin. The experiment lasted from December to May. During the first half of the experiment the average temperatures in the good and bad piggeries, respectively, were 51° and 43° F. and during the second half 58° and 54° F. No interaction between antibiotic and type of piggery was found, and results were considered comparing antibiotic with no antibiotic, and good piggery with bad.

During the growing period the bad piggery gave slower and less efficient growth, but the difference was not significant. In the fattening period there was no difference in rate of growth, but in the bad piggery efficiency was significantly better. The pigs from the good piggery were fatter and had a higher dressing percentage. Antibiotics did not give any growth response, or affect carcase measurements, but dressing percentages were significantly higher.—T. D. Bell.

2539

WALLACE, H. D., MCKIGNEY, J. I., PEARSON, A. M. and CUNHA, T. J. **The influence of chlortetracycline on the growth and carcass characteristics of swine fed restricted rations.** *J. Animal Sci.*, 1955, **14**, 1095–1102. [Univ. Florida, Gainesville.]

Three experiments with 7, 3 and 3 groups of 8 pigs of initial liveweight 40 lb., fattened to 190 lb., 2 on pasture and one in dry lot, are reported. Some pigs were given unrestricted feed without antibiotic, the same quantity with antibiotic, unrestricted feed with antibiotic or 60 or 80 per cent. as much as the first group with or without antibiotic. The antiobic was chlortetracycline, as crystalline Aureomycin in the dry lot, and Aurofac 2-A in the pasture experiments.

In dry lot no growth response was obtained with the aureomycin on restricted rations, nor was efficiency affected or any change in dressing percentage or carcase quality produced. On pasture there was some improvement in efficiency when the antibiotic was given and rations were restricted, probably because of increased consumption of forage, but there was no significant difference in the rate of gain. Restriction of feed in dry lot gave somewhat higher dressing percentages. On pasture it reduced dressing percentage but increased the percentage of lean cuts. The dressing percentages reported were calculated from final liveweight and warm carcase weight including leaf fat and head.—T. D. Bell.

2540

HILL, E. G. and LARSON, N. L. **Effect of chlortetracycline supplementation on growth and feed utilization of unsuckled baby pigs obtained by hysterectomy.** *J. Animal Sci.*, 1955, **14**, 1116–1121. [Hormel Inst., Univ. Minnesota, Austin.]

In the first 4 experiments piglets obtained by hysterectomy were started in isolation units, without access to colostrum, on a diet of homogenised milk, egg, vitamin D and minerals. At 5 to 25 days of age they were transferred to cages or pens with concrete floors and fed on modified cow's milk or a commercial creep feed. For the experimental groups the chlortetracycline supplement was given at birth or at 21, 28 or 42 days of age at the rate of 5 or 10 p.p.m. on a dry basis. In 3 of the 4 experiments, all at the 10 p.p.m. level, greater weight gains were made by the pigs receiving chlortetracycline. There was no difference with 5 p.p.m. In 2 of the experiments in which feed consumption was estimated, the supplemented groups showed better feed utilisation.

In the last 8 experiments all the piglets were kept in isolation units till 24 days of age and the experimental groups received chlortetracycline at the rate of 10 p.p.m. to 3 weeks and thereafter 200 p.p.m. till 8 weeks. Pigs receiving the supplement showed better growth and feed utilisation than the controls.

These results conflict with those previously obtained with healthy pigs by Speer *et al.* (Abst. 429, Vol. 21).—J. S. Thomson.

2541

McErlean, B. A. **Effect of feeding an aureomycin supplement ("Aurofac") to runt pigs.** *J. Dept. Agric., Republic of Ireland*, 1953–54, **50**, 23–29. [Vet. Res. Lab., Dublin.]

In 2 experiments runt pigs, weighing about 20 lb. and from 66 to 77 days old, were grown and fattened for 112 days on a ration containing separated milk powder, and supplements of 40·3 and 28·8 g. aureomycin per ton of feed in the first and second experiments, respectively. The average growth rates were 1·47 and 1·62 lb. daily for the 2 experiments, and in control groups getting the same basal ration but no supplement growth rates were 1·18 and 1·46 lb. daily. To reach the same weight as the experimental pigs, control pigs took 26 days longer in the first and 12 days in the second experiment. There was no difference in efficiency of feed utilisation due to the aureomycin.—T. D. Bell.

2542

Février, R. and Vachel, J. P. Les antibiotiques et la croissance du porc. 1. Implantation de bacitracine sur le porcelet allaité. [**Antibiotics and the growth of the pig. 1. Implantation of bacitracin in the suckling pig.**] 2. Adjonction de pénicilline et d'auréomycine à un régime dépourvu de protéines animales. [**2. Addition of penicillin and aureomycin to a diet deprived of animal protein.**]

Février, R., Vachel, J. P. and Michel, M. 3. Stockage des antibiotiques dans les organes et les tissus. [**3. Storage of antibiotics in organs and tissues.**] 4. Destruction des antibiotiques dans le tube digestif. [**4. Destruction of antibiotics in the digestive tract.**] 5. Teneur en vitamine B_{12} du foie et du contenu de l'intestin. [**5. Vitamin B_{12} content of the liver and intestinal contents.**]

Février, R. and Vachel, J. P. 6. Influence de l'auréomycine et de la pénicilline sur la digestibilité de la ration. [**6. Effect of aureomycin and penicillin on the digestibility of the ration.**]

Legagneur, E. S. and Michel, M. 7. Action des antibiotiques sur porcelets allaités. [**7. Effect of antibiotics on suckling pigs.**] *Ann. Zootech.*, 1955, **4**, 133–135; 136–138; 139–143; 144–145; 146–149; 150–152; 153–163. [Stat. Recherches Élevage, Centre Nat. Recherches Zootech., Jouy-en-Josas.]

1. Implantation of 1000 I.U. bacitracin in pigs 2 to 6 days old did not affect rate of gain or survival to weaning.

2. Growth rate and efficiency from 50 to 200 lb. liveweight were improved by aureomycin plus vitamin B_{12}, and by procaine penicillin added to a ration containing only vegetable protein. The greatest stimulation was in the aureomycin group, and was slightly more from 100 to 200 lb. liveweight than from 70 to 100 lb. There was no effect on carcase quality or the capacity of the caecum. The antibiotics improved appetite.

3. Blood, bile, liver, kidney and ham of pigs which had been given either penicillin or aureomycin from birth were analysed, and the results showed that only traces of the antibiotics were deposited in the tissues.

4. Only small amounts of the antibiotics taken with the feed a few hours before slaughter were recovered in the contents of digestive tract.

5. Total vitamin B_{12} stored in the liver was greater in the group of pigs getting the vitamin with aureomycin, but penicillin without vitamin B_{12} did not increase the stores of the vitamin in the liver over the levels in control pigs. In the small intestine there was more vitamin B_{12} in control pigs than those getting antibiotics, but in the caecum the position was reversed. The quantities of vitamin B_{12} recovered indicated that it was synthesised in the gut, and synthesis was increased by antibiotics in the feed.

6. The percentage digestibility of the ration was not altered by penicillin or aureomycin supplements which had improved growth rate.

7. Aureomycin and chloramphenicol were given to pigs from birth to weaning by incorporating them in soil for the first month and then giving them with skimmed milk. The antibiotics reduced scouring, particularly of the type which persisted more than 48 hr., reduced mortality and increased weaning weights. There was little difference between the bacterial counts in the faeces of treated and control animals which did not have diarrhoea. When antibiotics had been given and diarrhoea occurred, the only change was a slight increase in clostridia in the faeces. In control animals there was an increase in coliform bacilli and Gram-negative streptococci. Studies *in vitro* showed that the antibiotics inhibited the microbiological deamination of arginine, and this was thought to be the possible reason for the growth response.—T. D. Bell.

2543

Pérez-Cuesta, M. Experiencia de alimentación intensiva para la ceba precoz de cerdos ibéricos de raza colorada. [**Experiments in intensive feeding for rapid fattening of pigs of the red Spanish breed.**] *Consejo super. de Invest. Cient. Dept. Zootec., Córdoba*, 1954, pp. 82. English summary.

A trial with 20 red Spanish pigs fattened from weaning to 220 lb. slaughter weight is reported. The pigs were fed to appetite on a balanced meal. At slaughter carcase data were obtained. There was considerable variation between pigs in rate of gain and efficiency of feed conversion, but it was established that animals of this breed were capable of quick economical gains giving good quality carcases, and by selection an improvement in standard could be achieved which would be of great value to the Spanish pig industry.
T. D. Bell.

2544

TAYLOR, J. M. and HAZEL, L. N. **The growth curve of pigs between 134 and 174 days of age.** *J. Animal Sci.*, 1955, **14,** 1133–1139. [Iowa State Coll., Ames.]

Weights of 255 pigs were recorded at 134, 144, 154, 164 and 174 days of age. The weight for age curves were linear for both fast and slow growing pigs. When weight for age was calculated by different methods, and compared with the actual figures obtained in practice, it was concluded that the most satisfactory formula for adjusting actual weight to weight at 154 days was Adjusted weight =

$$\frac{(\text{Actual weight} + 154)\,(199)}{\text{Actual age} + 45} - 154.$$

If weights at 2 ages are known a growth curve could be drawn which would be just as satisfactory.
T. D. Bell.

2545

COEY, W. E. **The relationship between growth rate and carcass conformation in pigs.** *Agric. Progress*, 1954, **29,** 60–65. [Queen's Univ., Belfast.]

Statistical analysis of the results of growth and fattening trials showed significant relations between rate of gain during different periods of life and carcase quality. Rapid early growth improved carcase quality, and rapid growth during the later stages before slaughter reduced it. The results indicate the importance of the difference between periods when the effect of rate of gain on carcase quality is being assessed. It is suggested that rapid gain in the early stages, from birth to 70 lb. liveweight, is as important in producing lean long carcases as restricted gain of weight in the later stages.—T. D. Bell.

2546

DÖRING, H. Über die Verteilung der Geschlechtskombinationen und die Sterblichkeit bei Schweinewürfen. [**Distribution of sex combinations and mortality in pig litters.**] *Ztschr. Tierzücht. Züchtungsbiol.*, 1955, **65,** 169–186. [Max Planck Inst. Tierzucht, Mariensee, Kr. Neustadt a. Rübenberge.]

Analysis of 7272 litters with 81,050 piglets of the German Improved Landschwein breed in the Hanover district between 1931 and 1948 showed that litters with equal or nearly equal numbers of males and females were much more frequent than would be expected from the laws of chance. This is ascribed to foetal mortality chiefly affecting the sex which happens to preponderate. This being so, the opposite sex, being less heavily selected before birth, should show a greater mortality after birth, and the figures for mortality up to 28 days bore this out. The preponderance of balanced litters was more pronounced during and after the war than before, and it is thought that poor feeding led to more intense selection before birth. The total size of litters was also reduced, on the average by 0·216 of a unit. Mortality after birth of survivors of the sex originally preponderating was less than before the war; further evidence for the selection theory. It is suggested that the differential foetal mortality results from the presence in only limited amount of some substance or substances necessary for life but different for the sexes.—W. M. Deans.

See also Absts. 1658, 1746, 1786, 1907, 2201.

GOATS, RABBITS AND OTHER MAMMALS

2547

FRENCH, C. E., MCEWEN, L. C., MAGRUDER, N. D., INGRAM, R. H. and SWIFT, R. W. **Nutritional requirements of white-tailed deer for growth and antler development.** *Pennsylvania Agric. Exp. Stat. Bull.* No. 600, July 1955, pp. 50.

The difficulties of rearing deer in confinement are discussed. In the 2 experiments reported, extending over 2 years, 26 fawns were reared to 6 months on a diet of milk, green alfalfa hay and a calf starter. Two pens of 2 were then given to appetite rations believed to be complete in all nutrients and other similar pens received the same diet in restricted amounts or rations low in protein, Ca or P. Other pens had the deficient rations supplemented with Ca, P, protein, vitamins A and D, sulphur or methionine. The energy value of the diet was about 4 Cal. per g., the protein content ranged from 4·7 to 16·8 per cent., Ca from 0·07 to 0·74 per cent. and P from 0·25 to 0·68 per cent. Growth data indicated a requirement of about 2 lb. feed (3600 Cal.) for a deer weighing 50 to 60 lb., 3 to 4 lb. (6300 Cal.) for one weighing 100 lb. and 5 to 6 lb.

(9900 Cal.) for one weighing 150 lb. Growth during the first year was best on the complete diet (108 lb. gain); all the other diets seriously affected growth, although the diet containing only 0·09 per cent. Ca gave a weight increase of 80 lb., increased to 99 lb. by a supplement of Ca. Protein requirement for optimum growth was 13 to 16 per cent. of the ration. Approximate Ca and P requirements could not be determined but appeared to be in excess of 0·09 and 0·25 per cent., respectively. The addition of sulphur or methionine to the low-protein rations had no effect on growth, nor had the addition of vitamins A and D to the low-P rations. Best antler growth was obtained with the complete diet, but it was almost as good in those receiving Ca and P supplements.

In the second year of the experiment one of the 2 deer in each of the restricted or supplemented groups was given the complete diet to determine the powers of recovery, the remaining deer being maintained on its original diet. Weight recovery and antler growth in the deer originally restricted in feed intake was good but not so good as in the deer maintained all the time on the complete diet; deer maintained on the low-protein and low-Ca and -P diets were only about half the size of the controls and developed thin spike antlers.

J. S. Thomson.

2548

ABRAMOV, M. D. and POVETZKIĬ, I. G. Normy i ratziony dlya plemeanogo i tovarnogo molodnyaka golubykh pestzov. [**Standards and rations for the stock and store young of blue Arctic foxes.**] *Karakul. i Zver.*, 1955, **8,** No. 2, 22–27. [All-Union Sci. Res. Lab. Fur-Bearing Animals.]

Cubs to be kept for stock were given rations with a higher energy value than those to be killed for fur; the proportions of different feeds in the ration were also different.

The energy value of the ration per head for stock cubs ranged from 550 to 700 Cal. daily; for the others it was from 500 to 650 Cal., both according to the season of the year.

As percentages of the energy value the constituents of the ration were: *for stock*, meat and fish 60 to 70, dairy products (summer only) 5 to 10, grain 12 to 28, vegetables 3 to 5, dried yeast 3 to 5 and fish oil 2; *for fur* the corresponding percentages were 50 to 60, 5 to 10, 22 to 33, 3 to 5, 3 to 5 and 2.

These rations were given to the cubs from 2 months old. As the cubs grew up, some might be moved from one group to the other, but this was not found to have any adverse effect either on their reproduction or on the quality of the fur.

H. Scherbatoff.

2549

LUCIFERO, M. Il visone ed il suo allevamento. [**Mink and its husbandry.**] *Riv. Zootec.*, 1955, **28,** 260–266. [Ist. Zootec., Univ. Florence.]

A review.

See also Abst. 2195.

POULTRY

GROWTH AND FATTENING

2550

O'NEIL, J. B. **Percentage size of chick at hatching and its relationship to growth and mortality.** *Poultry Sci.*, 1955, **34,** 761–764. [Dept. Poultry Husb., Univ. Saskatchewan, Saskatoon.]

2551

BIRD, H. R. **"Performance index" of growing chickens.** *Poultry Sci.*, 1955, **34,** 1163–1164. [Dept. Poultry Husb., Univ. Wisconsin, Madison.]

When "performance index" of growing chickens is calculated by considering weight gain and efficiency of feed conversion the gain in fact is used twice in the calculation, thus

$$\text{Performance index} = \text{Gain} \times \frac{\text{Gain}}{\text{Feed}}.$$

This has been criticised on the grounds that weight gain is given too much emphasis. It is considered justifiable when it is understood that the interest of the breeder is in gain per unit of time and in gain per unit of feed. This is discussed, and it is pointed out that other workers have shown that net returns were only slightly more affected by feed per unit gain than by time taken per unit gain.—T. D. Bell.

2552

AUSTRIA, I. V. and MARQUEZ, L. S. **Preliminary report on the observations regarding the use of different chick starter mash.** *Philippine J. Animal Indust.*, 1954, **15,** 25–30. [Bur. Animal Indust., Manila.]

Starter mashes made with rice bran, ground maize and fishmeal, some with copra meal and molasses, were inferior to a commercial meal in growth trials with day-old chicks. The addition of an antibiotic feed supplement to the experimental rations reduced mortality and improved growth and efficiency, but not to the same level as with the commercial starter.—T. D. Bell.

2553

WILLIAMS, R. J. and DEBUSK, B. G. **Overnight nutritional responses of chicks.** *Proc. Nat. Acad. Sci., Washington*, 1955, **41,** 894–899. [Biochem. Inst., Univ. Texas.]

In tests with newly hatched chicks, lasting from 18 hr. to 3 days, deficiencies of 13 amino-acids, fatty acids and trace minerals were detected in synthetic rations as judged by growth rates and feed efficiency. The method is described and the results of experiments are presented. The practical possibilities and the limitations of the method are discussed.—T. D. Bell.

2554

GRAU, C. R. and WILLIAMS, M. A. **Fish meals as amino acid sources in chick rations.** *Poultry Sci.*, 1955, **34,** 810–817. [Dept. Poultry Husb., Univ. California, Davis.]

Tests with over 100 commercial samples of fishmeal showed that 48 per cent. of them gave good growth in chickens, 40 per cent. fair and 12 per cent. poor. The results were not related to the percentage of protein in the fishmeal. Sardine meals had the greatest number of samples promoting good growth rates; with other types results were more variable. Differences in methods of processing were not related to the quality of the meals, as indicated by the growth rates of the chickens, and quality did not depend on whether fish were processed fresh or unfit for canning.

T. D. Bell.

2555

HILL, C. H. and KELLY, J. W. **The effect of fish meal and antibiotics on the growth of chicks fed equal amounts of feed.** *Poultry Sci.*, 1955, **34,** 1030–1032. [Dept. Poultry Sci., N. Carolina State Coll., Raleigh.]

The results of 3 experiments are reported with New Hampshire chickens, raised in clean quarters, on the effect on growth of the addition of fishmeal or antibiotics, 100 mg. per lb., or both to a maize and soya bean basal ration containing adequate amounts of vitamins, minerals and methionine. In each experiment feed intake was equalised in all groups.

Neither of the supplements given individually had any effect on growth, but when both were added there was a significant increase in weight gain at 4 weeks. Reasons for this are suggested.

J. S. Thomson.

2556

HOHLS, H. W. Der Anteil tierischen Eiweisses im Kükenaufzuchtfutter und sein Ersatz durch pflanzliches Eiweiss bei Zugabe von antibiotischen Mitteln. [**The role of animal protein in chick rearing rations and its replacement by plant protein with antibiotics.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 238–249. [Bundesforschungsanst. Kleintierzucht, Celle.]

Studies were made on 84 groups of 19 or 20 growing and fattening chickens. The rations contained 16 to 17 per cent. total protein in the first 4 weeks of life, but often this was later reduced. Supplements of penicillin or more rarely aureomycin or terramycin were given in some experiments, and sometimes vitamin B_{12}.

It was concluded that not more than 5 per cent. of animal protein is necessary for adequate feed utilisation, and that when antibiotics are given the animal protein can be reduced to 2 per cent.

D. Duncan.

2557

SQUIBB, R. L. and BRAHAM, J. E. **Blood meal as a lysine supplement to all-vegetable protein rations for chicks.** *Poultry Sci.*, 1955, **34,** 1050–1053.

Lysine is one of the chief limiting amino-acids in poultry rations compounded of Guatemalan feeds and bloodmeal was used as a source in all-vegetable-protein rations for chickens. The addition of 3 per cent. bloodmeal or 0·45 per cent. L-lysine to a basal ration of sesame oilmeal and ground maize resulted in significant stimulation of growth but the addition of 4 per cent. ramie meal did not. Further experiments showed that 2 to 4 per cent. bloodmeal was most effective, and that 8 per cent. depressed growth. Desmodium, cottonseed and corozo oilmeals added to the basal ration also stimulated growth.—J. S. Thomson.

2558

PEPPER, W. F. and SLINGER, S. J. **Value of supplementary methionine for turkey diets.** *Poultry Sci.*, 1955, **34,** 957–962. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

Eight groups of turkey poults were fed from hatching to 24 weeks on a basal mash containing 28 per cent. crude protein, 0·43 per cent. methionine and 0·42 per cent. cystine. Duplicate groups received a supplement of 0·025 per cent. methionine for the whole period, others received it to 8 weeks but not thereafter, and others from 8 to 24 weeks only. After 8 weeks the birds had mash, wheat and oats to appetite.

At 8 weeks the birds receiving the methionine supplement were significantly heavier than the controls and showed better feed efficiency. Groups receiving the methionine supplement to 8 weeks only or during the whole period were heavier at 24 weeks than those receiving the supplement from 8 to 24 weeks only or not at all, but the differences were not significant. The use of methionine for the first 8 weeks only was as effective as its use during the 24-week period. On

the basis of feed consumed from 8 to 24 weeks and from estimation of the composition of the diet it is concluded that the methionine requirement in the presence of adequate cystine is about 1·48 per cent. of the protein.—J. S. Thomson.

2559

RIZVANOV, K., VANCHEV, T. and IVANOV, I. Izpolzuvane na mikroorganizmen protein pri ugoyavane na pateta. [**The use of micro-organisms as protein for fattening ducklings.**] *Nauch. Trudove, Selskostop. Akad. "Georgi Dimitrov," Sofia,* 1953–54, **4/5,** 427–434. Russian summary.

2560

MILNE, F. N. J. **Studies on condensed whale solubles in chick starter rations.** *Queensland J. Agric. Sci.*, 1955, **12,** 21–31. [Poultry Branch, Div. Animal Indust.]

In 2 experiments with chicks reared from 2 to 7 weeks of age condensed whale solubles were used to replace all or part of the meatmeal in the starter mash. In the first experiment the solubles had been stored for 18 months, and in the second for 5 months. In the second, one group of chicks got condensed whale solubles and livermeal.

In both experiments growth was progressively depressed by increasing amounts of solubles in the ration, and dermatosis developed. In the first experiment there was also high mortality and poor feathering in the groups getting the solubles. In experiment 2 the addition of livermeal improved growth rate over that of a group getting all fish-meal, and prevented the dermatosis. Deficiency of biotin in the whale solubles was thought to be responsible for the poor performance of the birds. This is discussed.—T. D. Bell.

2561

SLINGER, S. J., PEPPER, W. F. and HILL, D. C. **The use of keratin products in poultry rations.** *Poultry Sci.*, 1955, **34,** 919–922. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

Four keratin products prepared from dried beef hooves, fresh beef hooves, pig hooves and pig hair were found to have no nutritive value for chickens when added to a basal ration of soya bean oilmeal alone or with bloodmeal.—J. S. Thomson.

2562

SLINGER, S. J., MCCONACHIE, J. D. and PEPPER, W. F. **The value of animal fat for different strains and crosses of broilers.** *Poultry Sci.*, 1955, **34,** 789–794. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

One hundred chickens from each of 10 different strains were fed for 10 weeks on a practical broiler ration and a similar number had the same ration except that 5 per cent. tallow and 2 per cent. soya bean oilmeal replaced 7 per cent. wheat. Statistical analysis of weight data showed that the effects of strain, sex and diet were highly significant. The interactions between strain and sex, strain and diet, and sex and diet were not significant, but only 2 of the 10 strains showed no weight response to the fat diet and in all but 2 of the strains the males showed a greater response than the females to the fat diet. Feed efficiency was in all cases improved by the addition of fat.—J. S. Thomson.

2563

LEWIS, R. W., BRAY, D. J. and SANFORD, P. E. **Chicks prefer fat-supplemented diets.** *Poultry Sci.*, 1955, **34,** 1165–1167. [Dept. Poultry Husb., Kansas Agric. Exp. Stat., Manhattan.]

Basal rations for chickens from 1 to 8 weeks old were compared with the same diet with 2 per cent. lard or maize oil added. The birds had free access to each diet. They ate more of the diets supplemented with fat, but the kind of fat made no difference. The birds getting the fat supplements reached greater weights than those getting the basal ration only, but efficiency of feed conversion was not altered.—T. D. Bell.

2564

ARSCOTT, G. H. and COMBS, G. F. **Unidentified growth factors required by chicks and poults. 4. Experimental variables which influence the dietary requirements of chicks for these factors.** *Poultry Sci.*, 1955, **34,** 843–850. [Dept. Poultry Husb., Univ. Maryland, College Park.]

For part 3 see Abst. 5520, Vol. 24.

Experiments are reported on the response of day-old chicks during 4 weeks to sources of unidentified growth factors when the basal ration was modified. The effects of using cerelose or sucrose as the source of carbohydrate, adding 0·03 per cent. iodinated casein, raising the level of vitamins, and of multiple deficiency states were studied.

Greater responses to supplements providing unidentified growth factor were obtained with sucrose as the source of carbohydrate than with cerelose. The addition of 0·03 per cent. iodinated casein increased the response to dried whey or a liver product alone or in combination. The effect of high levels of vitamins was not consistent, but there seemed to be a tendency for this treatment to reduce to some extent the requirement for the factor in condensed fish solubles. From the studies on multiple deficiencies of unidentified growth factors it seemed that condensed fish solubles contained 2, one of them present also in a liver fraction and the other in dried alfalfa meal.—T. D. Bell.

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2565

SCHAEFER, A. E., GREENE, R. D., SASSAMAN, H. L. and WIND, S. **Fermentation meals as a source of unidentified chick growth factors.** *Poultry Sci.*, 1955, **34,** 851–855. [Squibb Inst. Med. Res., New Brunswick, N.J.]

Streptomycin mycelium (SM) and penicillin mycelium (PM) residues were tested as sources of unidentified growth factors in trials with chickens grown to 8 or 11 weeks of age. Growth was best stimulated by 3 per cent. PM or SM, or a combination of 1 per cent. PM and 0·5 per cent. SM. The addition of 5 mg. procaine penicillin per kg. feed to any of these supplements did not improve growth further, and the responses obtained were better than those from a supplement of fishmeal and yeast. Procaine penicillin alone, added to the basal ration, improved growth more than did fishmeal and yeast, but not as much as the combination of PM and SM. In further trials a compound of PM and SM at a level of 0·8 per cent. gave better growth than 4 per cent. fishmeal or distiller's solubles, and when the mycelium residues were added to either of these supplements growth was better than without them, though only slightly better than with the PM and SM compound alone.

The water-soluble fraction of an autolysate of SM, estimated to contain 10 per cent. of its solids, was as effective when added as 0·1 per cent. of the ration as was 3 per cent. of the original SM. This suggested that the process of autolysis improved the value of the soluble fraction.—T. D. Bell.

2566

ATKINSON, R. L., FERGUSON, T. M. and COUCH, J. R. **Further studies on unidentified growth factor sources for Broad Breasted Bronze turkey poults.** *Poultry Sci.*, 1955, **34,** 855–861. [Dept. Poultry Husb., Texas Agric. and Mech. Coll. System, College Station.]

As sources of unidentified growth factors for turkey poults, condensed fish solubles, hydrolysed whey, dried whey and dried brewer's yeast were tested in one trial; condensed fish solubles, dried distiller's solubles and dried brewer's yeast in a second; and lactose-free whey, dried whey, dried brewer's yeast and condensed fish solubles in a third. The basis for comparison was rate of gain from hatching to 8 weeks of age.

In all the trials the dams had been maintained on rations believed to contain sources of all unidentified growth factors. In the first trial the poults were hatched from eggs laid from the 18th to 20th week of production. All supplements and combinations of supplements increased growth; either form of whey with fish solubles was better than either separately, but the combination of dried yeast and fish solubles was no better than fish solubles alone. There seemed to be one factor in the whey and another in the yeast and fish solubles.

The poults in the second experiment were from eggs laid only 6 weeks into the laying period, and no growth response was obtained with any supplement.

Eggs from which the poults in the third trial were hatched were laid in the 15th week of the laying period. Again growth responses were obtained with all the supplements tested, greater when condensed fish solubles, lactose-free whey and dried whey were added as 5, 2·5 and 5 per cent., respectively, than when they were added at only 2·5, 1·0 and 2·5 per cent. With dried yeast 2·5 per cent. was better than 5 per cent. With 2·5 per cent. lactose-free whey growth was better than with the same amount of dried whey and equal to that with 5 per cent. dried whey.

It was considered that the unidentified factor was associated with the protein of the whey. Combinations of the different supplements had the same effect as was found in the first trial. Comparing the 3 trials, it seemed that there was a carry-over of growth factors from the hens, and this emphasised the importance of choosing depleted poults for this type of trial.—T. D. Bell.

2567

MARCH, B., BIELY, J. and TOUCHBURN, S. P. **Studies on an unidentified chick growth factor in dehydrated green feed.** *Poultry Sci.*, 1955, **34,** 968–972. [Poultry Nutrit. Lab., Univ. British Columbia, Vancouver.]

Growth data are reported from 2 experiments with cockerels and pullets fed on a purified basal diet complete in all known vitamins to which was added 5 per cent. herringmeal, 3 per cent. dehydrated cereal grass, 3 per cent. dehydrated alfalfa or a combination of herringmeal with each of the green feeds. In the first experiment neither dehydrated green feed alone nor herringmeal alone stimulated growth. When herringmeal and dehydrated cereal grass were given together there was a significant increase in rate of growth. An increase was obtained also with herringmeal and alfalfa, but it was not significant. In the second experiment the cereal grass alone gave a significant increase, but not the alfalfa, and the herringmeal and alfalfa, given together, also showed a significant increase. As in the first experiment, there was a much increased rate of growth with the mixture of herringmeal and cereal grass. It is concluded that herringmeal and dehydrated green feed each contain a separate growth factor for chickens, but that they can act only in the presence of each other.

Three other experiments are reported of a similar nature except that the chickens used were from hens which were fed on experimental diets

with or without dehydrated green feed. The same supplements were used as in the first 2 experiments. From the difference in growth responses of the chicks it is concluded that there is a carry-over of the growth factor present in dehydrated cereal grass from the dam to the chick.—J. S. Thomson.

2568

HOHLS, H. W. Kükenaufzuchtversuche mit Penicillium-Mycel. [**Chick rearing experiments with penicillin mycelium.**] *Arch. Geflügelk.*, 1955, **19,** 425–432. [Bundesforschungsanst. Kleintierzucht, Celle.] English summary.

Four groups of 19 White Leghorn chicks were reared to 8 weeks in dark batteries on a ration of wheat, oat kernels, hulled barley and maize 14 each, lucerne meal 4, wheat germ 2, minerals 3, meatmeal 8·6, soya grits 10·2 and wheatfeed 16·2 per cent., with 500 mg. Dohyfral D 80 per 100 kg. ration, or the same with 4·5, 13·6 or 22·8 per cent. penicillin mycelium (corresponding to 1, 3 or 5 per cent. mycelium protein) replacing some or all of the meatmeal, and compensatory adjustments in the amounts of soya grits and wheatfeed were made.

Final weights were slightly greater with 3 per cent. mycelium protein and slightly less with 5 per cent., probably because the digestibility of the protein of this ration was less than that of the others. From measurements of the respiratory quotient twice weekly (see Abst. 4702, Vol. 24) the biological values of the 4 different protein mixtures were calculated weekly. They differed little and declined in much the same way with the age of the chicks, except for an unexplained rise in the sixth week, possibly due to a change of temperature. The results are discussed in conjunction with those of Wetterau (*Kühn-Archiv*, 1954, **68,** 202), from which they differ. The present experiments do not establish the most economic proportion of penicillin mycelium for the rearing of chicks.—W. M. Deans.

2569

DANNENBURG, W. N., REID, B. L., ROZACKY, E. E. and COUCH, J. R. **An inorganic chick growth response.** *Poultry Sci.*, 1955, **34,** 1023–1026. [Dept. Poultry Husb., Texas Agric. and Mech. Coll. System, College Station.]

In 2 trials the addition of 3 per cent. dried distiller's solubles or the ash of a similar quantity of the solubles to a synthetic basal ration for chicks was compared. In both trials the response to the ash was about half the response to the original solubles, when growth to 4 weeks of age was the criterion. Additions of trace elements did not alter the difference in response, and 0·5 per cent. added Ca, bringing the total Ca to 1·58 per cent., without the addition of either of the solubles supplements, depressed growth.

In another trial the basal diet with added Ca again depressed growth, but the addition of 3 or 10 per cent. dried distiller's solubles with the Ca increased growth rates more than the solubles supplements alone. The response to 10 per cent. solubles was 5 per cent. greater than that to 3 per cent. solubles. The additional response to 10 per cent. solubles with added Ca was 10 per cent. It was thought that dried distiller's solubles may contain a substance that affects utilisation of Ca by the chick.—T. D. Bell.

2570

WILCOX, R. A., CARLSON, C. W., KOHLMEYER, W. and GASTLER, G. F. **The availability of phosphorus from different sources for poults fed practical-type diets.** *Poultry Sci.*, 1955, **34,** 1017–1023. [Dept. Poultry Husb., S. Dakota Agric. Exp. Stat., College Station.]

Growth rate from day-old to 4 weeks and percentage ash in the tibia were the criteria used in trials comparing 18 different sources of inorganic P for turkeys. As a preliminary, trials were made which showed that the optimum level of total P in the ration was 1·0 per cent. It was calculated that 0·45 per cent. was phytin P from plant sources and therefore 0·55 was inorganic P, a value in agreement with other workers' findings.

For the control group 0·15 per cent. dibasic Ca phosphate was added to the basal ration. Altogether 12 trials were made, and defluorinated rock phosphate, imported rock phosphate, soft phosphate with colloidal clay, monobasic Ca phosphate, bonemeal, dicalcium phosphate, tribasic Ca phosphate, and beta tricalcium phosphate were tested. The utilisation of P from colloidal phosphate, tribasic and tricalcium phosphate and some samples of commercial dicalcium phosphate was unsatisfactory. Other sources tested were suitable for turkeys, the best being monobasic Ca phosphate, steamed bonemeal and some samples of commercial dicalcium phosphate and defluorinated phosphate. The results are presented in detail.—T. D. Bell.

2571

ANDERSON, J. O., HURST, J. S., STRONG, D. C., NIELSEN, H., GREENWOOD, D. A., ROBINSON, W., SHUPE, J. L., BINNS, W., BAGLEY, R. A. and DRAPER, C. I. **Effect of feeding various levels of sodium fluoride to growing turkeys.** *Poultry Sci.*, 1955, **34,** 1147–1153. [Dept. Poultry Husb., Utah State Agric. Coll., Logan.]

Six groups of 12-week-old and 6 of 10-week-old turkeys of both sexes were fed on a basal ration containing 43 p.p.m. F to which sodium fluoride was added in groups 2 to 6 to give levels of 100, 200, 400, 800 and 1600 p.p.m. The experiment

lasted for 16 weeks. Feed consumption was not affected until the level of F reached 400 p.p.m., when there was a slight decrease; the decrease was much greater at the 1600 p.p.m. level. Weight gain by male turkeys was affected at the 200 p.p.m. level, but in females not greatly until the 800 or 1600 p.p.m. level was reached. Among the birds on the 2 highest levels extreme variations in weight gain were found, some of the birds having nearly normal weight and condition. Feed efficiency was not greatly affected at the 100 p.p.m. level, but was much decreased at the higher levels. There was a great increase in F content of the bones as F intake rose. After 16 weeks on the basal ration the F content of the femur was 360 p.p.m. on the dry, fat-free basis; in the group on the 1600 p.p.m. level the value was 14,900 p.p.m. Considerable increases were also found in the F content of the soft tissues.—J. S. Thomson.

2572

FANGAUF, R. Der Einsatz von Mineralstoffen, Vitaminen und Antibiotica in den Mischfuttermitteln für Geflügel. (Referat anlässlich der 3. Tagung über Probleme der Tierfütterung in Europa [FAO/EAAP] in Göttingen am 26./30. September 1955.) [**The addition of minerals, vitamins and antibiotics to mixed feeds for poultry. Report to the 3rd meeting on Problems of Animal Feeding in Europe (FAO : EAAP) at Göttingen, 26-30 September, 1955.**] *Arch. Geflügelk.*, 1955, **19,** 471 – 484. [Kiel - Steenbek.] English summary.

The problems of supplying hens and turkeys with minerals and vitamins and of speeding up growth by means of antibiotics are discussed in the light of conditions in Europe.

In Germany the following standard mineral mixture (*DLG-Mineralstandard* I*a für Geflügel*) is prescribed: bonemeal 69, iodised cattle salt (containing 0·01 per cent. iodine) 30, trace elements in the proportions Fe : Cu : Mn = 3 : 1 : 4, 1 per cent.; guaranteed to contain 20 per cent. P_2O_5, corresponding to P 9 and Ca 21 per cent. Complete feeds are to contain 1 per cent. of this mixture, feeds to be given along with grain 2 per cent. With the usual feed mixtures of, roughly, ground cereals 60, milling offals 20, soya grits 10 and fishmeal 10 per cent., the mineral mixture suffices for requirements, provided shell is always available. Further research on the physiological importance of grit is required.

Synthetic vitamins are tending to oust natural vitamin carriers because of their convenience, reliability and reasonable price. The usual mixed feeds normally cover the requirements of vitamins B_1 and B_{12}, nicotinic and pantothenic acids, and choline, leaving vitamins A and D_3 and riboflavin to be added. For these the following recommendations, based on U.S. Nutrient Requirements for Poultry plus a safety factor, are made: complete feeds, vitamin A, I.U. per kg. feed, chicks 4000, young pullets 3000, laying hens 6600, for fattening 4000; feeds to be given with grain, chicks 6600, young pullets 5000, laying hens 11,000; vitamin D_3, I.U. per kg., 300, 300, 750, 300, 500, 500, 1250; riboflavin, mg. per kg., 1·5, 1·0, 1·5, 1·5, 2·5, 1·5, 2·5 for the classes in the same order. It is suggested that vitamin pre-mixes should contain vitamins A and D_3 in the ratio 9 : 1, and that tests of the vitamin content of poultry feeds should include a chick growth test, say with 30 chicks for 6 weeks. Minerals and vitamins are best supplied in separate mixtures.

Antibiotics are still a subject for controversy and are unlikely to be of great economic importance until broiler production is more widespread and there is a greater difference between the prices of fishmeal and soya grits.

In Germany it has been proposed that feeds containing antibiotic should be permitted to contain less animal protein: for complete chick feed, without antibiotic, minimum animal protein 6 per cent., minimum fishmeal 3 per cent., with antibiotic, 4 and 2 per cent., respectively; chick rearing feed 10, 5, 7, 4; complete fattening feed, 10, 5, 7, 4. The amounts of antibiotic proposed are, per kg., complete chick feed and fattening feed, aureomycin or terramycin 10·0 mg. plus vitamin B_{12} 10·0 μg., or penicillin 5·0 mg. plus vitamin B_{12} 10·0 μg.; for chick rearing feed, aureomycin or terramycin 15·0 mg. plus vitamin B_{12} 15·0 μg., or penicillin 7·5 mg. plus vitamin B_{12} 15·0 μg. In view of the great losses from respiratory infections it is suggested that trials be made of special laying meal containing antibiotic, which could be given for a short time only.

W. M. Deans.

2573

MILLIGAN, J. L., WILCKE, H. L., MARR, J. E. and BETHKE, R. M. **Arsonic acid in commercial broiler rations.** *Poultry Sci.*, 1955, **34,** 794–799. [Ralston Purina Company, St. Louis, Mo.]

Large-scale experiments, with 9902 chickens in all, are reported on the effect of 0·005 per cent. arsonic acid on growth on a high-energy broiler ration including fishmeal, dehydrated alfalfa meal, vitamin supplements and bacitracin. The experiments lasted for from 6 to 11 weeks. Group weights only were recorded.

Eleven out of 13 experiments showed that arsonic acid increased final weight slightly or definitely, the average improvement being 0·08 lb. Market grade was better in birds receiving arsonic acid, and feed efficiency was slightly improved. There was no effect on mortality rate,

feather score, pigmentation score or incidence of leg weakness. At slaughter, breast muscle contained less than 0·01 p.p.m. arsenic and liver 0·47 p.p.m.—J. S. Thomson.

2574

LIBBY, D. A., EVANS, R. J., BANDEMER, S. L. and SCHAIBLE, P. J. **Effect of long-time feeding of certain arsonic acids to chickens.** *Poultry Sci.*, 1955, **34,** 972–980. [Dept. Poultry Husb., Michigan State Coll., East Lansing.]

Arsanilic acid, 90 g. per ton feed, or the dodecylamine salt of *p*-chlorophenylarsonic acid, 63 g. per ton, was included as supplement to a starter mash for chicks from day-old to 10 weeks of age. Some of the birds were kept on floors, others in batteries. Both supplements improved growth, and penicillin was equally effective, but a combination of antibiotic and either arsenical was no better than any one of them. The response was greater in the battery-reared birds, and in females. The intake of arsenic from the arsanilic acid was 3 times as great as from the dodecylamide, but the As contents of the liver and edible flesh were almost the same. The As contents of liver and flesh increased when penicillin was given either in combination with arsenical supplements or alone, which suggested that penicillin gave improved absorption of minerals.

From the 10th to the 19th week of life birds were transferred to grass range. In these circumstances the arsenical supplements did not yield any advantage in weight or condition, but the tissues of the birds getting arsanilic acid had lower As contents than in those getting dodecylamide.

During the subsequent year the pullets off the range were housed and laying performance was recorded. The supplements improved egg production, 5 per cent. for arsanilic acid and 3 per cent. for the dodecylamide. Hatchability and efficiency of feed utilisation for egg production were not affected. The As contents of the eggs were higher than in those from birds getting no supplement, but the values found were less than those permitted in fruits for human consumption treated with arsenic sprays, and were not considered dangerous. Contrary to what had been found with liver and edible meat, penicillin did not increase the As content of the eggs.

T. D. Bell.

2575

PEPPER, W. F. and SLINGER, S. J. **Effect of arsonic acid derivatives and a high level of aureomycin on the performance of turkeys to 24 weeks of age.** *Poultry Sci.*, 1955, **34,** 928–934. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

From hatching to 8 weeks of age 4 groups of turkey poults were given an all-mash ration. The control group got no supplement and experimental groups got 3-nitro-4-hydroxyphenylarsonic acid, 45 g., arsanilic acid, 90 g., or aureomycin, 50 g. per ton of feed. Growth of all experimental groups was better than that of controls during the first 4 weeks. The response in females was not as great as in males. From 4 to 8 weeks the groups getting 3-nitro-4-hydroxyphenylarsonic acid and aureomycin maintained an advantage, though reduced, over the controls, but the arsanilic acid group did not.

From 8 to 24 weeks the birds were subdivided so that half of each group was reared on slatted floors and the other on deep litter of wood shavings. The basal ration was of mash and grain, both given free choice, and the supplements were continued. At the end of the period there was no difference in the liveweights of the birds due to the diet. On slatted floors the supplements improved efficiency of feed utilisation, and on deep litter 3-nitro-4-hydroxyphenylarsonic acid also had this effect, though the ratio of mash to grain was less than in controls.

The birds reared on deep litter made better weight gains than those on slatted floors in comparable groups, probably because they ate more mash relative to grain. The incidence of perosis was higher in supplemented groups, and higher in groups on slatted floors.—T. D. Bell.

2576

OLIVARES, E. O. **Value of cow manure extract (CME) on growth of chicks and egg production.** *Philippine J. Animal Indust.*, 1954, **15,** 11–23. [Bur. Animal Indust., Manila.]

Starting, growing and laying rations were made to contain 0, 2·5 or 5 per cent. fishmeal. To each of these 3 per cent. cow manure extract was added. A fourth ration had 5 per cent. fishmeal but no manure.

At 4 months old chickens given the starting and growing rations with 5 per cent. fishmeal and cow manure were heaviest, weighing 1606 g. Those getting 5 per cent. fishmeal weighed only 973 g., and those getting cow manure extract without fishmeal 979 g. Cow manure and 2½ per cent. fishmeal gave birds weighing only 952 g. The highest egg production on the laying rations was on cow manure only, followed by 5 per cent. fishmeal only and then 2½ per cent. fishmeal plus cow manure and lastly 5 per cent. fishmeal plus cow manure. Highest percentage hatchability was on 5 per cent. fishmeal with cow manure. The health of all chicks hatched was good.—T. D. Bell.

2577

SMYTH, J. R. (Jr.) and VONDELL, J. H. **The effects of diethylstilbestrol administered in a paste carrier to turkey fryers.** *Poultry Sci.*, 1955, **34,** 963–967. [Univ. Massachusetts, Amherst.]

Groups of Jersey Buff and White Holland turkeys, injected at 8 weeks of age with 10 mg. diethylstilboestrol in a paste carrier, had higher weights at 12 weeks than untreated controls. There was no effect on feed efficiency. A growing ration proved superior to a finishing ration.

J. S. Thomson.

2578

GERRIETS, E. and BOBSIEN, R. Vergleichende Kükenaufzuchtversuche nach veterinärhygienischen Gesichtspunkten und Aufzuchtversuche unter Verwendung der Altstreuverfahren. 2. [**Comparative trials in chick rearing from the point of view of veterinary hygiene and experiments in rearing on deep litter. 2.**] *Berl. Münch. tierärztl. Wochenschr.*, 1955, **68,** 372–375. [Abt. Geflügelkrank., Humboldt Univ., Berlin.] English summary.

The 1953 experiment (Abst. 2605, Vol. 24) was repeated in 1954. There were again 4 groups each of 100 Leghorn day-old chicks on sawdust, sawdust with under-floor heating, deep hen litter alternated with garden compost, or horse litter with garden compost. This time the groups on deep litter did better than those on sawdust, but since under-floor heating gave an improvement in both years it was thought that the good effect of deep litter was largely that of a warm floor.

Another experiment was made with 4 groups, each of 20 chicks, from 4 groups each of 10 pullets from the 1953 experiment, kept in the same way over the winter, whose laying performance is to be reported elsewhere (Gerriets and Werner, *Arch. Geflügelzucht,* 1955, in the press). The results were similar to the above, except that there was less difference between the groups on sawdust on a heated floor and deep hen litter, possibly owing to some acclimatisation effect.

The results of all 3 experiments are tabulated together. The mean increase in weight gain with horse litter over the 3 experiments was as much as 11·5 per cent., which is of the order of that produced by including antibiotics in the feed. The birds on deep litter remained healthy, but the practice involves risks and it is considered that veterinary experts should be consulted when new deep litter houses are constructed or old buildings adapted.—W. M. Deans.

2579

HAFEZ, E. S. E. **Differential growth of organs and edible meat in the domestic fowl.** *Poultry Sci.*, 1955, **34,** 745–753. [Fac. Agric., Univ. Cairo.]

Fayomi pullets were killed at ages of one week and at intervals up to 27 months. The carcases were dissected and the growth rates of different parts were compared by expressing the weight as a percentage of the weight of the same part at one week. Most of the organs showed maximum growth during the first 5 months. Early maturing parts were head, liver, blood and digestive tract. Wings, legs, feathers, lungs, kidney and pancreas were intermediate, and ovary, oviduct, spleen and body fat were late-maturing. The yield of edible meat at 5, 12, 21 and 27 months of age was 66, 63, 68 and 67 per cent., respectively. When expressed as percentage of weight at 1 week the rate of increase of the dressed carcase was greater than that of the whole body or giblets. The influence of environment, particularly diet, on development and the practical implications of this are discussed.—T. D. Bell.

2580

ORR, H. L. **Effect of strain, sex and diet on dressing percentage and on cooked meat yield of 10 week old broilers.** *Poultry Sci.*, 1955, **34,** 1093–1097. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

A comparison was made between 10 strains and crosses of different breeds of broilers on the basis of dressing percentage, percentage of ready-to-cook weight and yield of edible cooked meat. Two diets, one containing 5 per cent. and one no animal fat, were tested with each strain, and sexes were compared.

There was no difference due to strain, sex or diet in dressing percentage. Strain and sex had a significant effect on ready-to-cook weight as a percentage of liveweight. As percentages of live or of dressed weight, differences in percentage of edible meat were significant between sexes, but on basis of ready-to-cook weight the differences were not significant.—T. D. Bell.

2581

KRÜGER, L. Voraussetzungen der bäuerlichen Geflügelhaltung. [**Basic requirements for poultry keeping on the farm.**] *Mitt. deutsch. landwirtsch. Gesellsch.*, 1955, No. 28, pp. 3. [Inst. Tierzucht. Milchwirtsch., Justus Liebig Hochsch., Giessen.]

See also Absts. 1628, 1629, 1643, 1646, 1647, 1657, 1673, 1696, 1783, 1784, 1787, 1788.

EGG PRODUCTION

2582

TYLER, C. **The variations in limestone and flint grit consumptions by laying birds.** *J. Sci. Food Agric.*, 1955, **6,** 696–704. [Dept. Agric. Chem., Univ. Reading.]

The amounts of feed, water, limestone and flint grit taken by 5 hens nearing the end of their first laying year were recorded. The birds were given 200 g. laying mash daily, in 2 equal feeds for 8 days and in 4 feeds for 8 days, and had access to

flint grit, limestone grit and water. The Ca carbonate usually included in the laying mash was omitted. Differences between birds and between days were found in the amount of limestone, but not of the flint grit eaten. The greatest consumption of both grits was in the hour before dusk, but this excess was not related to formation of egg shell. Large amounts of both grits were eaten, and there was a great deal of wastage, but sufficient limestone was dissolved in the intestine to satisfy the Ca requirement of the laying hen. The different methods of feeding did not alter the general picture.—T. D. Bell.

2583

MACHLIN, L. J. **An estimate of the leucine requirement of the laying hen.** *Poultry Sci.*, 1955, **34,** 984–985. [Animal Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

Four trials are reported on the egg production of hens on diets containing 16 per cent. protein and from 1·0 to 1·6 per cent. leucine. In the first trial an egg production of 78 per cent. was maintained for 4 weeks on a ration containing 1·0 per cent. leucine. In the second, over 10 weeks, birds on a ration containing 1·0 per cent. leucine laid as well as, or better than birds on the same ration with a supplement of 0·2 per cent. leucine. In the third, 8 birds were given a low-leucine ration (1·0 per cent.) and 8 a high-leucine ration (1·6 per cent.) for 12 weeks and the rations were then reversed for 6 weeks. The superior production on the high-leucine ration in the first period was not affected in the second period on the low-leucine ration, and the high-leucine ration in the second period did not improve production in the group on the low-leucine ration during the first period. It is concluded that the leucine requirement of laying hens does not exceed 1 per cent. of the ration (see Absts. 3831, Vol. 18 and 3726, Vol. 23).—J. S. Thomson.

2584

BURGSDORFF-GARATH, A. v. Untersuchungen über die Futterwirkung von Alleinfutter der gepressten und ungepressten Form, sowie Legemehl mit Körnern bei in Legebatterien gehaltenen Hennen. [**Nutritive value of all-mash rations pelleted and unpelleted and of laying mash and grain for hens kept in laying batteries.**] *Arch. Geflügelk.*, 1955, **19,** 407–420. [Garather Geflügelzucht.] English summary.

Three groups each of 108 Rhode Island Red × Leghorn pullets in a battery of cafeteria type were fed from 1 October 1953 to 30 June 1954 on mash pelleted or as meal or on laying mash with grain. They had a 15-hr. day. Other details of management were as in a previous trial (Abst. 5553, Vol. 24). Birds sick, dead or off lay for over 4 weeks were replaced. The feed for the first 2 groups consisted of protein concentrate 10 (fishmeal 70, ground extracted sunflowers 20, dried feed yeast 5, coarsely ground bone 5 per cent.), ground millet 15, ground barley 10, ground oats 10, ground wheat 8, ground maize 7, wheat bran 15, maize gluten feed 10, wheatfeed 6, lucerne meal 5, wheat germ 2, and a 6 : 4 mixture of $CaCO_3$ and bonemeal 2 per cent., with, per kg., vitamin A 2000 I.U., vitamin D_3 1000 I.U., carotene 7 mg., vitamin B_1 2 mg., riboflavin 2 mg. The laying mash given with a mixture of equal parts of maize, barley and sorghum consisted of protein concentrate (fishmeal 40, herringmeal 20, meatmeal 20, soya grits 10, coarsely ground bone 7, dried feed yeast 3 per cent.) 15, wheat bran 18, wheatfeed 15, maize gluten feed 10, ground oats 10, ground millet 10, ground barley 8, lucerne meal 6, maize 5, minerals as above 2, and charcoal 1 per cent., with, per kg., vitamin D_3 1000 I.U., carotene 6 mg., vitamin B_1, 2 mg., riboflavin 2 mg.

The following results show the clear superiority of the pelleted ration: average number of eggs per cage, 149, 93, 107; percentage of eggs in the 2 top grades by egg sorting machine, 70, 47, 57; average weight gain of hen, 430, 120, 370 g.; percentage of hens lost, 28, 51, 44. The average daily weights of feed consumed were 146, 115 and 108 g., and it was concluded that although pellets are doubtless more attractive to hens than meal, their superiority was really due to the hens being able to secure more feed in the limited time available. During the first month the hens on pellets produced more eggs without shells and broken eggs than the others, but this was thought to be a psychological effect of their being on the top storey of the battery.—W. M. Deans.

2585

HAND, C. J. E. and TYLER, C. **The effect of feeding different seaweed meals on the mineral and nitrogen metabolism of laying hens.** *J. Sci. Food Agric.*, 1955, **6,** 743–754. [Dept. Agric. Chem., Univ. Reading.]

The meals were of *Laminaria cloustoni*, *L. saccharina* and *Ascophyllum nodosum*. Control groups got the basal ration only. In each experiment there were 5 consecutive periods of 14 days, and one seaweed meal was used at 10 per cent. in the second and at 20 per cent. in the fourth period.

More water was drunk when seaweed meal was given at either level, and this was attributed to the Cl content of the ration. Weight was lost, and to a less extent egg production was reduced at both levels of seaweed intake, but losses were significant only when 20 per cent. seaweed was given, and could be related to reduced intake of starch equivalent. Changes in Ca, P and N balances were not consistent, and were related to

changes in egg production. There was no effect on chemical composition of the eggs, shell thickness or porosity.

Another experiment lasting 100 days compared seaweed meals at 10 and 15 per cent. levels in rations for laying pullets; the effects on body-weight, egg production and water intake were as before. It was concluded that no benefit is gained from including seaweed meal in laying rations, and at a level of 20 per cent. it may be harmful.—T. D. Bell.

2586

KUMANOV, S. and VOLCHEV, P. Prouchvaniya vorhu vliyanieto na slonchogledoviya, leneniya, ricinoviya i ot grozdovi semki shrotove vorhu noslivostta na kokoshkite. [**Influence of sunflower, linseed, castor seed and grapeseed meals on the egg production of hens.**] *Nauch. Trudove, Selskostop, Akad. "Georgi Dimitrov," Sofia,* 1953–54, **475,** 41–50. Russian summary.

Four groups of 20 Rhode Island hens in their second year received for 6 months rations differing only in containing sunflower, linseed, grapeseed or castorseed meal at the 20 per cent. level. The last group had to be excluded because egg yields fell rapidly for 6 weeks. For the other 3 groups the digestible protein in the ration ranged from 10·83 per cent. with grapeseed to 14·0 per cent. with sunflower seed meal.

The mean egg yields in 6 months were with sunflower meal 113·18, linseed meal 106·82 and grapeseed meal 108·74. The mean intake of fodder units per bird was 27·7, 28·0 and 28·4. Fertility of the eggs and viability were good. There was no difference in liveweight of the hens at the end of the experiment.

It was concluded that all the meals except castorseed can be used at the 20 per cent. level in rations for laying hens. The relatively low protein and high fibre content of the grapeseed meal should be considered when rations are made up. (From summary.)—D. Duncan.

2587

ZNANIECKA, G., ŚLIWIŃSKI, A. and WODZINOWSKI, J. Kiszona rzęsa jako pasza dla kaczek. [**Duckweed silage as a feed for ducks.**] *Rocz. Nauk. rol.* [*B*], 1955, **69,** 259–266. [Inst. Zootech. ZZD Pawłowice.] Russian and English summaries.

The silage was prepared from a 1 : 1 mixture of *Lemna gibba,* L. and steamed potatoes with the addition of 2 per cent. sour milk, and was of good quality. An experimental group of 20 ducks received 200 g. of the silage, a control group 100 g. ensiled potatoes and 10 g. alfalfa hay daily. Egg production in the experimental group was 17·3 per duck and in the control group 12·8. There was a slight increase in weight of the experimental group but a decrease in the control group. There was no effect on fertility or hatchability of the eggs.—J. S. Thomson.

2588

SWART, L. G. **Lupins in laying rations.** *Farming in S. Africa,* 1955, **30,** 404–406. [Stellenbosch-Elsenburg Coll. Agric., Stellenbosch.]

Rations with up to 10 per cent. sweet lupin meal replacing part of the fishmeal did not decrease egg production significantly, but higher amounts, replacing most or all of the fishmeal, did. Egg weight also decreased as the amount of sweet lupin meal increased, and feed eaten per dozen eggs produced rose. There was no effect on hatchability.

Experiments on the feeding of bitter blue lupin meal had to be discontinued because it imparted a bitter taste to the eggs.—J. S. Thomson.

2589

GRAU, C. R., LAU, T. L. and WORONICK, C. L. **Inactivation of gossypol by treatment with phloroglucinol.** *J. Agric. Food Chem.,* 1955, **3,** 864–865. [Dept. Poultry Husb., Univ. California, Davis.]

Preliminary experiments are reported on the inactivation of the gossypol in cottonseed meal by treatment with phloroglucinol, ethyl alcohol and HCl. When the treated product was given to hens it was found to contain little gossypol, as measured by the gossypol-cephalin content of the eggs.—J. S. Thomson.

2590

WORDEN, A. N., BUNYAN, J., DAVIES, A. W. and KLEISSNER, M. **The experimental production of "green yolks" by the oral administration of sodium copper chlorophyllin.** *J. Agric. Sci.,* 1955, **46,** 384–385. [Cromwell House, Huntingdon.]

Green yolks in eggs were produced by giving from 250 to 1000 mg. of water-soluble sodium copper chlorophyllin 100 % daily to Light Sussex hens. The appearance of the yolks was similar to that recorded as occurring naturally. The condition was not produced by an oil-soluble copper complex containing 15 per cent. copper phaeophytin. Sodium copper chlorophyllin was identified in the eggs, indicating that intestinal absorption had occurred.—J. S. Thomson.

2591

PLATT, C. S. **A study of the effect of restricted lighting on January hatched pullets.** *Poultry Sci.,* 1955, **34,** 1045–1047. [Poultry Dept., Rutgers Univ., New Brunswick, N.J.]

White Leghorn pullets hatched in January were divided into 2 groups when they were 13 weeks old, one maintained in natural light, the second with natural light excluded but provided with artificial light for 8 hr. daily, later extended to 14 hr. when the birds were 7 months old. When the birds were 35 weeks old the group under natural light was given supplementary artificial light to provide a 14-hr. day.

Egg production in the group restricted to 8 hr. light was much less than in the normal group, but surpassed it when the light was increased to 14 hr. and was still superior to that of the control group when the latter received supplementary light. Growth of the pullets was retarded under restricted lighting, but at maturity the 2 groups were similar in weight.—J. S. Thomson.

2592

NIGHTALL, E. W. **Egg production and flash lighting.** *Agriculture, J. Minist. Agric. Engl.*, 1955, **62,** 421–424. [Sch. Agric., Univ. Nottingham.]

Flash lighting for 3 periods of 20 sec. during the night improved egg production in White Leghorns. The equipment required is outlined.

J. S. Thomson.

2593

ERASMUS, J. E. **Artificial lighting for laying hens.** *Farming in S. Africa*, 1955, **30,** 445–446. [Stellenbosch-Elsenburg Coll. Agric., Stellenbosch.]

2594

RIGOR, T. V. **Seasonal and geographical variations in egg production.** *Philippine J. Animal Indust.*, 1954, **15,** 59–71. [Bur. Animal Indust., Manila.]

Records of egg production of White Leghorns and New Hampshires at 5 centres were examined. There was no difference between centres in average egg production. White Leghorns were better than New Hampshires. There were differences between centres and between breeds in the time of year at which maximum and minimum productions were reached.—T. D. Bell.

See also Absts. 1697, 1719, 1815, 2572, 2574, 2576.

OTHER BIRDS

2595

SCOTT, M. L., HOLM, E. R. and REYNOLDS, R. E. **Effect of diet on the ability of young pheasant chicks to withstand the stress of cold, drenching rain.** *Poultry Sci.*, 1955, **34,** 949–956. [Dept. Poultry Husb., Cornell Univ.]

When pheasants are reared in confinement they are moved from darkened brooders at 4 weeks of age, kept in wire pens for 48 hr. and then allowed out into large enclosures of several acres supplied with hedges and breaks for shelter. If cold rain falls during the first 72 hr. on the open range, many collapse. It was thought that an improved diet might increase resistance to this climatic stress.

When 6 commercial rations and a comparable experimental starting ration were given, growth was satisfactory on all except one, but when artificial rain was applied for 2 hr. during the critical 72 hr. there was no relation between the body-weights of the birds and the percentage which succumbed, except that birds far lighter than normal were all prostrated. The affected birds recovered in 2 hr. in a warm hover.

When an experimental ration containing a high proportion of fishmeal was given resistance was improved, but was not as good as with the commercial ration with which it was compared. When the fishmeal was replaced by livermeal all the birds were affected, and a mixture of fishmeal and livermeal gave intermediate results. The fishmeal diet had 24 per cent. protein and 2·5 per cent. fibre, compared with 28 and 5·5 per cent. in the commercial ration.

Increasing the protein and fibre contents of these latter experimental rations to equal the commercial ration by the addition of fishmeal and oat hulls improved resistance, but they were still not as good as the commercial ration.

When the protein content was increased to 34 per cent. with casein or livermeal and the fibre content was kept at 5·5 per cent. resistance was improved beyond that on the commercial ration, but was poor in all because the stress was also increased. Under less severe stress, with rain which was not so cold or heavy, experimental rations containing 28 and 31 per cent. protein gave complete protection. The possibility that fishmeal, and livermeal and casein, contain 2 different factors that increase resistance is discussed.

T. D. Bell.

FOOD ECONOMICS AND STATISTICS

2596

KRISHNAMURTI, M. **The position of cattle in India.** *Trop. Agric., Trinidad,* 1955, **32,** 278–289. [Pachaiyappa's Coll., Univ. Madras.]

For religious and social reasons cattle in India are not used extensively for beef, but the production of milk and ghee is widespread, and skins and hides also play an important part in the economy of the country. It is as draught animals for agriculture and transport that cattle and buffaloes are most important, and the supply of manure, almost the only source of fertiliser, is vital to agriculture.

A great deal of improvement in all aspects of animal husbandry is necessary. The supply of milk is small compared with the demand, and distribution is unequal, depending on the wealth or poverty of the people. Objections to the slaughter of cattle have led to poor quality of animals both in milk yield and in working capacity, and ignorance has allowed widespread disease. The selection and processing of skins and hides is defective, and manure is not well used. By-products are almost entirely neglected.

Some schemes for improvement have already been introduced, with due regard to social, religious and climatic limitations, by state and national governments, and many more are planned. Projects for the expansion of improved breeding and research on nutrition, dairy and forage improvement and veterinary services, including artificial insemination, are described.—T. D. Bell.

2597

NEWMAN, P. **Some calculations on least-cost diets using the simplex method.** *Bull. Inst. Statistics, Oxford,* 1955, **17,** 303–320.

It is shown how least-cost diets for farm animals can be calculated by a process of successive approximation. It is assumed that the dietary needs of the animals can be stated in terms of daily weights of feed containing certain minimum weights of dietary constituents, and that the content of each of these constituents is known for each of the basic feedingstuffs available. Given the prices of these basic feedingstuffs, the problem is to find that combination of them which will satisfy the dietary requirements at minimum cost. The number of different feedingstuffs required will never exceed the number of constraints.

The essence of the simplex method of calculation, which is described, is to obtain one combination of feedingstuffs which will satisfy the conditions laid down, then to see what amounts of these could be replaced by unit quantities of each of the remaining feedingstuffs in turn. Whichever of these latter would result in the greatest economy is then taken for inclusion in a new mixture, again satisfying the conditions, and one of the original group is excluded. The process is repeated until no further economy is possible.

Least-cost diets are given for cows, pigs and poultry on the basis of the price levels in the years 1950–51, 1951–52, and 1952–53, and illustrate the changes in constituents which may arise as prices change. The practicability of the method is discussed with reference to its use by farmers and by manufacturers of feedingstuffs, and attention is drawn to possible faults, such as failure to take account of palatability.—I. McDonald.

2598

Zunahme der Weltschafbestände und des Weltwollaufkommens. [**Increase in the world sheep population and world wool production.**] *Ztschr. Tierzücht. Züchtungsbiol.,* 1955, **65,** 199.

According to the International Wool Secretariat in London, world sheep population in 1952–53 was 814 millions, a rise of 3½ per cent. since the previous year, and the estimated wool production for 1953–54 was 1979 thousand tons, a rise of some 4000 tons, despite a slight fall in Australia ascribed to drought. Since before the war sheep population has risen by about 8 per cent. but wool production by over 14 per cent. thanks to better breeding and management, especially in Australia, New Zealand and South Africa.—W. M. Deans.

2599

ENGLER, H. L'importanza della pollicoltura nel mondo. [**Importance of the world's poultry production.**] *Zootec. Vet.,* 1955, **10,** 320–330. [FAO, Rome.] English and French summaries.

According to an estimate by FAO, less than half of the world's population received more than 15 g. animal protein daily, and only 17 per cent. received over 30 g., which is recognised as adequate. This deficiency could be at least partly rectified by increasing the production of eggs and poultry for the table. At present there is wide variation in the production of eggs: in the Far East only from 1·8 to 18 eggs per head are available annually. By contrast, in North America and Australasia the number of eggs is from 216 to 378. Within Europe the number in the different countries ranges from 36 to 234. The differences in production of poultry meat are similar in trend. The efficiency of poultry production also differs greatly, and in areas where production is low great improvements are necessary. Many problems are regional in character, but some are universal. These include poultry diseases which need work on an

international as well as a national scale, to improve diagnosis, treatment and organisation ; there must be improvement by vigorous selection for productiveness and resistance to disease, better balancing of rations, and less waste of feedingstuffs. At the same time marketing must be improved, and the economy of poultry production must be stabilised and guaranteed. Relevant statistics should be available. Research and experimental work should be encouraged and extension work should be organised, so that it may be used to reduce costs, increase output and aid stability.—T. D. Bell.

2600

PACI, C. Panorama valdostano. [**A panorama of the Val d'Aosta.**] *Riv. Zootec.*, 1955, **28,** 286–289.

The climate and topography of the Val d'Aosta are described. Although much of the land is high-lying it is sheltered and the climate is mild. It is also dry, and irrigation is given first consideration when the water is harnessed to supply electrical power to the industrial plains. Some of the irrigation schemes in use are of Roman or mediaeval origin.

Fruit is grown in a few regions, but only 4 per cent. of the land is cultivated and the rest is in pastures and meadows. The alpine pastures are second to none. Cattle are maintained on the grassland, and dairying is the economic basis of life in the Val d'Aosta. The cattle are Red or Black Pied Aosta, the former larger and yielding more milk, but not quite so adaptable to mountain conditions. In some of the more remote areas variations in the breed are found, but attempts are being made to establish greater uniformity of the best types. The breeds are believed to derive from Swedish cattle introduced through France 1500 years ago. It was not until the end of the last century that the Val d'Aosta had any extensive trade or intercourse with the rest of Italy.

The most famous export is Fontina cheese, and though the trade is depressed, it is hoped that with the help of legislation if will soon regain its former magnitude.—T. D. Bell.

2601

Aumento da nossa área cultivada no período 1944–1952. [**Increase in our cultivated area between 1944 and 1952.**] *Arq. brasil. Nutrição*, 1954, **10,** 121–123.

The area under cultivation in Brazil in the 3 years 1950–52 was 18 per cent. more than in 1944–46. The greatest increases were in cereals, roots and beans, fruit, onions and alfalfa, the products supplying food, ranging from 21 to 28 per cent. Products cultivated for industrial use, such as cotton, coconut and sugar cane, and for export, cocoa, coffee and castor bean, increased in area by 9 and 15 per cent. respectively. In the same period population increased by 17 per cent.

The increase in cultivated area can be ascribed to the increased mechanisation of agriculture: there were 4000 tractors in 1940 and in 1951 there were 30,000. The wider use of fertilisers, crop rotations and irrigation have also played an important part.

In some cases increased areas under cultivation have meant somewhat smaller yields per acre. When considering the question of food production as a national problem it must be remembered that a large part of the food produced is consumed directly by the producer and does not reach the market.—T. D. Bell.

2602

KENT, N. L. **Out of mouse range.** *Brit. Farmer*, July 1955, p. 1.

The results of 3 experiments on the effectiveness of raised platforms (staddles) in protecting oat stacks against infestation by rats and mice are briefly reported. Compared with stacks built on the ground those built on staddles showed an increase in yield of threshed grain of from 20 to 35 per cent. Grain from the staddle stacks contained 4 to 9 mouse pellets per lb. compared with 14 to 78 in the ground stacks. Grains kibbled by mice numbered on the average 1 per lb. in the staddle stacks and from 23 to 230 per lb. in the ground stacks.—J. S. Thomson.

DIET IN ETIOLOGY OF DISEASE

GENERAL

2603

COOPER, D. M. and GORDON, R. F. **A study of a possible mode of action of antibiotics in chicks.** *J. Sci. Food Agric.*, 1955, **6,** 664–674. [Poultry Res. Stat., Animal Health Trust, Houghton, Hunts.]

Experiments are reported in which depression of growth in chicks was investigated. The depressing agent was transmitted by adding raw gut contents of chicks to the mash and by indirect contact with chicks already showing the depression.

Only 37 and 54 per cent. of these chicks in 2 consecutive years showed a significant response to penicillin in the diet. It was found that if the depression did not appear by the second week of age it did not usually occur later.

Of crude filtrates of liver, lung and intestine excluding caecum from chicks which had shown depression of growth, only the lung filtrate reduced weight gains significantly, and penicillin in the diet counteracted this depressing effect. The possibility of the depression of growth being caused by a sub-clinical infection is discussed.

T. D. Bell.

2604

McSherry, B. J. and Coghlin, C. L. C. **Report of an anaemia of unknown origin in cattle.** *Canad. J. Comp. Med.*, 1955, **19,** 307–312. [Ontario Vet. Coll., Guelph.]

The bull, 7 mature cows and 4 calves in a herd of 35 Holsteins were affected by anaemia in the spring. They were indoors at the time, but were well fed. One cow died, but the others recovered spontaneously during the summer when they went out to pasture. The calves and the bull, in which the signs were more severe, were treated with iron. One calf treated with vitamin B_{12} and folic acid did not respond. The results of blood tests of the affected animals are described. The anaemia was characterised by lack of reticulocytes, and after recovery necrosis of the distal portion of the tails of the calves and the bull occurred. This was probably due to lack of circulation. An experimental heifer was given 100 ml. blood from the bull, but did not develop anaemia. The anaemia could not be classified as haemolytic or haemorrhagic, and the signs seemed too severe for Fe deficiency. The cause of the disorder was not ascertained.—T. D. Bell.

2605

Mariakulandai, A. and Venkataramaiah, P. **Biochemical study of fluorine intoxication. 1. Etiology, prophylaxis and cure. 2. Metabolism of fluorine.** *Indian J. Vet. Sci.*, 1955, **25,** 165–181 ; 183–199. [Sect. Chem., Agric. Res. Inst., Coimbatore.]

1. A disorder of cattle in the Kurnool district of Andhra State (formerly Madras State) was found to be associated with a high F content of river and well waters. F intoxication was made worse by deficiency of P in the fodder available. Slaked lime at 500 p.p.m. was effective in temporarily reducing the F content of natural waters below the toxic level of 1 p.p.m. The feeding of 3 oz. bonemeal daily improved the growth of cattle suffering from a combination of intoxication and P deficiency.

2. Chronic F intoxication characterised by hoof abnormalities, exostoses of the long bones, anorexia, inanition and irritation of the small intestine was induced in South Indian calves by drenching with NaF solution. This treatment had no effect on blood inorganic P, serum Ca or blood F and did not affect the retention of Ca and P as measured in balance experiments. The administration of up to 3 oz. bonemeal daily reduced F retention, particularly in the skeleton, but did not prevent the development of signs of F poisoning.—C. F. Mills.

2606

Wood, P. C. **The epidemiology of white scours among calves kept under experimental conditions.** *J. Pathol. Bacteriol.*, 1955, **70,** 179–193. [Royal Vet. Coll., London.]

During the years 1950 to 1953 calves were kept in isolated communities for the first 3 weeks of life. In each season there was diarrhoea, fatal in some. The mortality increased as the season progressed. The greatest number of deaths were due to *Bacterium coli.* At post-mortem examination septicaemia was found in most, though infection was limited to the intestinal tract and associated lymph nodes in a few. Specific strains of *Bact. coli* were the cause of most deaths, and these were also distributed in the faeces of surviving calves and in the calf pens. In the pens mixed strains were found, but the lethal strains became established periodically ; there seemed to be some relation between the type of *Bact. coli* and the giving of colostrum. Usually septicaemia occurred in calves which did not get colostrum.

T. D. Bell.

2607

Murphy, T. **White scour of calves in West Limerick—an investigation of the disease and its prevention.** *J. Dept. Agric., Republic of Ireland*, 1953–54, **50,** 5–22. [Vet. Res. Lab., Dublin.]

A survey of 133 farms in West Limerick showed that in 1952 white scours occurred on 94 per cent. of the farms, and on 75 per cent. there were deaths due to the disease. Of all calves born 17·1 per cent. died because of white scours. There was a significant correlation between the incidence and severity of the scouring and the time before which, and during which, colostrum was given : if it was withheld for more than 24 hr., or if it was allowed only for a short period, then it did not help to prevent the scours. Significant correlations were found also between the incidence of the disease and the dilution of colostrum when given from the bucket, and between the incidence and the standard of hygiene of the housing.

Field trials in which the dams were given up to 2 million I.U. vitamin A during the weeks before calving failed to show any advantage from this treatment. Giving 450 mg. aureomycin as Aurofac A to the calves in their milk reduced the incidence of white scours from 48·4 to 4·3 per cent.

T. D. Bell.

2608

Raleigh, R. J., Binns, W., Shupe, J. L., Harris, L. E. and Madsen, L. L. **Studies on a cattle disease of unknown origin in Southeastern Utah.**

J. Animal Sci., 1955, **14,** 951–963. [Dept. Animal Husb., Utah Agric. Exp. Stat., Logan.]

From 1 to 5 per cent. of the cattle in the area are usually affected, and the mortality rate among infected animals is nearly 100 per cent. The most obvious signs of the disease are loss of appetite and oedematous swelling of the throat and brisket, hence the popular name of " brisket disease ". A possible cause of the disease was thought to be dietary deficiency of Cu or Co. Trials are reported in which cattle were offered mineral mixtures with or without Cu, Co and Fe, drenched with solutions of trace elements, or given supplementary feeds of alfalfa hay, as preventive measures. Curative treatment of animals which developed the disease included the giving of grass hay or alfalfa hay and Cu sulphate.

The incidence of the disease was reduced by all the preventive measures, more by those including trace elements or alfalfa hay. Of the curative treatments grass hay relieved the signs of the disease temporarily, but they recurred on return to the original pasture. Only treatment with alfalfa brought about a permanent cure.

T. D. Bell.

2609

MILNE, J. A. **The occurrence of phalaris staggers in sheep.** *N.Z. Vet. J.*, 1955, **3,** 119–121. [Dept. Agric., Dunedin.]

In October 1954, 10 out of 19 ewes with lambs grazing on a 2-acre experimental plot showed signs of phalaris staggers. At the time the plot contained, per cent., *Phalaris tuberosa* 75, sweet vernal 12, clover 5 and mixed species 8. The ewes had been on it a month; the weather had been dry until 6 days before the trouble was detected. At first the ewes ate out the clover and weeds and only then ate much phalaris. The signs in affected ewes were as described by McDonald (Abst. 4035, Vol. 12) and others. Two were acutely ill, 4 less so and 4 appeared abnormal only when driven.

Three ewes were given Co, without effect. The 6 worst affected all died or had to be killed; the condition of the other 4 remained unchanged. Post-mortem examination revealed no macroscopic abnormality except areas of greenish pigmentation in midbrain and medulla, the nature of which is under investigation.—D. Duncan.

2610

HOFFMANN, J. A. Die " Darre " (Glossitis gelatinosa circumscripta), eine bisher unbekannte Mangelkrankheit junger Gänse. [**" Darre " (*Glossitis gelatinosa circumscripta*), a hitherto unrecognised deficiency disease of young geese.**] *Berl. Münch. tierärztl. Wochenschr.*, 1955, **68,** 378–380. [Hermsdorf, Thuringia.] English summary.

" Darre ", a disease of goslings between the ages of 5 and 12 weeks, which is found here and there on the forest plateau of East Thuringia, is not new but does not seem to have been described in the literature. A ball-like bright yellow swelling filled with gelatinous material develops at the back of the tongue and leads to death by starvation. Treatment is surgical. No infective agent has been found. The disease is commoner in ill-fed birds and is not seen in those given plenty of freedom. The soil of the region is mostly sand and very poor in minerals and trace elements. Hence it is thought that the disease arises from deficiency of vitamins, minerals or both.—W. M. Deans.

See also Absts. 1719, 1722, 1853, 1860, 2053.

DEFICIENCY DISEASES

2611

STEWART, J., MITCHELL, I. W. and YOUNG, F. J. **Cobalt therapy in farm practice with special reference to hill farms.** *Vet. Rec.*, 1955, **67,** 755–756; 757. [Moredun Inst., Gilmerton, Edinburgh 9.]

A summary of experiments with lambs kept on Co-deficient pasture shows that liveweight gain is roughly inversely related to the intervals between doses of Co. In 3 months lambs getting no Co, 1 mg. daily, 7 mg. weekly, and 28 mg. monthly gained 26, 55, 52, 39 and 30 lb., respectively. Lambs on a Co-dressed pasture gained 57 lb. in the same time.

Experiments in 1952 and 1953 are described in which lambs were kept on deficient or Co-dressed pasture from June to September. Some of the lambs on the deficient pasture got 250 mg. Co monthly. In 1952 after 2 months on the deficient pasture untreated lambs were showing signs of deficiency and they were given a single dose of 250 mg. Co. The weight increase in this group was 31 lb. compared with 47 lb. in the treated group and 53 lb. in the group on the dressed pasture. In 1953 weight gains in the 3 groups, in the same order, were 34, 46 and 49 lb. In the untreated group half the lambs were given a single dose of 250 mg. Co at the end of August, and their liveweight gain during the last month was comparable to that of the other groups.

Massive monthly doses of Co seem adequate to prevent severe deficiency on hill grazing, and could be given during the monthly gathering with little extra work.—T. D. Bell.

2612

GUILIANI, R. Le carenze alimentari del bestiame. **[Nutritional deficiencies of livestock.]** *Riv. Zootec.*, 1955, **28,** 277–282.

A review.

See also Absts. 1653, 1685, 1721, 2097.

DISEASES OF METABOLISM

2613

MARR, A., MOODIE, E. W. and ROBERTSON, A. **Some biochemical and clinical aspects of milk fever.** *J. Comp. Pathol.*, 1955, **65,** 347–365. [Royal (Dick) Sch. Vet. Studies, Univ. Edinburgh.]

Ca, inorganic, total acid-soluble, total and lipid phosphates, and Mg in blood of cows with milk fever were estimated. Some estimations were made also in blood of healthy cows at the ages when they are most susceptible to milk fever. In cows which succumbed to the disorder Ca and inorganic, total acid-soluble and total P were low, but Mg and plasma lipid phosphate were not significantly different from normal. The incidence of milk fever became higher up to the fourth calving. Most cases occurred between 10 hr. before and 96 hr. after calving; the earliest was 14 days before and the latest 4 months after calving.

When cases were considered as severe, moderate or mild, the depression of Ca and P values in the blood serum was significantly greater as severity increased.

Treatment was by intravenous Ca borogluconate. Responses were classified as satisfactory, needing only one treatment, or unsatisfactory, needing more. The former occurred on an average 23 hr. after parturition, and the latter 6½ hr. after. In milk fever occurring before parturition response was generally unsatisfactory. There was no correlation between initial blood values of Ca and P and response to treatment.

A detailed study of the changes in blood constituents during the 10 hr. after treatment with Ca borogluconate showed that in cows giving satisfactory or unsatisfactory responses the change in Ca was the same; it rose sharply, and then fell to the pre-treatment level at 10 hr. The values for serum inorganic P, total acid-soluble P and total P of cows which responded satisfactorily increased sharply, and then gradually throughout the 10 hr. In 3 other cows the increase was less, and was followed by a slight decline throughout the 10 hr.

In some cows which did not respond to Ca borogluconate udder inflation was used. This caused a sustained rise in serum Ca, inorganic P, total acid-soluble P and total P.—T. D. Bell.

2614

BLOOD, D. C., HUTCHINS, D. R. and DUNSMORE, J. D. **The use of calcium laevulinate solution in the treatment of milk fever in dairy cows.** *Austral. Vet. J.*, 1955, **31,** 245–246. [Fac. Vet. Sci., Univ. Sydney.]

Eleven cows with milk fever were successfully treated with calcium laevulinate, 500 ml. of a 13 per cent. solution, mostly intravenously but in one subcutaneously and in another subcutaneously and intravenously. The results were comparable with those expected from sodium borogluconate. The laevulinate is more soluble and less irritant than the gluconate.—J. S. Thomson.

2615

MAPLESDEN, D. C. **Milk fever prevention.** *Canad. J. Comp. Med.*, 1955, **19,** 290–294. [Dept. Med. Surg., Ontario Vet. Coll., Guelph.]

2616

HOFLUND, S., NORDSTRÖM, G. and HALLGREN, W. Acetonämibehandling med natriumpropionat. **[Treatment of acetonaemia with sodium propionate.]** *Nord. Vet.-Med.*, 1955, **7,** 809–825. [Veterinärhögsk., Stockholm.] English and German summaries.

In all, 79 typical cases of acetonaemia were treated, attributed 12 to underfeeding, 60 to overfeeding and 7 to other causes. The sick animals were given free access to best quality hay, and received ½ kg. wheat bran, some roots and 200 g. molasses twice daily, with as much meal and silage as was required to cover their needs. If milk yield was heavy, only 15 to 20 litres were removed, unless there was mastitis in the herd. Treatment was with 50 g. sodium propionate twice daily by mouth for 3 to 5 days. Acetone in blood and urine quickly fell and blood sugar rose in almost all.

If bacteria producing propionic acid have disappeared from the rumen, rumen contents from a healthy animal should be transferred.—I. Leitch.

2617

REBER, E. F. and SCHOETTLE, C. E. **The use of sodium ethyl oxalacetate in the treatment of hypoglycemia and ketonemia in the ruminant.** *Cornell Vet.*, 1955, **45,** 548–555. [Dept. Physiol. Pharmacol., Coll. Vet. Med., Univ. Illinois, Urbana.]

Administration by stomach tube of sodium ethyl oxaloacetate at the rate of 1·5 g. per lb. bodyweight to pregnant ewes starved for from 4 to 9 days reduced blood ketones and increased blood sugar. Subsequent treatments at 24-hr. intervals had less effect. Disadvantages of the treatment are pointed out, causation of diarrhoea and production of ethyl alcohol in amounts sufficient to be toxic. As the level of blood ketone bodies rose during starvation there was a decrease in the lymphocyte : neutrophil ratio, indicating increased activity of the adrenal cortex.

J. S. Thomson.

2618

VIGUE, R. F. **Evaluation of various treatments for ketosis.** *Univ. Pennsylvania Bull.*, 1955, **56,** No. 5, 2–31.

A brief report is given of the use of 10 different methods of treating ketosis in dairy cows with glucose by vein or glycerol or sodium propionate by mouth; by cessation of milking; by exercise and feeding with specially attractive feed; with ammonium lactate or potassium chloride by mouth, adrenocorticotropic hormone or cortisone by intramuscular injection and ketogestin by mouth or intramuscular injection. Of 10 cows treated in each way only a proportion recovered, and in some response to one treatment was obtained when another had failed. The highest proportions of recoveries were with the ACTH and cortisone treatments. The nature of the disease and the choice of method of treatment are discussed.—T. D. Bell.

2619

SHAW, J. C., CHUNG, A. C., OZANIAN, C. H., CHRISTIANSEN, F. J. and RIGHETTI, A. T. **Studies on ketosis in dairy cattle. 19. Glucocorticoid and ACTH therapy in the Los Angeles area.** *J. Amer. Vet. Med. Assoc.*, 1955, **127,** 324–328. [Dept. Dairy, Maryland Agric. Exp. Stat., College Park.]

Treatment of ketosis with hydrocortisone alone or with hydrocortisone acetate was successful in most cases studied. There did not appear to be any advantage from the inclusion of the acetate, and the simultaneous use of Ca and glucose did not improve results. When treatment was given on 2 or 3 successive days recovery was more certain than after a single treatment. If a second treatment was required a larger dose was necessary. Adrenocorticotropic hormone and cortisone were also used to treat some cows, with successful results. The doses necessary were higher than those required in Maryland. This difference is discussed, and possible reasons for ketosis in the cows investigated, which were well fed, are suggested.

T. D. Bell.

2620

SHAW, J. C., GESSERT, R. A. and CHUNG, A. C. **Studies on ketosis in dairy cattle. 20. An evaluation of metacortandracin and 9-alpha-fluorohydrocortisone acetate.** *North Amer. Vet.*, 1955, **36,** 918–920. [Dept. Dairy, Maryland Agric. Exp. Stat., College Park.]

Treatment with 500 mg. metacortandracin or 100 mg. 9-alpha-fluorohydrocortisone was effective in curing cows with primary uncomplicated ketosis. These doses appear to be optimum. The results are compared with those previously found when cortisone acetate and hydrocortisone were used (see above Abst.).—T. D. Bell.

2621

MCCLYMONT, G. L. and SETCHELL, B. P. **Ovine pregnancy toxaemia. 2. Experimental therapy with glycerol and glucose.** *Austral. Vet. J.*, 1955, **31,** 170–174. [Nutrit. Res. Lab., Vet. Res. Stat., Glenfield, N.S.W.]

For part 1 see Abst. 5982, Vol. 25.

Pregnancy toxaemia was induced experimentally by starvation in 2 groups of ewes due to lamb in 3 to 4 weeks. Some of the ewes were treated with glycerol by mouth, 3 ml. daily per kg. liveweight, some were treated with subcutaneous injections of 2·5 ml. of 60 per cent. glucose solution and penicillin every 12 hr., and control animals were not treated. Glycerol increased the rate of recovery from 17 to 78 per cent. and glucose from 20 to 75 per cent. Blood analysis showed that in all cases of pregnancy toxaemia blood sugar levels were low. The time taken for recovery ranged from 16 to 120 hr. with glycerol and from 7 to over 240 hr. for glucose. The results were thought to confirm the theory that pregnancy toxaemia is a hypoglycaemic encephalopathy. The treatment should be given as quickly as possible, and should be continued to prevent the recurrence of hypoglycaemia until full return of appetite is obtained.

T. D. Bell.

2622

SETCHELL, B. P. and MCCLYMONT, G. L. **Reversal of the hypoglycaemia of fasted pregnant ewes.** *Austral. Vet. J.*, 1955, **31,** 204–209. [Nutrit. Res. Lab., Vet. Res. Stat., Glenfield, N.S.W.]

Reversal of hypoglycaemia in fasted pregnant ewes lasted for 18 hr. when glucose, 60 per cent., 3 ml. per kg. bodyweight, was given subcutaneously, and for 24 hr. when glycerol, 3 ml. per kg., was given by mouth. Exercise, adrenaline, adrenocorticotropic hormone and cortisone also reversed the hypoglycaemia. There was only a small blood glucose response to adrenaline in 2 field cases of pregnancy toxaemia. For treatment of early cases of pregnancy toxaemia glycerol is recommended at the rate of 6 ml. per kg., on the grounds of ease of administration and the comparatively long interval allowable between treatments.—J. C. Gill.

2623

STANSBURY, R. L. and TRUESDAIL, R. W. **Occurrence of vesical calculi in cats receiving different diets.** *North Amer. Vet.*, 1955, **36,** 841–845. [Arroyo Animal Hosp., Pasadena, Calif.]

The investigation reported was made in response to a suggestion that " Puss 'n boots ", a commercial cat food of whole fish and cereals, caused urinary calculi in cats. For 3 years 50 cats were maintained on this food only without urinary calculi. In a group of 25 cats getting raw horsemeat as the diet, true cystic calculi were recovered from 2 animals. A " high-ash " fish diet given to 12 cats also failed to produce urinary calculi after 40 days.

T. D. Bell.

2624

GRUNSELL, C. S. **Marrow biopsy in sheep. 2. Anaemia.** *Brit. Vet. J.*, 1955, **111**, 473–480. [Dept. Hyg. Prevent. Med., Royal (Dick) Sch. Vet. Studies, Univ. Edinburgh.]

See also Abst. 1623.

POISONS OCCURRING IN FOOD

2625

OLOMUCKI, E. and BONDI, A. **Problems connected with ethylene dibromide fumigation of cereals. 1. Sorption of ethylene dibromide by grain.**

BONDI, A., OLOMUCKI, E. and CALDERON, M. **2. Feeding experiments with laying hens.** *J. Sci. Food Agric.*, 1955, **6**, 592–599; 600–602. [Lab. Animal Nutrit., Agric. Res. Stat., Rehovoth, Israel.]

1. Grains fumigated with ethylene dibromide contained bromine in 2 forms, a volatile bromide which disappeared after the grains were aired for 6 to 7 weeks, and a residual, non-volatile, water-soluble bromide. The effects of exposure time, concentration and temperature on the absorption of bromine by different grains is discussed.

2. When laying hens were given grain containing from 180 to 320 p.p.m. free ethylene dibromide laying ceased after from 46 to 56 days; egg weight fell steeply. Smaller amounts also, 10 to 15 p.p.m., produced a decrease of egg weight after 12 weeks. Grain containing no free ethylene dibromide but 120 p.p.m. of residual bromide had no effect on egg size or production. It is concluded that grain fumigated with ethylene dibromide can safely be used for poultry provided it is sufficiently aired.

J. S. Thomson.

2626

CROOKSHANK, H. R. and SIMS, F. H. **Serum values in wheat pasture poisoning cases.** *J. Animal Sci.*, 1955, **14**, 964–969. [Animal Poultry Husb. Res. Branch, U.S. Dept. Agric., Amarillo, Tex.]

Wheat pasture poisoning is a condition found in cattle grazing the wheat crop in Texas and Oklahoma, and generally occurs during periods of lush growth. The course of the disease, which starts with lack of appetite and nervous excitement, and ends with coma and death, if not treated, is described. Treatment is with a solution of calcium gluconate, sometimes with added glucose, Mg, or P. The cause of the disease is not fully understood.

All were at least 2 years old and were pregnant or had a calf at foot. Beef, dairy and crossbred animals were affected. Usually the disease appeared after 60 to 150 days on wheat pasture. Supplements of sorghum or minerals did not prevent the disease. Blood samples were taken also from comparable cows, reared and maintained in the same condition, which did not develop the disease.

The comparison of sera from sick and healthy cows showed that in the sick inorganic P, total and diffusible Ca, Mg and the albumin : globulin ratio were low. Total serum protein, globulin and possibly K were high. There was a wide range in the values found.—T. D. Bell.

2627

O'MOORE, L. B. **Arum maculatum poisoning in cattle.** *Irish Vet. J.*, 1955, **9**, 146–147. [Vet. Res. Lab., Div. Biochem., Dept. Agric., Dublin.]

2628

BELL, A. T., NEWTON, L. G., EVERIST, S. L. and LEGG, J. ***Acacia georginae* poisoning of cattle and sheep.** *Austral. Vet. J.*, 1955, **31**, 249–257. [Animal Health Stat., Oonoonba.]

IMMUNITY

2629

KELLEY, G. W. **The effect of roughage on the number of eggs of *Haemonchus contortus* per gram of feces from experimentally infected calves.** *J. Amer. Vet. Med. Assoc.*, 1955, **127**, 449–450. [Dept. Animal Pathol. Hyg., Univ. Nebraska, Lincoln.]

The number of eggs per g. faeces from calves infected with *Haemonchus contortus* was inversely proportional to the amount of roughage given and to the amount of faeces excreted. The total daily output of eggs was not influenced by the amount of roughage in the ration.—G. C. Hunter.

2630

PARNELL, I. W. and DUNN, A. M. (with REEVE, E. C. R.) **Some observations on anthelmintic dosing of hill hoggs in Southern Scotland.** *Brit. Vet. J.*, 1955, **111**, 519–534. [Dept. Zool., Univ. Edinburgh.]

The effects of anthelmintics on the bodyweight, fleece weight and worm egg counts of hill sheep are reported. The treated animals showed greater gains of body and fleece weight than the controls, but the differences were not statistically significant, nor did the different anthelmintics give different effects. An explanation of the lack of statistical significance and the shortcomings of this type of trial are discussed in an appendix.—G. C. Hunter.

2631

GILL, B. S. **Observations on the relationship of thyroidal activity of chicks and caecal coccidiosis (*Eimeria tenella*).** *Indian J. Vet. Sci.*, 1955, **25**, 75–87. [Indian Vet. Res. Inst., Mukteswar-Kumaon, U.P.]

Methylthiouracil, 0·15 per cent., or thyroprotein, 0·04 per cent., was included in the basal mash of chicks 3 days old. A third group received the basal mash only. After 14 days the chicks were infected with 300 sporulated oöcysts each of *Eimeria tenella*. Faecal output of oöcysts was measured for 9 days after infection; then the birds were killed and oöcysts in a suspension of the caecum were estimated. Thyroids were dissected out and weighed. The thyroprotein increased oöcysts 4 times by the seventh day of infection, when most oöcysts were produced in all birds; in those getting thiouracil, oöcyst production was slightly reduced compared with the untreated controls. Thyroids were larger in the thiouracil and smaller in the thyroprotein group.

In a second experiment larger numbers, 200,000, of sporulated oöcysts were given as the infective dose to chicks treated in the same way as in the first experiment. More severe caecal lesions were found in the thyroprotein group at post mortem, but mortality from coccidiosis was lower. Again the opposite was found with the thiouracil group. This was possibly explained by the weight changes, reflecting the appetites, of the 3 groups during infection: during the acute stage from the fifth to the eighth day the birds getting thyroprotein gained weight but the others lost.—T. D. Bell.

7. BOOK REVIEWS

2632

WATERLOW, J. C. (Ed.) **Protein malnutrition. Proceedings of a conference in Jamaica (1953) sponsored by The Food and Agriculture Organization of the United Nations (F.A.O.), World Health Organization (W.H.O.), Josiah Macy Jr. Foundation, New York.** University Press, Cambridge, 1955, pp. xvi + 277.

Sometime in 1953—in spite of the detail in which it is reported the Conference's exact dates are not given—twenty-six participants assembled at the University College of the West Indies. Ten were persons working in that area, three came from South America, two each from Africa, the United States, Central America and India and four were from the headquarters of the international organisations. Under the chairmanship of a delegate from Australia they discussed the condition for which it had been agreed at an earlier meeting in Gambia that protein malnutrition was a sufficiently wide and generally acceptable name. It was natural that kwashiorkor should have been the main theme.

In the tradition of the Macy Foundation there were no prescribed agenda beyond the particular aspects of the subject, biochemical, pathological, clinical and epidemiological, which were the titles for discussion at the four sessions. This book, beautifully produced and illustrated, is a record in direct speech of what was said.

After discussions which seem to have continued at times with keenness tinged with acerbity the members reached the core of the problem at their last session. Perhaps it was the absence from their midst of an agriculturist, an absence which is readily explained by the Conference's general approach to the subject, that led to two footnotes of great significance being added to the Report after the meeting. One makes the point, by quotation from the Second World Food Survey, that "to a very large extent animal and crop production are supplementary rather than competitive and under the climatic and other conditions prevailing in many parts of the world a system of mixed farming gives best results for both". The other comments that for about 80 per cent. of tropical American areas the best use that can be made of the land is to return it to pastures and forests and that as a means for conversion of the forages to highly palatable human foods it is difficult to surpass the dairy cow. The expensive nature of that process was admitted by the Conference; it seems not to have laid sufficient stress on the very great wastage of nutrients that results annually from failure to conserve natural pasture and to integrate stock production with the production of crops.—D. Harvey.

2633

MONNET, P. Diététique du nourrisson, normal et pathologique. [**Feeding of infants, normal and pathological.**] Masson et Cie, 120 Boulevard Saint-Germain, Paris, 1955, pp. 264. Price 1600 fr.

This book has two main defects, one of content and one of style.

The first is the preoccupation of the author with Continental, especially French, literature. This is particularly so in the section on the feeding of healthy infants and may explain why some vitamin requirements, *e.g.*, for riboflavin, are left undecided and Ca requirement is given as only 0·15 to 0·30 g. daily. The preoccupation with French literature, although less marked in the section on the feeding of infants in disease, here also has its disadvantages, as when coeliac disease is discussed

without reference to modern work in the Netherlands and the United Kingdom on the therapeutic use of diets free from gluten.

The second defect, although of no real importance, is none the less irritating. This is the use of abbreviations, for the key to which one must constantly refer to the beginning of the book. Only by so doing may one know, for example, that the discussion on M.F.K. relates to *maladie fibrokystique*.

For the benefit of hospital dietitian and paediatrician the book brings together under one cover information on the requirements of healthy infants in terms of nutrients and foods and the special needs of ill babies. Useful data are given on the composition of foods used in infant feeding but information on breast milk composition is inadequate. The section on therapeutic dietetics covers a wide range of diseases and syndromes such as diarrhoea, vomiting, disorders of water and mineral metabolism, digestive disorders, nutritional dystrophies, coeliac disease, allergies and kidney disease.—F. C. Aitken.

2634

JELLIFFE, D. B. **Infant nutrition in the subtropics and tropics.** World Health Organization, *Monogr. Ser.* No. 29, 1955, pp. 237. Price 25s.

The book opens with a summary of systems of infant feeding in the western world. In the two main chapters which follow and which comprise more than half the book the present infant feeding practices in the subtropics and tropics are described and the present status of nutritional disease among infants there is discussed. These are the more interesting chapters, the first especially so, since much of the information has been brought together after the author's very extensive tour of the Near, Middle and Far East. In a chapter on methods of improving infant feeding the conclusion is that breast feeding alone should be the method of choice for the first six months and that more attention should be paid to the inculcation of feeding habits which will improve the nutritional status of the mother during pregnancy and lactation. The prevention of kwashiorkor is given a separate chapter. The book ends with one on nutrition education in the maternal and child health centre, written in association with Dr. Anne Burgess, Consultant to the Central Council for Health Education, London, and indicating the pitfalls which well intentioned efforts may not always avoid.

Throughout the work there are references to subjects on which more information is needed and to new problems which changing social conditions may pose. It is a most interesting production.

D. Harvey.

2635

MOYER, E. Z., KELLY, H. J., MACY, I. G., MACK, H. C., DILORETO, P. C. and PRATT, J. P. **Nutritional status of mothers and their infants.** Children's Fund of Michigan, 660 Frederick St., Detroit 2, 1954, pp. viii + 112 + 91 tables.

About half this book consists of tables. The study from which they are derived has been described previously (Abst. 5104, Vol. 24). The text describes the findings briefly and summarises the literature. About 500 references are listed.

A. M. Thomson.

2636

UHRY, P. and DUCAS, P. (with ELIACHAR, E.) Le diabète infantile et juvénile. [**Diabetes in infants and young people.**] Masson et Cie, 120 Boulevard Saint-Germain, Paris, 1955, pp. vii + 487. Price 3200 fr.

This comprehensive, well documented treatise reviews and discusses available data on etiology, pathology, symptoms, diagnosis, complications, biochemistry and treatment of diabetes in infants and young people. All of these, except the two last mentioned, are possibly more the concern of the clinician than the nutritionist. Just over 20 pages are devoted to diet treatment. In these the cases for restricted diet and free diet are presented. The authors cautiously conclude that only time will show whether the free diet increases the danger of degenerative complications. Not so cautious is the writer of the preface, Robert Debré, who uses the free diet system with confidence.

There is a brief subject index.—F. C. Aitken.

2637

HAUBOLD, H. Der Kropf, eine Mangelerkrankung. [**Goitre, a deficiency disease.**] Verlag Friedrich Find, Stuttgart-Plieningen, 1955, pp. vii + 343. Price 24 D.M. English summary.

An extensive investigation was made between 1948 and 1954 of the incidence of goitre in Germany, especially among children in Upper Bavaria and Lübeck. It is reported that there was a post-war wave of goitre affecting much of the country and not only the endemic goitre areas. Peasants especially were affected. The children of the American Occupation Forces remained healthy. The goitre was resistant to treatment with iodine, especially in adults.

The goitre is ascribed to deficiency of vitamin A. Night blindness was common. Pastures in endemic goitre areas have a low content of carotenoids, and so has the diet of the agricultural population. This was especially so when home butter-making was forbidden. The war-time and post-war shortage of P fertilisers was blamed for a reduced carotenoid content of crops and pastures.

Endemic goitre and goitre waves are said to be polyglandular disorders; the thyroid hyperplasia is the most noticeable sign. Treatment with vitamins, minerals, protein and small doses of thyroid and pituitary hormones is reported to be effective.

A chapter deals with goitre in livestock. The problem of goitre is discussed from several aspects and there are nearly 800 references.—D. Duncan.

2638

YATES, P. L. **So bold an aim. Ten years of international co-operation toward freedom from want.** FAO, Rome, 1955, pp. 174.

The monosyllables which form the title of this most readable book have been culled from their context in a speech by Mr. Lester Pearson, who was Chairman of the historic First Session of the Conference of FAO at Quebec in 1945. At that meeting, the tenth anniversary of which is celebrated with the publication of this book, Mr. Pearson used the words:

"There have been functional international agencies with more circumscribed objectives and tasks, but FAO is the first which sets out with so bold an aim as that of helping nations to achieve freedom from want".

This account of the agency's performance is by an author who was a member of the staff of FAO for the first six years of its existence. From his intimate association he tells how the boldness of the first Director-General's proposals for the establishment of a World Food Board outstripped the courage which governments were inclined to show in their dealings with the problem of shortages and surpluses, and he describes how timely to the Organization was the help which came to its hand with President Truman's so-called "Point Four" proposals and the creation of the Expanded Technical Assistance Programme.

The descriptions given of the wide variety of its services and the value set on the information which the agency has amassed will provide some of the answers to the less bold critics who have expressed doubt as to the value for money which some of the member nations may be getting in return for their subscriptions. In their smaller way subscribers to an abstracting journal will be interested in this quotation:

"Any abstracting service is comparatively expensive in men and money if it is to provide world coverage and, moreover, such services already existed in one country or another for many sectors of the field. The view prevailed that FAO should encourage existing services to extend and improve their coverage and should itself enter the field only in sectors where it proved impossible to get the job done by some other body. In the event, only in fisheries has FAO undertaken the task."

D. Harvey.

2639

VAN DE WALL, G. and ALVORD, E. D. (Jr.) **A survey of the food and feed resources of the Union of South Africa.** J. L. Van Schaik, Ltd., P.O. Box 724, Pretoria, 1954, pp. xiv + 312.

This survey is in two parts. The first, by the second author, deals with "the nutritional background of the animal industry and the contribution of the industry to human food requirements", the second, by the first author, with "the production and consumption of primary and secondary foodstuffs for human consumption". Each study was made during the tenure by its author of a bursary awarded by the National Council for Social Research and each was submitted as a thesis for a higher degree in the University of Pretoria. The studies are, in a very real sense, twins, identical ones at that, which the authors admit were difficult to keep apart.

The period of reference of the statistics on which the arguments are based is the 30 years from 1917 to 1946 and, when it is remembered to how great an extent in the 20th century war has affected the fortunes of the political unit which we now know as South Africa, the advances made by the Union in the years of peace are all the more remarkable. None could be more conscious than the authors of the limitations of the statistics which were their raw materials, and each has something to say on possible improvements in their collection. In this respect the survey as a whole, by indicating the gaps which exist in the information available in the Union, will provide an object lesson to other countries less well supplied.

In spite of these limitations some interesting findings emerged and reference to some has already been made by Dr. F. W. Fox in a series of articles in the *South African Medical Journal* (see Absts. 3594, 5556, Vol. 24; 1127, 2612, 4068, 5542, Vol. 25). Two conclusions, one that 90 per cent. of the digestible protein and 86 per cent. of the total digestible nutrients which are available for feeding stock in the Union are furnished by natural veld pasture, and the other that in human nutrition there is need for an annual production of 200,000 more tons of beef, underline the necessity for the fullest use and the most careful conservation of pasture. It is in providing suitable supplementary feeds for use with this pasture that the problems arise, in agronomy of finding species that will level the seasonal variation in nutritive value, and in agricultural practice of avoiding the loss of many millions of tons of digestible nutrients which is shown to be an annual occurrence.

When a subsequent edition, the demand for which will be irresistible, is planned, consideration should be given to increasing the scale of some of the diagrams and especially of the maps in order to make them more easily legible.—D. Harvey.

2640

SWIFT, R. W. and FRENCH, C. E. **Energy metabolism and nutrition.** The Scarecrow Press, Washington, D.C.; Bailey Bros. and Swinfen, Ltd., London, 1954, pp. 264. Price $5.75

The preface tells us that this book is presented "from the standpoint of the teacher having seniors and graduate students under his direction". The peculiar mixture of ingredients argues a much more catholic education in the Department of Animal Nutrition, Pennsylvania State University, than would easily be found in the United Kingdom. Human and animal nutrition are discussed side by side, as if those who are concerned with stock feeding must also be interested in the almost medical problems of obesity and diabetes in man.

The book is perhaps at times too learned for students, and is scarcely argumentative enough for the research worker; unless the shattering of current precepts moves him to fresh efforts, for instance after reading the following: "As a result of long usage and tradition therefore, the T.D.N. system has survived though wholly undefended, so far as the authors are aware, by any research worker in the field of nutrition". Or this: "Group feeding has unquestionably contributed much in the early days of what might be called primitive investigation but is of little or no value in the more specific detailed requirements of present day research". Some of the judgments sound deliberately provocative, as: "It is invariably the case that the student wrongly chooses the 'moderately active' or 'physically active' classification when 'sedentary' should be applied. The latter category should be used for the great majority of our population. . . ." So long as there are any heavy workers, the student cannot always be wrong. The dictum might have been more moderately put: "Most of our population require no more than the 'sedentary' allowance." Still, if the aim is instruction the mode must no doubt be didactic, and the book contains in small space lots of information that is often required but not easily memorised or readily found in larger textbooks.—I. Leitch.

2641

JUKES, T. H. **Antibiotics in nutrition.** Medical Encyclopedia, Inc., New York, Antibiotics Monographs 4, 1955, pp. 128. Interscience Publishers, London.

The writer who has to deal, in less than 90 pages, with 439 publications, many of which report contradictory experimental findings, is in a difficult position. His account of the subject must, almost inevitably, become a catalogue of claims made or repudiated. Many of the later pages of this compilation are of this nature and will interest the more specialised workers. The earlier ones, which give a history of the use and a review of the mechanism of action of antibiotics in nutrition, will be more to the liking of the general reader. Whatever the level of his approach, the reader will not fail to conclude that much still remains to be clarified in connection with the nutritional effects of these thaumaturgic drugs.—D. Harvey.

2642

HAMMOND, J. (Ed.) **Progress in the physiology of farm animals. Volume 2.** Butterworths Scientific Publications, London, 1955, pp. 395–740 + xv. Price 45s. Postage 1s. 8d.

The reviewer of Volume 1 of this publication (Abst. 1547, Vol. 25) said that, "Perhaps the most worrying feature of the book is that it reveals the conflict between those who think solely in terms of animal production and those who adhere to a physiological approach". Volume 2 appears to represent a continuation of Dr. Hammond's efforts to reconcile these conflicting personalities. Perhaps it might have been better to sacrifice individual expertise in the interests of unity of approach.

In the first chapter the treatment of growth in a general sense does not do justice to the theme. Later, it hardly gives enough attention to the effects of antibiotics and the use of hormones in fattening. There is some overlapping with the next chapter, on conformation and body composition. This chapter, in contrast, is extremely thorough and runs to more than 100 pages, and the author is one of those more successful in combining the practical with the academic. But he passes over some interesting implications. For instance, in discussing heterogonic growth in sheep the statement is made that in the foetus of 56 days' gestation the abomasum makes up 17·2 per cent. of the total weight of the stomach [not *four* stomachs], while at birth it has increased its proportion to 55·8 per cent. This is explained as "clearly functional"; but is it not as interesting that at first the stomach develops in almost its adult proportions, the relative increase in the abomasum coming quite late in gestation?

The chapter on wool growth is especially authoritative, though it is a pity that we must look elsewhere for the bibliography. Animal behaviour is rightly given its place; it can no longer be regarded as a neglected subject. The remaining chapters deal with locomotion in quadrupeds, interestingly dealt with, and with egg production in poultry, making altogether a mixed bag indeed.

Altogether, this is another stimulating book, which provides information not always as new as might be expected from the title, but with enough freshness of approach to interest students of most ages from the undergraduate onwards. Good

paper, large clear print and well produced illustrations are its material assets.—D. Duncan.

2643

FISHWICK, V. C. **Pigs: their breeding, feeding and management.** (Revised edition edited by Biggar, W. A.) Crosby Lockwood and Son, Ltd., 39 Thurloe St., London, S.W.7, 1953, pp. 228. Price 18s.

Chapters deal with the rearing and feeding of young pigs, breeding gilts and boars, and fattening for bacon or pork. The market requirements are described. The chapters on housing, health and disease and feeding have been rewritten in the light of new knowledge since the last edition in 1951. Policy as regards choice of breeds, buying or rearing, integration of pigs into the economy of the farm, and the costing of the pig enterprise are discussed. The book is based on the experience of the author and the editor and is designed to appeal to the practical pig-keeper.—T. D. Bell.

2644

COMAR, C. L. **Radioisotopes in biology and agriculture. Principles and practice.** McGraw-Hill Book Company, Inc., London, New York, 1955, pp. xiii + 481. Price 67s. 6d.

In the preface the author states that "a primary purpose of this volume is to bring home to the student and investigator an appreciation and understanding of how radio-isotopes can fit into his programme and then to show how the experimental work can be undertaken". This expresses well the choice and arrangement of material. The first chapter deals in some detail with the principles of tracer methodology: this is of particular value, since a thorough understanding of the theoretical basis of tracer kinetics is necessary for the correct interpretation of experimental results. The next chapters are concerned with fundamental difficulties in tracer methods and with radiation hazards. A detailed account is then given of the design and equipment of laboratories and of basic procedures with animals, plants and soils. The fifth chapter describes general methods for the assay of radio-active isotopes. Chapter 6 is a summary of the properties of individual isotopes and suitable procedures for their use. This is a valuable guide to the choice of an isotope for a particular investigation and occupies more than one-quarter of the book; typical studies are described and practical hints given on the use of the isotopes discussed. The last four chapters are concerned with the principles and application of autoradiography, paper chromatography, ion exchange and radio-activation analysis.

On account of the detailed treatment of theoretical and practical fundamentals this book should be of great value to workers beginning to use radio-active isotopes. The large number of references and the wide range of the subject material drawn upon should make it a useful work of reference for all biochemists.—H. G. Bray.

2645

HOLMAN, R. T., LUNDBERG, W. O. and MALKIN, T. (Ed.) **Progress in the chemistry of fats and other lipids. Volume 3.** Pergamon Press, London; New York, 1955, pp. vii + 475. Price 70s.

In this book, consisting of 11 "short monographs" bound together for convenience, 6 are of direct interest to the biochemist and to workers in the field of nutrition; it is with these 6 contributions that the present review will be mainly concerned.

An account of problems in the parenteral administration of fats to animals and man given by Dr. Smith Freeman (Chicago) directs attention to the many difficulties which must be overcome before intravenous injection of lipids can be considered a safe means of administering a fluid rich in energy and of low osmotic pressure to undernourished and sick persons. Included in this survey are sections dealing with conditions affecting the stability of fat emulsions, toxic reactions to infused emulsions and evidence relating to the utilisation of injected lipids.

Professor Henrik Dam (Copenhagen) reviews current knowledge of the biochemistry of the fat-soluble vitamins A, D, E and K, to each of which a separate section is devoted; short accounts are given also of the guineapig antistiffness factor and of the factor which prevents gizzard ulceration in chickens.

The formation of animal fats, with special reference to triglycerides, is discussed by Dr. F. B. Shorland (Wellington, N.Z.). A survey of research concerned with the fate of dietary lipids and the endogenous synthesis of fatty acids, including branched-chain acids, is followed by considerations of the dynamic state of body lipids and conditions determining the fatty acid composition of depot fats. Finally, changes in the pattern of fat metabolism during the course of evolution are discussed; it is suggested that animal species can be divided into 3 main classes, (1) species which deposit dietary fat only, *e.g.*, fishes, (2) species which deposit exogenous and endogenous fat, *e.g.*, amphibians, reptiles and non-ruminant mammals, and (3) species which deposit mainly endogenously-produced fats, *e.g.*, ruminants.

Modern theories of the glyceride structure of fats (so often characteristic of a plant or animal species) and mechanisms regulating the composition of natural fats are dealt with by Dr. Vander Wal (Chicago) in a critical survey of the "even distribution theory" of Hilditch, the "random

and partial random distribution theories" and the most recently proposed "theory of restricted random distribution" of Kartha. The latter is regarded by Vander Wal as the most complete and ingenious theory yet produced.

The Swedish workers Professor Bergström and Dr. Borgström have collaborated to write a valuable, critical account of the intestinal absorption of triglycerides and their hydrolysis products. Recent developments in methods (surgical and analytical procedures, including the use of radioactive isotopes) are discussed, and many of the authors' own experiments on the hydrolysis of triglycerides by pancreatic lipase *in vitro* are described. A valuable addendum to this chapter is a short description, illustrated with photomicrographs, of the structure of the intestinal mucosa by F. Sjöstrand and H. Zetterqvist.

Dr. L. T. Samuels (Utah) has contributed an extensive review of the metabolism of steroid hormones, which includes a discussion of acetate as a precursor of steroids and of cholesterol as a precursor of steroid hormones. The transport of steroid hormones and their overall metabolism and metabolism in specific tissues are discussed in considerable detail.

The other 5 chapters are mainly of interest to the pure chemist; they include "Solutions of Soap-like Substances", "Synthetic Detergents" and "Oxygenated Fatty Acids", together with accounts of the application of low-pressure fractional distillation and low-temperature crystallisation to analysis of lipids. In their preface the editors recognise a division between "chemistry and technology of fats" and technological advances will in future be covered in separate series of books.

The book is well produced and the price is not unreasonable. Each chapter carries full references to the literature and, in addition, author and subject indexes appear at the end of the volume.

G. A. Garton.

2646

LILLIE, R. D. **Histopathologic technic and practical histochemistry.** The Blackiston Company, Inc., New York, 1954, pp. ix + 501. Price 56s. 6d.

The first edition of this book was published in 1947 under the title "Histopathologic technic". The present work consists of a practical account of methods for the histological and histochemical examination of a wide variety of materials for many constituents. The first few chapters are concerned with equipment and fundamental techniques such as microscopy, fixation, sectioning, staining and mounting. Then follow chapters concerned with the recognition of nuclei and nucleic acids, amino-acids and characteristic chemical groupings, cytoplasmic granules, enzymes, endogenous and exogenous pigments, minerals, carbohydrates, lipids and connective tissue fibres. Finally, accounts are given of the examination of bacteria, protozoa and other parasites, of glia and nerve cells and fibres and of the treatment of hard tissues and other special procedures, *e.g.*, vascular injection, corrosion, autoradiography and micro-incineration. The chief characteristic of this book is the detail in which the procedures are described, so that it should be possible for any worker familiar with general histological technique to carry out any examination with a minimum of difficulty. Another useful feature is the general discussion of the histological properties of tissues and tissue components which forms a background to the detailed practical instructions which are given. This book clearly embodies a great deal of practical experience and will be of value to many workers who use histological methods.

H. G. Bray.

2647

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2649

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9. FOOD AND AGRICULTURE ORGANIZATION (AND OTHER ORGANIZATIONS) OF THE UNITED NATIONS

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Vol. 4, No. 12, December 1955, pp. 72. Price $0.50.

P. 1. The world food and agricultural situation. Statement by Director of Economics Division at Eighth Session of FAO Conference, November 1955.

P. 8. Progress and developments in the selective expansion of agricultural production and consumption. 1. The subject is considered regionally. In this part North America, Oceania, Western Europe, U.S.S.R. and Eastern Europe and Latin America are treated.

Vol. 5, No. 1, January 1956, pp. 48. Price $0.50.

P. 1. Progress and developments in the selective expansion of agricultural production and consumption. 2. In this part Africa, Near East and Far East are treated. General conclusions are given in relation to the policy of " progressive adaptation of agriculture to the changing need of a country or wider region " proposed at the Seventh Session of FAO Conference, November 1953.

Vol. 5, No. 2, February 1956, pp. 56. Price $0.50.

Commodity Reports. Rice No. 6. Rome, Italy, December 1955, pp. iii + 49. Price $0.25.

Commodity Policy Studies No. 9. The stabilization of the olive oil market. Rome, Italy, 1955, pp. 55. Price $1.00.

Commodity Series Bulletin No. 27. Cacao. A review of current trends in production, price and consumption. Rome, Italy, November 1955, pp. 99. Price $1.00.

In a chapter on the outlook for consumption and prices there is information showing that, for cocoa, not all countries reach the same income elasticity of demand at the same level of income. They can be grouped according as their income elasticity is low, Australia, New Zealand, Sweden, Canada and especially United States of America ; medium, Norway, France, Belgium and Denmark, or high, as in most other countries. Data are insufficient to allow prediction as to whether in the United Kingdom and Switzerland, countries with high rates of consumption, these rates will continue to rise with income or whether a saturation level will be reached. Data for surveys of consumption in Germany 1927–1928, Denmark 1939–1940 and the United States, 1935–1936 are discussed.

Agricultural Studies No. 30. Joint FAO/WHO Expert Committee on meat hygiene. First report. Rome, Italy, December 1955, pp. 52. Price $0.60. Also issued as WHO Technical Report Series No. 99.

Report of the third special meeting on the economic aspects of the rice industry. Bangkok, Thailand, 30 September - 7 October 1955. Rome, Italy, 1955, pp. v + 49. Price $0.50.

Delegates attended from 17 countries and their main concern was a solution to the problem of fluctuations in international trade. On the particular question of increasing human consumption it seemed possible that a rise in income, in certain areas such as Africa, might lead to an increase in the use of rice at the expense of millets and sorghums but in the rice-producing countries the same change might lead to a decrease in its use. The high price of rice in relation to that of other cereals has given rise to greater importation of wheat into Japan. The main recommendations to governments were that they encourage the use of rice directly as food or feedingstuff or for industrial purposes and indirectly by eliminating fiscal burdens which may add to its cost ; that they assist financially in creating national stocks ; and to FAO that it help towards these ends by referring the economic aspects to an intergovernmental group appointed by its Committee on Commodity Problems and by furthering the work of the *ad hoc* Working Group which it created after the Rangoon meeting (see p. 593, Vol. 25).

Agriculture in the world economy. Rome, Italy, November 1955, pp. vii + 76. Price $1.00.

This text, which is well illustrated by 26 figures, most of which are two-colour, describes the position held by agriculture in relation to the other industries of the world. It is complementary to an earlier publication *The Farm and the City* (see p. 973, Vol. 23). It is argued that, as a result of the antipathy towards agriculture which arose at the time of the Industrial Revolution, its true position in the world's economy and its value as an outlet for manufactured goods have not been appreciated. Because of the rapid rate of increase of the world's population and the present low standard of feeding of so many of its peoples there is an urgent need for agricultural expansion.

N.A. and R., April 1956

In the coordination of the efforts of individual governments FAO must play a vital role.

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Annual Report of the Institute for Medical Research, Kuala Lumpur, for the Year 1954. Pp. 126.

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NUTRITION ABSTRACTS AND REVIEWS

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LAND USE AND FARMING POTENTIAL OF NEW ZEALAND

BY

R. H. SCOTT

EXTENSION DIVISION, DEPARTMENT OF AGRICULTURE, NEW ZEALAND

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INTRODUCTION

WITH the realisation that New Zealand's population is likely to increase from the present total of just over two million people to three million in the early 1970s, considerable thought has been given by some experts on how production from the Dominion's farm lands can be increased, first to meet the needs of this expanding population, and second to provide them with the additional imports required to maintain, and if possible to improve, living standards. In his report to Parliament in 1953 and again in 1955 the Director-General of Agriculture drew attention to the task and stated that an increase of 60 per cent. in livestock numbers was necessary for a population of three million.

The task before the farming industry is one of no small order, and it is of interest to survey what is being done at present towards reaching this production goal and to review some of the problems.

PHYSICAL BACKGROUND

The Dominion covers about 66 million acres, of which about 44·2 million are occupied for farming. It is largely a mountainous and hilly country, less than one-quarter of the land surface lying below the 650-foot contour and, of the farming land, it is estimated that 28½ million acres (64 per cent.) are too steep to be cultivated by implements. Both islands are divided broadly into eastern and western regions by the main mountain axis, and the area of "easy" farming lowlands is very small, confined mainly to coastal strips and river valleys which are usually separated in such a way as to make road construction and maintenance difficult and costly.

Although New Zealand has some very wet regions and one semi-arid one, in general the farming lands have an annual rainfall between 30 and 70 inches, which is evenly distributed. The climate is temperate and nowhere is it necessary to house cattle at any season of the year. In the North Island grass grows for the greater part

of the year, but in the South Island growth is checked during the colder winter months and supplementary fodder has to be provided. Much of the country enjoys 2000 or more hours of sunshine a year, and even certain regions which have an annual precipitation of over 100 inches still have more than 1900 hours of sunshine.

It is true to claim that New Zealand's greatest asset is its climate.

HISTORICAL DEVELOPMENT

New Zealand can look back on little more than 100 years of farming history, and today the adjustment of farming to environment is still going on. Its broad characteristics, sheep farming for meat production and dairy farming for the production of butter and cheese, have become established only since the introduction of refrigeration in 1882. The first organised settlers arrived in the 1840s and for the first 10 years their main task was to produce food and animal products for themselves. The Crown Land Ordinance of the early 1850s made it possible for settlers to take up large areas of land for grazing, and Merino sheep from Australia were soon brought in to stock these large runs.* Within 10 years much of the south-eastern portion of the North Island and all of the tussock grasslands of the South Island were occupied and used for sheep farming for the production of wool.

The discovery of gold in Otago in 1861 resulted in a considerable increase of population and the consequent creation of a good domestic market for cereals and other farm products. That event, with a drop in world prices for wool, brought about a change in the farming pattern on the easily cultivated, flat land of Canterbury; in the early 1870s several run holders began to grow wheat on a large scale, and for a time "bonanza" wheat-farming was common. Some run holders grew as much as 5000 acres of wheat, and the area under wheat increased spectacularly from 78,000 acres in 1870 to 390,800 acres in 1883; for some time New Zealand was a wheat-exporting country.

While the Canterbury farmer was making the change from sheep farming for the production of wool to mixed farming for the production of wheat as well as wool, an onslaught on the bush and scrub vegetation of the North Island by the "bush burn" technique began. Under that system the larger forest trees were felled and fire reduced them and other forest growth to a wilderness of blackened and charred stumps and logs; then, before the ashes were cold, pasture seed was broadcast by hand. So was created much of New Zealand's hill pasture land, and also much trouble for the future, for in many areas of higher rainfall reversion to the prickly bushes of manuka (*Leptospermum* spp.) soon took place and the new settlers had to retreat. Only during the past decade has another vigorous attempt been made to establish good pastures on some of that deteriorated country.

The next distinctive phase of development began in the 1890s, but it was foreshadowed already in 1882 by the first successful shipment of frozen meat to Britain from Dunedin. By 1895 refrigeration was well organised commercially, new primary industries were possible, and there was an upward turn of prices for primary produce. A living could now be made off a smaller area of land and there arose a demand for small areas from the farm worker with limited financial resources.

The Liberal Party, which came into power in 1891, helped to provide these holdings by passing legislation to stop land aggregation and to recover land already alienated from the Crown. The Crown also purchased large holdings, subdivided them, and leased the areas to small farmers on favourable long-term leases. There now occurred a change from sheep farming for the production of wool and from "extensive" wheat production to a more mixed farming in which the output of frozen meat, butter and cheese assumed greater significance. Returns from fat lambs supplemented returns from wool, and emphasis was placed on carcase as well as fleece. A great new dairying industry appeared as soon as milk products could be transported successfully half-way round the world. The new farmers on their smaller holdings, who wished to carry the maximum number of stock, became leaders in the adoption of better farming techniques, and thanks to their enterprise the present farming pattern of the Dominion was established by 1920.

From 1920 until the end of the second world war techniques for the intensive cultivation of grassland were increasingly applied to a relatively small area of good flat and undulating land, and during that time these New Zealand farmers became among the most expert in the world in the production and use of high-quality pastures. Adaptation of some of the grassland techniques to hill country, particularly in the North Island, has been the latest development in farming, and it is to those areas of hill country that the Dominion will turn to obtain part of the increase in production necessary for its expanding population.

PRESENT FARMING SYSTEMS AND PRODUCTION

Present farm management systems can be classified according to product and according to type of pasture. Briefly, the systems are :

* A term applied to pastoral land held under lease or licence, generally extending to several thousand acres.

(1) Very extensive pastoral farming. Product : wool.
(2) Extensive pastoral farming. Products : wool and store and breeding stock.
(3) Semi-extensive pastoral farming. Products : wool, store and breeding stock, and some fat stock.
(4) Semi-intensive pastoral farming. Products : wool, fat stock and some store and breeding stock.
(5) Intensive farming. Products : (*a*) meat, or meat and cash crops ; (*b*) dairy products.

Very extensive pastoral farming is confined principally to the tussock grassland of the "montane" country, mountainous country to the east of the Southern Alps in the South Island, a region of large sheep stations which are devoted mainly to the production of fine wools. Here Merino and half-bred sheep predominate. The early pastoralists found that the fresh green growth which followed the burning of the tussock cover was eaten readily, and the discovery led to the regular and indiscriminate burning which has contributed to the depletion of large areas of once valuable grazing land. Actually it is the small plants, weeds and grasses which grow in the shelter of the tussocks that provide the main sustenance for the grazing animal.

Because of the grave risk of losses from snow, management in the extensive high-country runs (see footnote, p. 566) in the South Island hinges on the division of the available grazing area so that sheep can be moved to lower and safer country for the winter. Cattle have never been of much importance in that area, and although recently there has been a slight increase in numbers, in no section of the tussock country does the ratio of cattle to 100 sheep shorn exceed 3 and in many areas it does not exceed 1. The ratios are small compared with those in parts of the North Island such as the east coast district north of Gisborne, where the ratio is nearly 20.

The main product of the very extensive pastoral farming is fine wool, since, owing to the comparatively low rate of lambing and the risk of losses from snow, there is seldom any surplus stock for disposal.

Extensive pastoral farming, covering the production of wool and store and breeding stock, is carried on in the lower tussock areas of the South Island where danthonia (*Danthonia pilosa*) and browntop (*Agrostis tenuis*) are now important constituents of the sward, and on the danthonia and browntop surface-sown hill pastures of the North Island. The flocks and herds of the extensive pastoral areas supply the store lambs, wethers, cattle and breeding ewes required for the intensive farming areas where store animals are fattened on grass or fodder crops and the breeding ewes are mated for the production of export lamb.

The North Island extensive pastoralist keeps cattle as well as sheep, the proportion being usually 1 to every 10 sheep, but in the areas of higher rainfall the proportion is as high as 1 to from 5 to 7 sheep. The cattle can be used to clean up surplus summer growth of grass and crush out fern and other undesirable vegetation.

On surface-sown hill country of moderate fertility or where fertility has been built up by top-dressing, the pasture lands are capable of producing some fat stock, so that extensive pastoral farming grades into semi-extensive and semi-intensive pastoral farming. Surface-sown hill country of moderate fertility produces wool, store and breeding stock, and some fat stock. Top-dressed surface-sown hill land produces wool and fat stock and some store and breeding stock.

Intensive farming is practised on the flat and undulating land where the pastures, mixtures of grasses and clovers, have been established after ploughing the land. In the warmer and rainier areas the intensive grazier relies almost entirely on grass for the production of meat, and in some of the areas good land carries up to 6 and 7 ewes per acre, with their lambs, all the year round. He buys culled-for-age and surplus 2-tooth ewes from the extensive pastoralist and mates them with Southdown rams for the production of export lambs, which are often fit for slaughter at 30 or 40 lb. dead weight by midsummer. He also fattens store lambs, wethers and beef cattle purchased from the extensive pastoralist. In drier or colder areas grass has to be supplemented with fodder crops. In areas of low rainfall rape is grown for summer fattening of lambs ; in the colder areas turnips, swedes and green fodders are eaten where they grow in winter. On land of high fertility in the drier areas cereal, pulse, pasture seed and other cash crops are produced in rotation with grass and fodder crops. New Zealand cannot, however, be classed as a large-scale producer of arable crops and such crops cover little more than 1 million acres. The general aim in crop production is to satisfy domestic requirements, but considerable imports of wheat are needed.

Dairy farming is a form of intensive grazing on permanent grass. Hay and silage made from the surplus growth of summer pasture are used as supplementary feed, and with grass they form almost the whole feed of dairy cows. Seldom is purchased fodder brought on to a farm. On good land a dairy cow can be maintained on as little as from 1 to 1½ acres, which means a self-contained production of about 250 lb. butterfat per acre. Dairying tends to become the dominant farming industry where the rainfall is more than 40 in. per annum. North Auckland, Auckland, Taranaki

and Southland are the chief dairying districts. Considerable attention is paid also to meat production in those districts, and it is the chief activity where the rainfall is less than 40 inches. Cereal and other cash crops together with production of meat assume greater importance in areas where the rainfall is from 25 to 30 inches, the Canterbury Plains being the chief area of arable mixed farming.

New Zealand farming is highly specialised and mechanised and is fundamentally grass farming. There are about 38 million sheep, which produce about 328,000 tons of meat and 420 million pounds of wool a year. The 2·6 million head of beef stock and 3·1 million head of dairy stock together produce about 178,000 tons of beef and 21,000 tons of veal. The 2 million milking cows produce about 190,000 tons of butter, 105,000 tons of cheese, and about 70,000 tons of milk powder and condensed milk, as well as whole milk for just over 2 million people. Agricultural production forms the greater part of the Dominion's primary production, and of the wool, meat and dairy products approximately 75 per cent. by weight is exported.

Though the dairy cow and the sheep bring in the greater part of the Dominion's overseas revenue, other farm enterprises play a part in satisfying local market requirements or providing some export revenue.

Poultry farmers generally satisfy the local market and bee-keepers produce a small surplus of honey for export. The country is self-supporting in hops, and part of the local requirements of tobacco are met by tobacco growers in the Nelson and Motueka districts in the northern part of South Island. The orchards near Hastings in the Hawkes Bay District and in the Nelson District grow sufficient apples and pears to meet local requirements and to export annually about 1½ million cases of apples (about 40 lb. to the case) per annum, mostly to the United Kingdom. Market gardens supply all the fresh vegetables required, and during the past few years a vigorous canning industry has developed and export markets are being supplied. During the season 1953–54, 16,000 tons of canned and quick-frozen vegetables were produced in addition to pulped products such as vegetable soups and tomatoes, and the annual export value of canned vegetables is now about £350,000.

Another product of the soil that is assuming considerable importance is softwood from the 1 million acres of exotic forests, mainly pines, of which nearly 50 per cent. are state-owned. The annual output of sawn timber from the softwood forests is nearly 300 million board feet, of which about 10 per cent. is exported. With development of the manufacture of wood pulp and paper, greater quantities of the timber will be used. The production of wood pulp in the Dominion for the year ending 31 March 1955 was 72,800 tons, of which 19,600 tons were exported.

A reasonable method of obtaining an indication of the relative importance of the several segments of production in New Zealand is to compare the values of their products. Table 1 shows clearly how important to the Dominion is the produce of its soil.

TABLE 1

VALUE OF PRODUCTION IN NEW ZEALAND, 1953–54

Type of production	Value million £	
Arable crops	30·9	
Pastoral	180·2	
Dairying, poultry, bees	98·0	
Forestry	17·2	326·3
Mining	11·0	
Fisheries	2·1	
Factory *	130·5	
Building, miscellaneous	48·2	191·8
		518·1

* Excluding the processing of primary products included in other groups.

A review of past trends in production is a help in making an assessment of future trends. The index of the volume of farm production shows that over the 30-year period 1890–91 to 1920–21 it almost doubled, but the next doubling took only 15 years, being achieved by 1935–36. In the second period farmers began to use good seeds to establish pastures and also to use superphospate to topdress the pastures. In the 15-year period 1935–36 to 1950–51 the increase has been only 31 per cent., but during the war there were difficulties such as shortage of labour and farm requisites. Statistics since the end of the war show that the increase in production has averaged nearly 3 per cent. per annum, and it is generally held that an annual rate of increase between 2 and 3 per cent. should be expected for some years.

CONDITIONS ASSOCIATED WITH INCREASED PRODUCTION

Though one of the main means of expanding production lies in increasing on existing farms the acreage of good grassland and using it efficiently, other means are being exploited and some of them can be examined from the national point of view.

Development of Unimproved Land

It has been estimated that there are about 2·0 million acres of virgin land in the Dominion suitable for and capable of development into farming land. The greater part is in the North and South Auckland Districts. At present about 150,000 acres of land are being sown to pasture each year, of which 80,000 acres are being developed by private owners and the remainder by the Departments of Lands and Survey and Maori Affairs. There appears every prospect that development will continue at the same rate for some time.

The land development work of the Department of Lands and Survey is on a large scale. Some idea of its magnitude can be obtained from a record of the material requirements for one year's operation, which in a recent year amounted to 1100 tons of fencing wire, 384,000 fencing posts and battens, 776,000 feet of water piping, 620 tons of grass seed, 32,000 tons of superphosphate, and 25,000 tons of lime. Large numbers of stock are carried on the blocks till these are subdivided and ready to be offered to settlers. At the end of June 1953 the Department had 390,000 sheep, nearly 6000 dairy cattle, and 67,000 store cattle, which certainly made it the biggest farmer in the Dominion. The land is developed for disposal to private farmers and 748 persons were settled between 1950 and 1953.

Aerial Topdressing

Topdressing is the basic answer to the improvement of about 13 million acres of the Dominion's hill country. Although before the advent of aerial topdressing some fertiliser was spread by hand, the work was laborious, expensive, and inefficient and therefore little was done to improve the unploughable hill pastures.

The first test of dropping fertiliser from the air was made in May 1939, but the war prevented further progress and it was not until 1946 that the first extensive experiments were made. Subsequent tests were made by the Royal New Zealand Air Force, and by 1949 it was shown that aerial topdressing was operationally possible. Since that time progress has been remarkable, as is shown in Table 2.

The part that aircraft are playing today is shown by the fact that slightly over 25 per cent. of the 1 million tons of superphosphate produced by fertiliser works in New Zealand in 1954–55 was distributed from the air.

The full results of the extension of aeral topdressing over the last five years have yet to be assessed and it may be difficult to arrive at any definite measure of the increased carrying capacity it has brought about. Some examples are, however, available to show the results achieved so far,

TABLE 2

Aerial Topdressing in New Zealand

Year ending 31 March	Weight of fertiliser distributed (tons)	Area treated (acres)
1950	5000	48,700
1951	45,000	428,700
1952	88,900	802,200
1953	144,800	1,376,100
1954	203,100	1,929,500
1955	279,000	2,783,800

and it is clear that substantial progress is being made on some hill areas. One example is of a hill property in the Marlborough Land District. The property covers 1740 acres of which 1560 acres are hill country rising from 600 feet to 3400 feet above sea level. The predominant cover on the hill area was danthonia and browntop and there had been no topdressing. In the 1949–50 season 1500 sheep were shorn, and in that season a start was made in topdressing a hill block of 160 acres with superphosphate from the air. Since then, except for 400 to 500 acres of the highest country, all the hill country has been topdressed and oversown with clover and grass seed from the air. In the 1954–55 season 2050 sheep were shorn and the average fleece weight had risen from 7·9 to 10·3 lb.

For aerial topdressing to be continued on the present scale, a continuation of high prices for meat and wool is probably necessary. On the other hand, aerial topdressing, by raising the productivity of hill country, has put some hill country farmers in a stronger financial position than ever before. It is claimed that much of the hill country which until now has carried only 1 ewe per acre may be able to carry about 3 ewes.

Irrigation

In the semi-arid area of Central Otago and on parts of the Canterbury Plains irrigation may eventually play a considerable part in increasing production. In Canterbury there are about 750,000 acres of land capable of being irrigated and in Otago about another 100,000 acres. At present irrigation water is available for some 10,000 acres in Canterbury, but many farmers have made little or no use of it. In Central Otago, where water is available for about 62,000 acres, it is fully used, but unfortunately in summer the water available is insufficient in some parts for effective irrigation.

The climate of Canterbury differs from that in most overseas countries where there are irrigation schemes in semi-arid areas. With an average rainfall of between 25 and 30 inches that is reasonably well distributed throughout the year, the climate

is not arid, but hot north-west winds prevail during summer, and the soils generally lack moisture-holding capacity, so that the effectiveness of the rainfall is reduced. The farmer bases his system of management on the stock he can carry during summer and does not wish to take the risk of carrying more.

The general re-organisation of farm management that irrigation would bring about would lead to some changes in the average size of holdings. To give the farmer a fair return under dry-land farming, holdings are about twice the size they would need to be if most of them were irrigated. A good deal of subdivision of holdings would follow the introduction of irrigation and consequently the land would support a larger population as well as produce more.

On the land capable of irrigation in Canterbury it has been estimated that with irrigation an additional million ewes could be carried, and in parts of Central Otago, carrying capacity could be increased from an average of 1 to 1½ ewes per acre to about 4. However, despite the present level of farm prosperity, many farmers in areas served by irrigation schemes, particularly in Canterbury, are unwilling to incur the considerable capital expenditure needed before water can be used. Some do not plan to use any water and others are content to irrigate only a small part of their farms. There are several reasons for their unwillingness, one of the most important being the extra labour that irrigation requires. On many farms no outside labour is regularly employed and on few is there more than one man. Extra labour means extra accommodation, which usually means a considerable capital outlay.

Chemical Weed-killers

Since the end of the war the importance of weed-killers in New Zealand agriculture has steadily increased; this is shown by the value of the materials imported for making weed-killing preparations, which increased from £88,000 in 1949 to £611,000 in 1954.

From the national point of view the control of weeds in pasture should eventually have a marked effect on the production of dairy products and meat, particularly from the areas of more intensive farming where "high fertility" weeds have been on the increase. The use of weed-killers also promises to bring into production areas of gorse-infested hill country, much of which has hitherto proved so intractable as to be almost worthless for farming.

Destruction of Rabbits

Rabbits were an early problem in New Zealand, for they became a serious pest in the early 1870s, when pastoralists were already finding that they had to reduce the number of stock they were carrying because of rabbits.

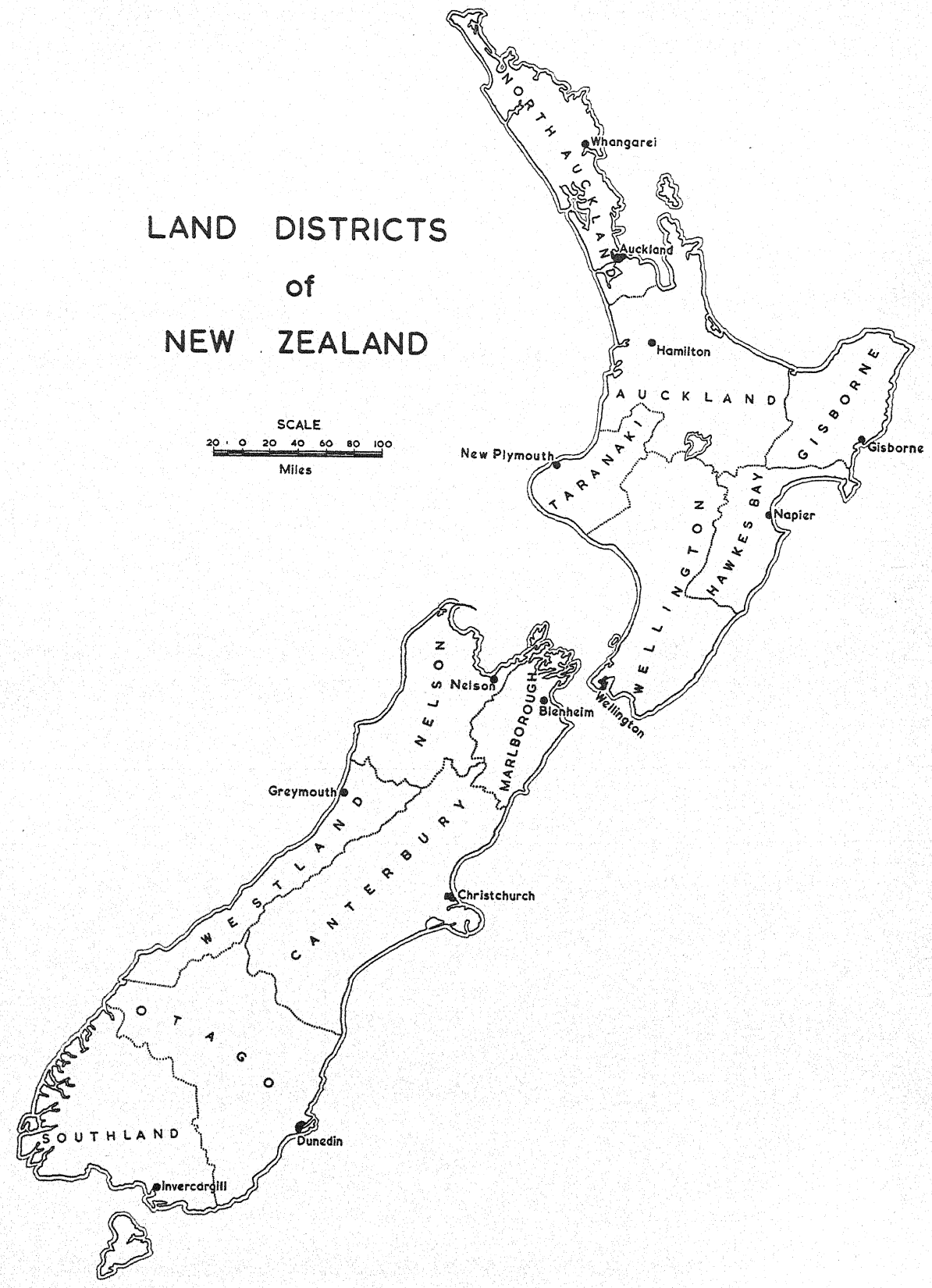
It is only since 1947 that a determined effort has been made to deal with the rabbit problem. In that year legislation was passed under which a Rabbit Destruction Council was set up as an advisory body to the Minister of Agriculture. Up to that time the trapping of rabbits for their skins was often profitable, but because a levy has been imposed on the rabbit skins sold in New Zealand and, recently, the export of rabbit carcases has been prohibited, the "farming" of rabbits is no longer lucrative and the policy now is to destroy by poisoning. The "killer" policy has been most effective. Areas, particularly in Otago, where rabbit infestation was severe, are now much relieved of the pest, and stock-carrying capacity is increasing as a result of the improved pasture. To assist in the work of destroying the rabbit the Government over the past five years has made available nearly £1·5 million to the Rabbit Destruction Council, which in turn makes grants to Rabbit Boards that apply the "killer" policy in the different districts.

Trace Elements

The correction of trace element deficiencies has already had an important economic effect in New Zealand. The discovery in the mid 1930s that cobalt deficiency was responsible for "bush-sickness", a wasting disease of stock widespread on some of the ash-shower soils in the central part of the North Island, enabled a large area of land previously of limited value to be developed for farming. In fact, until that time it was considered that the most suitable use for that land was the growing of *Pinus radiata* trees.

At present it can be claimed that if trace elements are arranged according to their immediate practical significance for agriculture, molybdenum is the most important one in New Zealand. Molybdenum deficiency in New Zealand soils was first demonstrated by Davies in 1945. By 1951 some outstanding field responses to molybdenum had been obtained in parts of Otago and Southland, and subsequent research has shown that some North Auckland soils also respond to treatment. Work is still proceeding in defining areas and conditions in which response to application of molybdenum may be expected, and a start has been made also in defining the soils on which application of molybdenum may give rise to pasture dangerous to stock.

The areas where response to molybdenum is obtained are fairly extensive and an increase in their productive capacity could make a significant contribution towards the expansion of national production.


LAND DISTRICTS
of
NEW ZEALAND
SCALE
20 0 20 40 60 80 100
Miles
NORTH AUCKLAND
Whangarei
Auckland
Hamilton
AUCKLAND
GISBORNE
Gisborne
New Plymouth
TARANAKI
HAWKES BAY
Napier
WELLINGTON
Wellington
NELSON
Nelson
Blenheim
MARLBOROUGH
Greymouth
WESTLAND
CANTERBURY
Christchurch
OTAGO
SOUTHLAND
Dunedin
Invercargill

PRODUCTION POTENTIAL BY DISTRICTS

To see the picture in greater detail it is necessary to consider potential production by districts. For the purpose of the present article, Land Districts have been chosen; these are land registration districts and not areas delineated by any physical characteristic such as climate, topography, or soil. The reason for choosing Land Districts is that agricultural and pastoral statistics can be compiled for those areas, but not for agricultural regions. The map shows the division of the Dominion into Land Districts.

The estimates of increase in livestock numbers for the next 30 years for each Land District were made by field officers of the Extension Division of the Department of Agriculture. To estimate the increases in livestock numbers they assessed the probable increase in carrying capacity of the different land classes within a county, which is a rural administrative area; the land classes usually comprised a group of soil types. Carrying capacity of the land classes was assessed in terms of livestock units, either the dairy cow in milk or the breeding ewe, and other stock was assessed in terms of those standards on the basis of relative feed intake.

Once a complete estimate for each county was compiled, the livestock units were split up into classes of livestock on the basis of the proportion of the classes in each county as shown by the agricultural and pastoral statistics for 1952. Groups of counties were then brought together to give estimates for Land Districts. The estimates are set out in Table 3. Present uses of the land and changes and extensions by which the increases estimated might be achieved are described below.

North Island

North Auckland

North Auckland has the distinction of being the cradle of farming in New Zealand, for it was at the Bay of Islands in 1819 that a beginning was made by missionaries to establish the first farm. In spite of this early start, parts of North Auckland, beyond the city of Auckland, can still be regarded as a pioneer fringe, because in considerable areas virgin land is still being brought into production. A land utilisation survey of the area made six years ago by the Department of Lands and Survey demonstrated this, by showing that of the farmable country nearly 1·3 million acres, about 40 per cent. of the total area of the district, were in an unimproved state.

The topography of the District is varied. In the southern part of the North Auckland peninsula there are low rolling downlands interrupted in

TABLE 3

Estimated Stock Numbers (Thousands) in New Zealand Land Districts in 1955 and 1985

Land District	Total sheep		Dairy cows in milk		Beef breeding cows and heifers		All other cattle	
	1955	1985	1955	1985	1955	1985	1955	1985
North Island								
North Auckland	1423	2010	451·2	635	118·8	128	431	492
Auckland	4200	6000	750	910	197	220	677	780
Gisborne	2182	3223	44·6	155	149·4	180	220·1	323
Hawkes Bay	4800	6720	53·7	68	180·8	207	292·5	360
Taranaki	1150	1350	260	325	42	47	198	222
Wellington	7500	9150	230	290	239·5	284	550·9	628
South Island								
Marlborough	1108	1700	14·7	15	18	30	37·3	45
Nelson	435	970	35	65	13	20	45	120
Westland	91	175	13·5	29	12·3	20	32·7	75
Canterbury	6600	12,950	65	137	55·6	78	142·2	232
Otago	4435	11,000	33·9	48	29·4	34	84·7	117
Southland	4250	15,800	42·7	52	36·2	73	89·1	203
All New Zealand	39,000*	71,048	1995	2729	1092	1321	2800	3597
Percentage increase		82·2		36·8		21·0		28·5

* The figures for total sheep for the several Land Districts were those for 1954, the latest available at the time of writing. For total sheep in New Zealand an estimate has been made of 39,000,000 for 1955.

places by moderately steep hills rising to from 600 to 700 feet above sea level; in the northern half the rolling areas are smaller, and moderately steep or steep hills predominate. Along a great stretch of the western coastline there are large accumulations of sand; loose rolling sand occupies about 60 square miles and rolling consolidated sand about 420 square miles. The climate is moist and warm, very few parts receiving less than 50 inches of rain per annum, but the distribution of the rainfall is not as good as in many other parts of the Dominion. The average fall in December, for instance, is about half that for the winter month of May. November, December, and January are usually months of low rainfall. The mean annual temperature at sea level is about 58° F. and the relative humidity is fairly high, about 80 per cent.

The general farming pattern is dairying on the alluvial soils in scattered valleys and plains, and intensive production of fat lambs together with dairying on the basic volcanic soils, the undulating limestone soils, and the undulating ploughable land. Semi-extensive and semi-intensive pastoral farming are practised on the higher unploughable country.

In the development of farming in the North Auckland District paspalum (*Paspalum dilatatum*), a subtropical grass which thrives particularly well because of the high rainfall and the mild climate, has been important. Under intensive grass farming paspalum has proved the ideal complement to ryegrass and white clover in the pasture sward, since the ryegrass comes away much earlier than the paspalum, which in turn provides most of the summer and autumn feed.

Citrus fruit is grown at Kerikeri on the east coast north of Whangarei, and of the annual New Zealand production of nearly 20,000 bushels of sweet oranges the North Auckland District produces about two-thirds. Grapefruit and lemons also are grown, as well as other subtropical fruits such as tree tomatoes and Chinese gooseberries.

Round Auckland city there is dairying for the whole-milk market and intensive market gardening; the latter is more common on the volcanic soils to the south of the city.

There are three large soil areas from which considerable increases in production are likely to be obtained. First the clay and loam gumlands, which occupy about 1000 square miles, occur in many places in the District and have developed under kauri (*Agathis australis*) forest, but were covered with low scrub and rushes when the first settlers arrived. They are strongly acid and well leached of plant foods, but considerable areas have been developed to support good pastures of ryegrass, white clover and paspalum, and the development is continuing. Production of nearly 200 lb. butterfat per acre or carrying of between 3 and 4 ewes per acre is possible on some of these soils.

In addition to the gumlands there are considerable areas of consolidated sand country to be brought into production and there the State has some plans for development. One of the last of the North Auckland soils to be tackled has been the type known as "ironstone country", a name derived from the formation of ironstone pellets in the basalt volcanic soils. There are about 50,000 to 60,000 acres of it and much of it can be worked by tractors. Development on a large scale began in 1949, when the Department of Lands and Survey grassed down a 500-acre block, which is now successfully carrying dairy stock, store cattle, and sheep. The development work is continuing, and it may be found possible to carry about $2\frac{1}{2}$ ewes and $\frac{1}{6}$ cattle beast per acre on a considerable part of this once "problem" country.

Though no allowance has been made for it in assessing the production potential of North Auckland, much land can be reclaimed from the sea when required. In the tidal harbours a great deal of the land between mean high-water and mean low-water marks could be reclaimed; an estimate puts the area at about 140,000 acres. The cost of reclamation would, of course, be great and in present conditions the work is not likely to be economic.

For some years North Auckland has been developing rapidly and over the past quarter of a century the area occupied for farming has increased from 2·8 to nearly 3·3 million acres.

Auckland

The District can be divided broadly into four topographical sections. The first is the western upland section extending inland from the west coast; it is hilly country with an annual rainfall between 60 and 100 inches. Further inland are the central lowland area of the Waikato, of which Hamilton is the principal town, and the Hauraki Plains. Here the annual rainfall is lower, 45 to 50 inches. To the east and south there is the pumice plateau, which has been built up by successive showers of pumice ash and is at an altitude of about 2000 feet, much of it reasonably flat with isolated volcanic cones rising from that level. The annual rainfall over much of the area is between 40 and 60 inches, but some higher areas have nearly 100 inches. The last section to the north-east, known as the Coromandel Peninsula, is steep country rising to 3000 feet, and much of it is unsuitable for farming.

On the western uplands sheep farming for the production of store sheep and wool is predominant, but much work is being done there to improve the hill pastures, and increasing numbers of fat lambs

and cattle are coming from these areas. The flat and easy rolling lands of the Waikato, the Hauraki Plains, and the narrow coastal plain of the Bay of Plenty on the east, form the chief dairying regions of the Dominion, with about 30 per cent. of New Zealand's two million dairy cows. All-grass farming is typical; the pastures grow for the greater part of the year, and the conversion of surplus early summer pasture into silage or hay provides the necessary supplementary feed in winter.

On the pumice plateau the Dominion's greatest undertaking in land development is in progress. Much of the pumice-covered area was "bush-sick," and until the discovery in the early 1930s that large areas were deficient in cobalt, the land was considered almost useless for farming. Not long before the second world war the Department of Lands and Survey began to develop some of the pumice plateau, but war-time shortages brought the work to a halt. Development work is now on such a scale that about 20,000 acres a year of this scrub-covered land are being sown to pasture, which enables between 60 and 80 new farmers to be settled each year.

The pumice plateau is also the site of the Dominion's largest exotic forests, which form the basis for the new papermaking industry. Here the Kaingaroa State Forest of 260,000 acres is one of the world's largest planted forests.

Gisborne

Except for a small area of plain round the town of Gisborne and some other small areas of flat land along river valleys, Gisborne District is hill country. The climate is mild, and the annual range of temperature is not great. The annual rainfall is about 45 inches on the coastal section, over 60 inches on the higher inland country, and above 100 inches along the mountain chain on the western boundary.

Extensive sheep farming is characteristic, and wool, surplus ewes, and wethers are the main products. It is estimated that the District supplies about 250,000 ewes and 100,000 wethers annually to other Districts of North Island.

On the hill country to the west, which occupies about 30 per cent. of the land area, there has been considerable erosion and reversion to secondary growth. On the farmed portion the carrying capacity is about 3/4 sheep and 1/8 cattle beast per acre. Yet, with the use of the aeroplane for oversowing and topdressing, there is a brighter future for some of the country, and there is likely to be a considerable increase in stock-carrying capacity.

The easier hill country, which includes the coastal hill area, is good sheep country, with a carrying capacity of about 2 sheep and 1/10 cattle beast per acre. Hereford and Polled Angus are the main beef breeds. This country too suffers from erosion and reversion, but during recent years there has been a considerable increase in the amount of fertiliser used, and reversion is likely to be arrested; carrying capacity should improve over much of the area from the present rate of 2 sheep per acre to about 4 sheep per acre.

The small area of flat country round the town of Gisborne, with a rich alluvial soil, is an area of mixed farming, dairying, sheep farming for fat lambs, market gardening, and production of pasture seed, and each year about 3000 acres of maize are threshed, which is 75 per cent. of the Dominion acreage under maize.

The District has a population with one of the highest proportions of Maoris to Europeans in New Zealand; about 45 per cent. of the rural population are Maoris. The Maori Affairs Department is encouraging them to farm their lands, and young Maori farmers are being trained in farming methods. In time, such a development must have a considerable influence on production in the District.

Hawkes Bay

Most of the District consists of hilly and steep country with smaller areas of flat land. From the western boundary the ranges and foothills extend for a considerable distance into the District, and take up about 50 per cent. of its land area of 3,250,000 acres. Running parallel to the ranges and extending from Napier to the southern part of the District is a valley lowland, the northern part of which is the Heretaunga Plain of 85,000 acres, the largest area of flat land in Hawkes Bay. To the east there is the coastal hill country, which is regarded as some of the best of the Dominion's hill sheep country.

Rainfall over most of the hill country is about 40 inches per annum, with higher falls against the western ranges. The northern and central part of the lowland area has one of the lowest rainfalls in the North Island, less than 35 inches per annum.

Sheep dominate the farming. The 2,760,000 acres occupied for farming carry about 4,800,000 sheep and 527,000 head of cattle, of which 54,000 are dairy cows in milk. In addition, there are about 7000 acres of orchards and market gardens, about 7000 acres growing cash crops, and each year between 8000 and 10,000 acres are set aside to produce pasture seed.

The orchards, which occupy 3800 acres, are situated on the Heretaunga Plain, about 12 miles south of Napier. Of the Dominion acreage of stone fruits, 36 per cent. is on the Heretaunga Plain, and 17 per cent. of the apple acreage. The production of apples per acre is the highest in New Zealand. The abundance of sunshine, on the

average 2400 hours per annum, and the low relative humidity contribute to make the region suitable for orchards.

The principal dairying region is in the south, in the valley lowland, where the rainfall is between 45 and 50 inches per annum.

It is to the hill country that the District must look for most of its increases in production. There are about 340,000 acres in the hill country section that are still in scrub, fern and second growth, and with modern equipment much of it could be developed. There are also 330,000 acres still under natural danthonia, much of it in the coastal hill country. In recent years a considerable amount of development work has been done and there are places where carrying capacity has been increased from 1½ to over 3 ewes per acre.

Taranaki

The region of Taranaki surrounding the extinct volcanic cone of Mt. Egmont (8260 feet) produces about 50 per cent. of the Dominion's cheese. Here the rainfall is well distributed and ranges from 50 inches on the coast to 80 inches nearer the mountain.

The northern, eastern, and south-eastern parts of the District form an upland which, though of relatively low altitude, is very rugged, and there are still large areas of bush. The rainfall over most of the upland is between 70 and 100 inches per annum. The first settlers felled the bush, burned it, and sowed grass seed on the ash. Rapid reversion to second growth, aided by the high rainfall, forced many of them to retreat, and it is only during the past decade that a vigorous attempt has again been made to develop some of the country. With bulldozers to construct tracks, heavy tractors to cultivate the easier country, and aircraft to oversow and topdress the steeper parts, it has been possible to reclaim many areas, and the work is continuing. Much of the upland region is capable of carrying sheep and cattle, and it is an area on which Taranaki will have to rely for a considerable part of the increase in production which must come from the District.

The number of dairy cows has increased by about 18 per cent. to 260,000 over the 10 years to 1955; this has been achieved mainly through more intensive farming on the dairying areas settled earlier. On the other hand, the number of sheep increased by nearly 22 per cent., to 1,150,000, during the same period; but the increase is due largely to development of some of the reverted hill country.

Wellington

Wellington is the largest of the North Island Land Districts and is divided into distinct western and eastern regions by a mountain range running in a north-easterly direction from the south coast.

In the western region from about 20 miles north of the city of Wellington there is an area of flat land which extends northwards for about 80 miles, where it emerges into rolling country and then into higher and more broken country. In the eastern region immediately east of the mountain chain is a lowland area, in the south of which is the Wairarapa Plain and, farther to the north, rolling or more hilly country. To the east of the lowland there is a large area of hill country.

Except for an area in the north-west and another in the north-east where the annual rainfall is below 40 inches, most of the farming areas have between 40 and 50 inches per annum; a few parts, particularly near the central mountain range, have over 60 inches.

Naturally, the farming pattern is varied. On the plain along the west coast farming is mostly for dairy produce and fat lambs, except for some market gardens which serve the city of Wellington and Palmerston North. On some of the rolling country immediately north of the plain there is a little cereal cropping in addition to sheep farming for fat lambs, and about 20 per cent. of the North Island wheat acreage is to be found here. On the hill country to the north-west there has been much reversion to fern and manuka, and farms have had to be abandoned, but during the past five years attempts have been made to re-develop some of the reverted country by modern techniques.

In the eastern region, on the plain and lowland area, dairying and fat lamb production are typical, and on the hill country towards the east coast, sheep farming for wool and store sheep. The plains and easy rolling country of the eastern section were the first in the Wellington District to be settled, and surveys of farm management made by the Department of Agriculture show that in many places production per acre is not as high as it could be if better methods of management were adopted. Any great increase of production appears unlikely until many of the farms pass into the hands of younger farmers.

The main area from which the District must look for increasing the number of livestock is the east-coast hill country. The area suffers at times from summer drought, but farmers who have cleared manuka-infested country and established good pastures have increased the carrying capacity from the equivalent of 1½ ewes to 3½ ewes per acre. If prices for meat and wool continue at the present levels, development work is likely to continue. Large areas of country too steep to be cultivated by implements are being oversown with subterranean and white clovers and topdressed with superphosphate from the air.

Another area where production is increasing is along the belt of sand dune country which occupies about 250,000 acres on the west coast. In the

past 25 years considerable progress has been made in developing the sand dune belt by applying phosphates and lime and by growing subterranean and strawberry clover.

South Island

Marlborough

Except for the Wairau Plain and river valley running inland from the coast near Blenheim and some other smaller areas of flat land on the coast and along river valleys, the Marlborough District is hilly and mountainous. Of the 2,400,000 acres occupied for farming, no less than 90 per cent. is too steep to be cultivated by implements. As a result most of the District is devoted to sheep. On the higher hill country the main breeds are Merino, with halfbreds, and Corriedale, and the main source of revenue for the farmers occupying the land is the sale of fine wool. On the lower hill country the sale of surplus sheep provides appreciable supplementary income.

On the flat areas and easy rolling country in and round the Wairau Valley there is mixed farming. Sheep are reared for the production of fat lambs and there is some dairying, cereal cropping (wheat and barley), and production of pasture seed. The Wairau Valley is one of the Dominion's chief pea-producing areas; about 5000 acres are harvested for seed each year. The climate of the area is suitable for cropping; the annual rainfall is about 25 inches, and the summers are hot and dry, so that suitable conditions exist for harvesting.

On the coast about 70 miles south of Blenheim in the Kaikoura district there is a small plain where dairy farming is carried on, the rainfall being over 40 inches per annum. The area can support good pastures of ryegrass and white clover.

The Marlborough District has been settled for just over a century, but for some years there has been little change in stock numbers. Sheep have remained at about 1,100,000 for the past 40 years, but there has been a gradual increase in the number of cattle other than dairy cows in milk, which has been accelerated recently. In 1920 there were 30,000 cattle, by 1950 the number had reached 44,000, and the latest return (1955) sets the total at 55,300.

In future the main stock increases in Marlborough are likely to occur on the hill country as a result of oversowing and topdressing, which will be aided by aircraft.

Nelson

The total land area of the Nelson District is 4,300,000 acres, of which only 1,100,000 acres are occupied for farming, the remainder being high or mountainous country, much of which is over 3000 feet and can never be adapted for farming. Even those figures do not convey the true picture, since, of the land occupied for farming, 350,000 acres are in fern and scrub and 181,000 acres in standing forest. The main area of flat land is the Waimea Plain, which is roughly triangular and lies immediately south of the town of Nelson.

Rainfall varies considerably, according to topography and proximity to mountains lying in the path of rain-bearing winds. Less rain is recorded on the small areas of flat land, particularly where they are near the northern coast-line. Over the north-western part of the District rainfall is about 150 inches per annum, and on parts of the eastern portion about 70 inches. The town of Nelson has an average rainfall of 38 inches.

The main farming areas are the Waimea Plain and valleys running inland from the northern coastal section. Here farming is diversified and includes dairying, fat-lamb raising, fruit growing, tobacco growing and market gardening. The orchard areas occupy about 4000 acres and are situated on the slopes of the Moutere Hills, which fringe the coastline westwards from the town of Nelson for about 20 miles. Apple orchards, which predominate, occupy about 3200 acres.

The whole of New Zealand's tobacco crop is grown on the alluvial soils of river valleys in the northern section of Nelson District; the area yearly devoted to the purpose is usually about 3000 acres.

North and south of Westport on the south-western coastal section and in two other small valley areas in the south there is some dairying.

The main area in which increase in farm production may be hoped for is that known as the Moutere gravels, a vast deposit of gravels, silt, and sand covering about 360,000 acres. It stretches from about 40 miles inland from the town of Nelson to the northern coastline and has an average width of 12 miles. It is hilly and has been regarded as problem country, but during recent years some farmers with heavy crawler tractors and modern equipment have successfully developed several thousand acres into pasture capable of carrying between 3 and 4 ewes per acre. It is estimated that about 150,000 acres of it can be farmed. Also on the gravels, there have been established about 50,000 acres of pine forest, and the production of soft woods is becoming important.

Westland

Westland District is a narrow strip of land that borders the Tasman Sea along the west coast of the South Island and stretches inland for an average distance of 25 miles to the irregular line of the Southern Alps. It is a rugged region of

three levels, steep mountain ranges, terraces, and lower ranges, and a narrow coastal plain. Running north-east from Greymouth is the relatively flat Grey River valley.

Westland is one of the high-rainfall regions of the Dominion ; Greymouth has an average annual fall of 101 inches and precipitation increases inland towards the Alps and southwards, the south coastal section being in the belt with 150 to 200 inches rainfall.

The early development of Westland centred on gold, and for a period during the gold rushes of the 1860s the district held most of the country's population. Coal mining was subsequently developed ; this and the exploitation of the native forest are still the main activities of the District. Now it is realised that coal and forest are wasting assets, and for the last ten years more attention has been given to the possibilities of farming in the region. Recently a land utilisation survey to define the areas which can be converted to farming was begun.

Cattle alone are important, and nowhere else in New Zealand are sheep so unimportant. Dairying is found where the clearings are sufficiently extensive to support a small dairy factory, and elsewhere, especially in remote south Westland, beef cattle are raised. In future, because of the high rainfall, cattle are still likely to play the major part in Westland farming.

Of the 893,000 acres occupied for farming in the District (total area 3,830,000 acres), at least 80 per cent. is unimproved or semi-improved. From the semi-improved land will come the main increases of production in the immediate future. The virgin country is not likely to be broken in and settled for a number of years.

Canterbury

Canterbury falls into four topographical units.

Southern Alps and foothills

The rugged mountain chain of the Southern Alps, with a north-easterly trend, has many peaks of over 8000 feet. Numerous subsidiary ranges, some at right angles to the main divide and others parallel to it, are separated by deep valleys and broad basins. The distance from the main divide to the outer edge of the foothills to the east varies from 30 to 40 miles and of Canterbury's land area of 9,760,000 acres over 75 per cent. is high mountainous and hill country.

Downlands

Along almost the whole length of the foothills there stretches eastwards an area of down country which at either end of the district extends to the sea coast. In the northern downlands, undulating country alternates with steep hills.

Plains

Between the foothills and ranges to the west, the sea to the east, and the lowlands to the north and south, lies the almost level expanse of the Canterbury Plains, which are about 120 miles long and have a maximum width of 40 miles. They are the largest flat area in the Dominion.

Banks Peninsula

Midway between the northern and southern boundaries of the district, Banks Peninsula rises abruptly from the eastern portion of the plains near the city of Christchurch. With one peak over 3000 feet, it is the remnant of a once large mass of volcanic rock formed principally by two volcanoes.

Compared with most other parts of New Zealand, the climate of much of Canterbury is considered dry. The rainfall is between 20 and 30 inches per annum on the plains, and increases westward, the mountainous country receiving over 50 inches.

The high country is the home of the run holders (see footnote, p. 556) who depend for their livelihood on the sale of fine wools from Merino and halfbred flocks. Holdings are large and carrying capacity is computed on the basis of acres per sheep, not sheep per acre. Many of the flocks contain more than 1000 sheep, and there are nearly 400 runs in the area with flocks of over 2500 sheep. In the winter the higher parts are under snow and the sheep are then moved to lower country. It is a part of New Zealand where little work has been done by the grassland scientist to select species suited to the environment, and until such a selection has been made there is not likely to be any noticeable increase in stock numbers. Even with such work, spectacular increases cannot be expected.

On the lower hill country sheep are farmed for wool and store sheep, and from this area come most of the ewes annually required for replacement on the mixed arable farms in the plains.

On the downlands and plains, cropping for cereals, pulses, potatoes, and pasture seeds together with the rearing of fat lambs is the most important type of farming. There are some dairy farms, mainly producing whole milk for the principal urban centres nearby. The Canterbury Plains grow per annum about 75,000 acres of wheat, 55,000 acres of barley, 16,000 acres of peas and 10,000 acres of potatoes ; about 100,000 acres are set aside each year for the production of pasture seed.

On the plains there are about 750,000 acres of soils with low moisture-holding capacity, and although improvements are being effected by the

introduction of subterranean clover and the use of lucerne, their ultimate productive capacity will not be attained until irrigation water becomes available. So far irrigation water is available for 100,000 acres, but irrigation schemes are costly and it is doubtful if any additions will be made for some years. It is evident, however, that consideration will eventually have to be given to the development of irrigation, since the carrying capacity of many of the soils of low moisture-holding capacity could be raised from the present level of between 1½ and 2 ewes per acre to 3 ewes and over.

With the improvements which are taking place on the downlands and foothill areas and also on the drier soils of the plains, future increases in stock numbers are likely to be considerable.

Otago

From high mountains on the fiords on the west coast, Otago stretches eastwards through a region of mountains and lakes to its central region of basins which lie between ranges of hills, the whole central section being almost surrounded by high mountains. From here hills extend to the coast in the east, and to the south they merge into downland. In the north-east coastal section there is a small plain extending inland along a river valley, and there is another plain in the lower Clutha river valley in the south-east. Also immediately south-west of Dunedin there is the Taieri Plain, from which Dunedin obtains much of its vegetables and milk.

Rainfall is high on the mountains on the extreme west, between 100 and 200 inches per annum, but it becomes rapidly less towards the east, and over the greater part of Otago the annual fall is between 20 and 40 inches. The central basins have the lowest rainfall in the Dominion; the annual fall does not reach 20 inches. Topography and climate have been conducive to extensive rather than to intensive farming, and sheep have dominated the farming scene. Of a total area of 8,100,000 acres occupied for farming no less than 6,600,000 acres are unimproved land, of which 5,100,000 acres are in natural tussock, the greatest area of tussock in the Dominion (approximately 45 per cent. of the total). Of the 1,500,000 acres of improved land, 1,300,000 acres are in pasture and the remainder is used for summer and winter fodder crops, some cereal crops, commercial orchards, and market gardens.

From 1930 until recently there was little change in stock numbers; sheep have remained at about 4 million and cattle, with the exclusion of dairy cows in milk, at about 110,000. Over the past four years, however, there has been an upward movement in the numbers of both sheep and cattle, and with the amount of development of private land that is occurring in some parts of the District the same trend should continue.

Along the hill country to the east some farmers have been ploughing up tussock areas and sowing good pastures of ryegrass and white clover. There has been a similar development also on the downlands in the south, where the browntop cover is being replaced by good pasture. The downlands area occupies nearly 240,000 acres and recent estimates made by economists of the Department of Agriculture show that sheep numbers there should increase by 25 per cent. in the next 10 years.

In central Otago, in the low rainfall region, for a number of years rabbits depleted the natural tussock cover and large areas became useless for farming. As a result of the policy of rabbit extermination, there has been a considerable improvement recently in the vegetative cover, which is being reflected in increased carrying capacity that will become still more evident in the future. In the basins of the central Otago region, where water is applied and good pasture species are sown, dramatic results are obtained without the application of lime or fertilisers. Land which without water will not carry 1½ sheep per acre can be converted to pasture capable of supporting 3 or 4. At present there are 15 irrigation schemes in the district serving 62,000 acres, and though there are a number of other areas where irrigation can be developed, it is doubtful if there will be any great extension of irrigation in central Otago for some years, because of the high capital cost of construction. Some of the irrigation schemes serve orchard areas also; there are about 3000 acres of peaches, apricots, and nectarines.

Southland

Of the South Island Land Districts, Southland is the one which during the past 35 years has shown the most vigour. In that time sheep have increased from 1,600,000 to 4,250,000, and in the last four years the average annual increase has been about 150,000. In the same period dairy cows increased from about 56,000 to a peak of 82,000 in the mid-1930s. Today they number about 42,000. The decrease is due to replacement of cows by sheep as drainage was extended and pastures improved.

The western portion, including the greater part of the South Island fiordland, will never be of any significance for farming. The remainder of the District, of which 3,200,000 acres are occupied for farming, consists of plains, downland, and hill country, and the topography of about half is such that it can be cultivated by implements. The main hill areas are in the west and south-east, with other isolated hill areas towards the north that break up the plains.

The south and south-eastern coastal parts have an average annual rainfall of from 45 to 50 inches, but northwards rainfall decreases to about 35 inches per annum. All the plains area is good country for fattening lambs and, with the development that is taking place on some of the eastern downland areas, where tussock country is being converted to good pastures, additional fat-lamb farms are being created.

In west Southland a large area of rolling and flat tussock country with an altitude between 700 and 1200 feet is being developed by the State. The Department of Lands and Survey has begun to break in 40,000 acres, which may represent the start of the development of nearly 200,000 acres of tussock country.

Of all the Land Districts, Southland is the one which is expected to record the greatest increase in sheep numbers during the next 30 years.

The total increases in stock numbers for the Dominion are given in Table 3 (p. 572). It is considered that such increases are possible when recent scientific and technical advances in agriculture have been taken into account and when allowance has been made for differences in the inherent ability of individual farmers.

SOME PROBLEMS

If the estimated increases of production are to be achieved, some problems will have to be overcome and there will also have to be a clear realisation of the farming industry's requirements. Some of the chief problems will now be considered.

Capital

The capital requirements will be considerable. On the better land, production can often be raised without any great increase of capital, but on the more difficult country outlay will be considerable. Where hill country is ploughed or giant-disked, cultivated, and sown to pasture the average cost at present is about £25 per acre. Where land is oversown and topdressed it is about £8 per acre. If scrub must be cleared before cultivation, the costs may be increased by from £3 to £5 per acre. In addition to the cost of establishing pasture, there is the cost of subdivision by fencing, water supplies, additional buildings and extra livestock and equipment.

Much of the capital will be found from farmers' own savings, and already farmers are encouraged by income tax concessions to use surplus earnings for certain classes of development work. Even so, considerable sums will have to come from other sources.

Under the normal policy of the institutions which provide short, medium and long term agricultural credit, the amount of the loan is based on the value of the security offered, and lending institutions usually require an adequate margin of security. It has not been their normal practice to lend money for development work and, in any event, those who want to develop unimproved country often have insufficient security to offer.

A significant step in the provision of finance for developing land was taken in 1950 when the Marginal Lands Act was passed. It introduced for the first time the principle that a government loan should be based on the potential value of a property rather than on its present-day value, and that advice and assistance should be provided for the borrower to enable him to develop the property. The board which was set up to administer the Act and consider applications for loans has placed considerable emphasis on the character of the prospective borrower and, where he has shown that he has the ability to develop his land to become an economic unit but is hindered by lack of capital, the board has usually made the necessary finance available. Unfortunately, the board has at its disposal each year less than £500,000, which means that it can make only a limited contribution to a national programme of land reclamation and development.

If the State is to expand its programme for developing Crown land and Maori-owned land, greater sums will have to be provided for the two Departments concerned, the Department of Lands and Survey and the Maori Affairs Department.

In addition to the farm capital necessary for land improvement and development, capital will be required for the processing and handling industries, for new fertiliser works, and for additional storage and port facilities.

Fertilisers

The provision of ample supplies of fertilisers will be a most important aid to increasing production.

At present about one million tons of phosphates, 35,000 tons of potash, and other fertilisers are used each year, and it has been estimated that by 1975 about two million tons of phosphates will be required. It is therefore obvious that additional fertiliser works will be necessary in areas that at present are at a considerable distance from existing works.

The expansion in the use of artificial fertilisers in recent years can be gauged from the statistics showing the area of grassland topdressed each year. In 1945, 1·6 million acres were topdressed; in 1954, 5·4 million acres.

Farm Machinery and Requisites

To improve soil fertility, establish better pastures, and use the pastures efficiently, mechanisation is a first essential. On ploughable country where pasture must be renewed, and that proviso applies to several million acres, the tractor is required, and on hill country where cultivation or oversowing, topdressing, and liming are initial requirements for improvement, the heavy crawler tractor and the aeroplane are now necessities. To use pastures efficiently, modern equipment for silage- and haymaking is required, including the tractor, forage harvester, buckrake, pick-up baler, and loader.

Some indication of how mechanisation on farms has increased is given by Table 4. It will be necessary for farm machinery to be readily available in the future, which means that farmers must have access to overseas equipment suited to local conditions.

TABLE 4

Machinery on Farms

Kind of machine	Numbers in :		
	1920	1940	1952
Milking machines . .	8,800	29,560	37,560
Internal combustion engines	13,980	23,350	29,050
Electric motors . . .	Not available	56,510	123,440
Shearing machines . .	5,160	10,630	20,810
Tractors	320	11,280	55,620*

* Figure for 1954.

With the increasing output of new types of farm machines, some of which are complex and expensive, the time has arrived when consideration should be given to the establishment of a station for testing many of the new machines in local conditions. Capital may be wasted if the farmer has to try some of the important equipment and then finds it not really suitable for the work for which it was bought.

At present, materials other than machinery are reasonably plentiful, but care will have to be taken that they continue to be available as required. Such foresight is needed particularly with building materials, fencing wire, piping, cement and chemicals. Temporary shortages of some of them can be exasperating to a farmer when he has embarked on a programme of land improvement.

Labour and Housing

As agricultural expansion takes place the demand for labour, both casual and permanent, will grow, but an increasingly large proportion of the labour on farms is likely to be contract and casual labour. It is difficult to foresee where this expanding labour force is likely to come from, because with the present shortage of labour in the Dominion there is little likelihood of attracting labour from the towns. Immigration policy could perhaps be so adapted as to help to meet the demand for farm labour.

In any case, it is desirable to improve the conditions for farm workers, which might help to retain labour on the land. In some of the more closely settled rural areas the scheme could be extended whereby State houses are built and let to farm workers who are obliged to work for a group of farmers. Under such schemes the workers' annual wages are guaranteed by the employer group, who also guarantee the rent to the State. In more isolated areas the application of such a scheme will seldom be possible and farmers there will have to provide accommodation for the additional workers needed.

In some areas, particularly in hill country districts where development work is in progress, the problem of obtaining and housing additional labour because the productive capacity of the farm has reached the limit which the owner can handle may prove a serious hindrance to attaining the possible increases in production. If a farm has reached the stage at which production can still be increased with extra labour but the farmer is unable or unwilling to employ and house the additional labour, then latent farming potential is left untapped.

There is also the need in some instances to raise the standard of existing farm homes, but fortunately New Zealand farmers generally appear to realise the benefits of a well equipped farmhouse. Few farm dwellings are without electricity and many farm kitchens are a source of envy to city housewives. It is a commonplace for them to be equipped with electric cookers, refrigerators and mixing appliances, in fact anything that will make the lot of the farm housewife easier. The telephone is to be found on almost all farms and even on back-country sheep stations there is the radio-telephone, which makes isolation more easily borne. All these amenities help to counteract the lure of the city for the country girl ; they also make for a more efficient and contented farm home, which in turn must have an indirect effect on the general efficiency of the farm.

It is estimated that in the past five years the 91,000 farmers in New Zealand have spent about £1½ million per annum on new farm dwellings and on modernising existing ones.

Scientific Work and Extension Services

For the production increases which have been achieved over the past 30 years New Zealand farmers would give a generous share of the credit

to the Dominion's agricultural scientists and the extension services of the Department of Agriculture, the Agricultural Colleges, and the New Zealand Dairy Board. The demands on these services will increase and research and extension tasks will become more complex. Agricultural scientific teams will have to be strengthened. The calibre of New Zealand's agricultural scientists is high, but may not remain so if the higher rewards offered by other Commonwealth countries, such as Australia, continue to attract some of the leading scientists from New Zealand.

Greater emphasis will have to be placed on agricultural extension services. Within the past five years a demand has arisen for more intensive aid, which is evident from the formation by farmers themselves of associations of about 50 who employ their own extension officer. There are now four such associations in New Zealand, and more will probably be formed soon. There will be a number of difficulties in operation, and the testing time for the farmers' associations will come when prices of farm produce move downwards.

Considerable difficulties are now being experienced in obtaining qualified staff for the extension services, and it is doubtful if a satisfactory State service can continue to be given unless there is a re-organisation of the services and a review of the rewards. Otherwise the prospects of attracting young people from secondary schools to the two Agricultural Colleges of the University of New Zealand to take degrees in agricultural science with the object of becoming extension officers are not good. The professional standing of extension services must be raised so that such a career becomes known as satisfying and rewarding.

Maori Land

There are about 4 million acres of Maori land in the Dominion, and although some of it is unsuitable, the Maoris are farming considerable areas of it. There are still large areas not being used or being poorly used.

Since the early 1930s the Maori Affairs Department has taken over areas where the Maori owners were agreeable and has developed the land, subdivided it, and allotted farm units to suitable Maori farmers, at the same time protecting the rights of the Maori owners. One of the difficulties has been to provide the Maori farmers with a lease on a satisfactory tenure and to protect them in respect of any improvements they may make on the farms. These problems are gradually being solved and, although production per acre is not high on most Maori farms, it is gradually improving and, as better conditions of tenure are devised, output will increase more rapidly.

At present the Maori Affairs Department is bringing into production about 11,000 acres per annum, of which about 75 per cent. is used for dairy farms and the rest for sheep farms.

There are many other problems, but those set out here are the principal ones. In his 1955 Annual Report to Parliament the Director-General of Agriculture summarised the position as follows: "The internal economy of New Zealand should be moulded on the recognition of the importance of primary industry to the national economy; and, so far as is expedient in the over-all economy, resources of labour, capital and goods should be directed to the development and servicing of our asset, the land of New Zealand, and to the production from that asset of purchasing power through the medium of sheep and cattle."

Information on the subjects discussed above will be found in the papers and reports listed below.

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CHEMICAL

APPARATUS

2650

GINSBURG, V. **Simple large volume fraction collector for column chromatography.** *Anal. Chem.*, 1956, **28,** 279–280. [Dept. Plant Biochem., Univ. California, Berkeley.]

2651

HUNTER, I. R., HOUSTON, D. F. and OWENS, H. S. **Chromatographic chamber for simultaneous preparation of many paper chromatograms.** *Anal. Chem.*, 1956, **28,** 283–284. [W. Utilization Res. Branch, U.S. Dept. Agric., Albany 10, Calif.]

2652

THOMPSON, J. F. and MARION, M. V. **Trough for use in descending paper chromatography.** *Anal. Chem.*, 1956, **28,** 288. [U.S. Plant, Soil, Nutrit. Lab., Agric. Res. Serv., Ithaca, N.Y.]

2653

GANGULI, N. C. **Use of large filter paper sheet in circular paper chromatography by descending technique.** *Experientia,* 1956, **12,** 38–39. [Dept. Appl. Chem., Univ. Coll. Sci. Technol., Calcutta.]

2654

POULIK, M. D. and PINTERIC, L. **An electronic computer for the evaluation of results of filter-paper electrophoresis.** *Nature,* 1955, **176,** 1226–1227. [Dept. Hyg. Prevent. Med., Univ. Toronto, Ont.]

See also Abst. 2694.

ANALYTICAL METHODS

General

2655

WIEGAND, O. F. and SCHRANK, A. R. **Concentration of solutes for paper chromatography.** *Anal. Chem.*, 1956, **28,** 259. [Dept. Zool., Univ. Texas, Austin 12.]

Three methods are described. The first consists in preparing a paraffin wax "dike" on the starting line of the chromatogram and applying the solution under investigation repeatedly to the enclosed area, evaporating after each application. In the second, a "wick" is prepared by evaporating the solution inside a suitably shaped "dike": the substance on the wick is then transferred by elution to the paper to be used for chromatography. In the third, a bent micropipette is used.

H. G. Bray.

2656

MICHEEL, F. and ALBERS, P. Chromatographische Analyse mit Cellulose-ester-Papieren (5). [**Chromatographic analyses with cellulose-ester papers (5).**] *Chem. Ber.*, 1956, **89,** 140–146. [Org. Chem. Inst., Univ. Münster.]

The preparation of benzoyl-, palmitoyl-, phthalyl-, diacetyl-D-tartryl-, chloroacetyl-, diethylaminoacetyl- and triethylaminoacetyl-cellulose chromatography papers is described. Examples are given of their application to the separation of *o*- and *m*-cresols, male and female sex hormones, fatty acids, basic amino acids, dinitrophenol derivatives of aliphatic amines, hydroxamic acids and other compounds. A new colour reaction for the detection of fatty acids on paper by means of lead acetate and dithizone is referred to.—H. G. Bray.

2657

RICE, R. V., KAESBERG, P. and STAHMANN, M. A. **Freeze-drying for electron microscopy.** *Arch. Biochem. Biophys.*, 1955, **59,** 332–340. [Dept. Biochem., Univ. Wisconsin, Madison.]

A simplified method is described in detail.

H. G. Bray.

2658

DIAZ CADAVIECO, R. Electroforesis sobre papel de filtro. [**Electrophoresis on filter paper.**] *Acta cientif. venezol.*, 1955, **6,** 86–97. [Esc. Ciencias, Univ. Central.]

A review and commentary.

Carbohydrate Constituents

2659

DUBOIS, M., GILLES, K. A., HAMILTON, J. K., REBERS, P. A. and SMITH, F. **Colorimetric method for determination of sugars and related substances.** *Anal. Chem.*, 1956, **28,** 350–356. [Div. Biochem., Univ. Minnesota, St. Paul.]

The method depends on the colour reaction between phenol and concentrated H_2SO_4 and simple sugars, oligosaccharides, polysaccharides and their derivatives, including methyl esters, which contain a free or potentially free reducing group. The method is applicable to 2 ml. test solution containing from 10 to 70 μg. sugar. A yellow-orange colour is produced at 25° to 30° C. and the absorption is measured at 490 mμ. for

hexoses and 480 mμ. for pentoses and uronic acids. The method can be used with paper chromatography and is applicable to a wide range of material, including urine and blood.—H. G. Bray.

2660

LUDWIG, T. G. and GOLDBERG, H. J. V. **The anthrone method for the determination of carbohydrates in foods and in oral rinsing.** *J. Dent. Res.*, 1956, **35**, 90–94. [Eastman Dent. Dispensary, Rochester, N.Y.]

The anthrone method of Morris (Abst. 14, Vol. 18) was slightly modified. The sample of the solution or suspension of carbohydrate, obtained from some foods by grinding and heating in water at 100° C., was added to the anthrone reagent and heated at 100° C. for 5 to 10 min. and the carbohydrate was then estimated colorimetrically. The accuracy of the method, ± 10 per cent. for foods and oral rinsings, was greater than that given by other standard methods.—A. Hepburn.

2661

BINKLEY, W. W. **Column chromatography of sugars and their derivatives.** *Advances in Carbohydrate Chem.*, 1955, **10**, 55–94. [Dept. Chem., Ohio State Univ., Columbus.]

2662

ALCOCK, M. and CANNELL, J. S. **Temperature effects in the paper partition chromatography of sugars.** *Nature*, 1956, **177**, 327 – 328. [Thomas Kerfoot and Co., Ltd., Vale of Bardsley, Ashton-under-Lyne, Lancs.]

The R_F values of a number of sugars were measured over the temperature range 0° to 50° C. They were most affected by the water content of the developing solvent. If this increased with increasing temperature the R_F values increased, and if it decreased they also decreased.

H. G. Bray.

2663

GIOVANNOZZI-SERMANNI, G. **A new solvent for quantitative paper chromatography of sugars.** *Nature*, 1956, **177**, 586–587. [Lab. Biochem., Ist. Sci. Sper. Tabacchi, Via Nazionale 66, Rome.]

The mixture devised to separate sucrose, fructose and glucose consists of *n*-propanol : benzyl alcohol : water : 85 per cent. formic acid (50 : 72 : 20 : 20); in this solvent mixture the R_F values are sucrose 0·17, glucose 0·26, mannose 0·30, arabinose 0·32, fructose 0·32, xylose 0·33, ribose 0·41.

H. G. Bray.

2664

MOYA, F. and DEWAR, J. **A simple colorimetric method to determine sugar in urine.** *J. Lab. Clin. Med.*, 1956, **47**, 314–319. [Dept. Biochem., Victoria Gen. Hosp., Halifax, N.S.]

Benedict's qualitative reagent is added to urine and, in the filtered solution, the remaining cupric ion is estimated spectrophotometrically at 650 mμ. False positive results obtained in Benedict's qualitative test are discussed. The yellow-orange precipitate formed in such cases was found to contain urate; little or no cupric ion is removed from solution.—H. G. Bray.

2665

BORENSTEIN, B., STIER, E. F. and BALL, C. O. **Determination of galacturonic acid in tomatoes and its changes on storage.** *J. Agric. Food Chem.*, 1955, **3**, 1041–1044. [Dept. Food Technol., New Jersey Agric. Exp. Stat., Rutgers Univ., New Brunswick.]

2666

SCHWIMMER, S., BEVENUE, A. and WESTON, W. J. **Separation of hexose phosphates by paper electrophoresis in borate buffers.** *Arch. Biochem. Biophys.*, 1956, **60**, 279–283. [U.S. Dept. Agric., Agric. Res. Serv., W. Utilization Res. Branch, Albany, Calif.]

The buffer used is 0·2 *M* borate buffer, *p*H 9·5, but variation of molarity and *p*H may be useful for separating certain compounds.

Fructose-1-phosphate has been tentatively identified as a constituent of potatoes.—H. G. Bray.

2667

REISSIG, J. L., STROMINGER, J. L. and LELOIR, L. F. **A modified colorimetric method for the estimation of *N*-acetylamino sugars.** *J. Biol. Chem.*, 1955, **217**, 959–966. [Inst. Invest. Bioquím., Fund. Campomar, Buenos Aires.]

2668

MILLS, J. A. **The stereochemistry of cyclic derivatives of carbohydrates.** *Advances in Carbohydrate Chem.*, 1955, **10**, 1–53. [Div. Biochem., C.S.I.R.O., Adelaide.]

2669

BALMAIN, J. H., BIGGERS, J. D. and CLARINGBOLD, P. J. **Micromethod for the estimation of glycogen in the genital organs of the mouse.** *Austral. J. Biol. Sci.*, 1956, **9**, 139–146. [Dept. Vet. Physiol., Univ. Sydney.]

The method is applicable to as little as 5 μg. glycogen in the presence of tissue hydrolysates. The tissue is digested with 30 per cent. KOH at 100° C. for 30 min., glycogen is precipitated with absolute ethanol, extracted from the precipitate by means of 5 per cent. trichloroacetic acid and estimated by an anthrone method.

H. G. Bray.

2670

CLEGG, K. M. **The application of the anthrone reagent to the estimation of starch in cereals.** *J. Sci. Food Agric.*, 1956, **7**, 40–44. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Sugars are extracted with 80 per cent. ethanol and the solvent is removed before application of the anthrone method. Starch is extracted in perchloric acid. An internal glucose standard is used. Values are given for the starch and sugar content of a number of cereals and similar materials.—H. G. Bray.

2671

MORITA, H. **Characterization of starch and related polysaccharides by differential thermal analysis.** *Anal. Chem.*, 1956, **28**, 64–67. [Chem. Div., Canada Dept. Agric., Ottawa.]

2672

GILLY, M. Recherches sur le dosage de la cellulose. [**Research on the estimation of cellulose.**] *Anal. chim. Acta*, 1956, **14**, 53–56. [Labs. Contrôle Recherches, Maison Sanders, Juvisy.] English and German summaries.

The Weende method for the estimation of cellulose was modified by neutralising each time after the successive attacks of acid and alkali instead of washing. Best results were obtained by filtering on an alundum crucible and ashing for exactly 2 hr. at 700° C. The method is time-saving and gives more reproducible results.—A. Hepburn.

2673

POMA TRECCANI, C. and TENTORIO, G. Metodi di analisi per la determinazione separata dell' amido, di altri polisaccaridi e degli zuccheri solubili nei tessuti legnosi. [**Methods for separate estimation of starch, other polysaccharides and soluble sugars in woody tissues.**] *Ann. Sper. agrar.*, 1955, **9**, No. 6, Suppl., xxvii - xxxiv. [Staz. Sper. Ortofrutticolt., Milan.] English summary.

For estimation of the true starch in woody tissue of apple trees the material was dried at 70° C., milled and sieved to ensure a fine division and then extracted repeatedly with ethanol at 50° C. to extract all the simple sugars. The woody residue was suspended in boiling water and autoclaved at 120° C. for 1½ hr. After cooling at 40° C. some drops of dilute NaOH were added to bring the *p*H to 6. Enzymic hydrolysis followed with 9 ml. *M*/15 KH_2PO_4 and 1 ml. *M*/15 Na_2HPO_4, 2 ml. saturated NaCl solution and 5 ml. diastase solution, for 1 hr. at 40° C. The solution was then autoclaved again for ½ hr. to destroy the enzyme and cooled, and, after fresh addition of enzyme, incubated overnight. Next day it was again autoclaved, cooled and passed through a buchner filter. After a test with iodine to ensure that all starch had disappeared from both residue and filtrate, 50 ml. of the latter was shaken with 2 ml. basic lead acetate to obtain a clear solution in which the maltose could be titrated with $KMnO_4$ by the method of Bertrand. A table of constants is given from which the starch content of the sample can be calculated. Polysaccharides can be estimated in the buchner filtrate and soluble sugars in the ethanolic extract.—D. Duncan.

2674

FABRIS, A. and ALBONICO, F. Ricerche sulla determinazione della lignina nei foraggi. [**Estimation of lignin in forages.**] *Ann. Sper. agrar.*, 1955, **9**, 1131–1165. [Ist. Indust. Agrar. Univ. Naples, Portici.] English summary.

The methods of preparing lignin compared were those of Hägglund ("Hölzchemie", Akademische Verlagsgesellschaft, Leipzig, 1939), Zeisel (*Monatsh.*, 1885, **6**, 989), Noll and Hölder (*Papier-Fabr.*, 1931, **29**, 485) and Metha (*Biochem. J.*, 1925, **19**, 985). It is concluded that the method of Metha gives the purest lignin, but it also gives much less lignin than the method of Hägglund, and much less methoxyl.

Forages with a low lignin content usually had a low methoxyl content also. The physiological reasons for this need study.—D. Duncan.

Nitrogenous Constituents

2675

YOKOI, H. and AKASI, S. **An improved Kjeldahl-Nessler method.** *Nagoya Med. J.*, 1955, **3**, 91–104. [Dept. Biochem., Med. Sch., Nagoya City Univ.]

The sample is digested with a minimum amount of H_2SO_4 with the aid of H_2O_2 and copper selenite. This takes about 30 min. The digest is then neutralised with NaOH, with tropaeolin OO as indicator, and potassium mercuric iodide (Nessler's solution 1) is added. The resulting solution is incubated in a water-bath at 20° or 25° C. along with a similar tube containing *N* NaOH. After the contents of the tubes are mixed by continuous transfer and shaking, the final solution is left in the water-bath for about 15 min. to attain maximum colour development. The ammonia N, in amounts of 5 to 25 μg., is then estimated by spectrophotometer and in amounts of 25 to 130 μg. by an ordinary filter photometer. The percentage error of the method is 1·5 to 2·0 for most substances tried.—A. Hepburn.

2676

FISCHER, F. G. and BOHN, H. Eine Mikrobestimmung des Ammoniaks, insbesondere in Protein-Hydrolysaten. [**Micro-estimation of ammonia**

with special reference to protein hydrolysates.] *Hoppe-Seyler's Ztschr.*, 1955, **302**, 278–282. [Chem. Inst., Univ. Würzburg.] English summary.

This micro-diffusion method is applicable to 0·2 to 10·0 μg. ammonia in 30 to 100 μl. solution. The apparatus consists of a conical flask containing the solution being analysed and a glass cup containing the acid into which the ammonia is to diffuse, attached to a glass rod inserted into the stopper. A tablet of magnesium oxide and sodium chloride is added to the test solution and diffusion is allowed to proceed for 15 to 20 hr. The ammonia which diffuses into the acid is estimated by a ninhydrin method.—H. G. Bray.

2677

VÖGELI, H. Zur chemischen Trennung des Eiweiss- vom Nichteiweiss-stickstoff. [**Chemical separation of protein nitrogen and non-protein nitrogen.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag. Prof. Crasemann, 71–76. [Eidg. Landwirtsch. Versuchsanst., Zürich, Oerlikon.]

A comparison was made between precipitation techniques with copper hydroxide, trichloroacetic acid or tannin and extraction processes using alcohol, trichloroacetic acid or water.

H. G. Bray.

2678

PATON, J. B., ROBERTSON, G. K. and WELLBY, M. L. **Separation of proteins in biological fluids by paper electrophoresis.** *Med. J. Austral.*, 1954, i, 108–113. [Inst. Med. Vet. Sci., Adelaide.]

The separation of albumin and α_1-, α_2-, β- and γ-globulins in 25 μl. serum, on Whatman No. 3 MM paper, with the apparatus of Flynn and de Mayo (Abst. 3027, Vol. 21), veronal buffer *p*H 8·5, ionic strength 0·05 to 0·1, for 20 hr. at 135 volts or 16 hr. at 180 volts, is described. Strips were stained with bromophenol blue in ethanol saturated with mercuric chloride; the protein bands were cut out and eluted with 4 per cent. Na_2CO_3 solution in methanol, and the colour was measured photoelectrically and compared with standard curves. With the same method, alkaline phosphatase activity could be demonstrated in the α_2-globulin, and the concentration of cholesterol in the α_2-, β- and γ-globulin fractions could be measured.

Over 500 specimens of serum were examined and changes in the serum proteins during pregnancy and in some pathological conditions were studied.—M. H. Pierce.

2679

PETERSON, E. A. and SOBER, H. A. **Chromatography of proteins. 1. Cellulose ion-exchange absorbents.**

SOBER, H. A., GUTTER, F. J., WYCKOFF, M. M. and PETERSON, E. A. **2. Fractionation of serum protein on anion-exchange cellulose.** *J. Amer. Chem. Soc.*, 1956, **78**, 751–755; 756–763. [Lab. Biochem., Nat. Cancer Inst., Nat. Insts. Health, Bethesda, Md.]

1. An account is given of the preparation and physico-chemical properties of a series of new adsorbents from cellulose, containing carboxymethyl, diethylaminoethyl and phosphate groups and basic groups derived from triethanolamine bound to cellulose through reaction with epichlorohydrin. The last of these was less useful than the others for protein separation, but was valuable for the chromatography of nucleic acids. The first 3 adsorbents have high adsorptive capacities for proteins and elution can be achieved under mild conditions. Titration curves are given.

2. The use of a cellulose adsorbent containing diethylaminoethyl groups is described; *p*H and salt concentration gradients were used for elution. A loading of 170 mg. protein per g. adsorbent was practicable.—H. G. Bray.

2680

WUNDERLY, C. **Control of the staining procedure after paper electrophoresis.** *Nature*, 1956, **177**, 586. [Med. Clin., Univ. Zürich.]

A spot of polyetheneimine is applied to the paper after electrophoresis but before staining. This polymer is stained by naphthalene black and Sudan black and so can be used as a reference substance for both protein and lipoprotein staining.

H. G. Bray.

2681

MEJBAUM - KATZENELLENBOGEN, W. Turbidymetryczna mikrometoda oznaczania białek tanina. [**Turbidimetric micro-method for estimating protein by means of tannin.**] *Acta biochim. polon.*, 1955, **2**, 279–296. [Zakl. Chemii. Fizjol., Akad. Med., Wrocław.] Russian and English summaries.

For estimation of serum proteins, lysozyme and gelatine, a 10 per cent. solution of tannin in *N* HCl with 2 per cent. phenol was used. The method was turbidimetric, based on photocolorimetric measurements with a red filter. After incubation of the protein solution with the tannin reagent for 10 min. at 30° C., the degree of turbidity was stabilised with a protective colloid. The sensitivity of the tannin test depended on temperature, and its accuracy on the duration of incubation. A concentration of proteins suitable for the method should not exceed from 10 to 100 μg. in 4 ml. of the mixed sample and reagents. Within that range there was a linear relation between protein concentration and optical density. (From summary.)

E. M. Hume.

2682

RIZZO, A. and GUZZETTA, F. Il metodo di Brandberg-Zaloziecki per la determinazione della protidemia totale serica. [**The method of Brandberg - Zaloziecki for estimating total serum proteins.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 381–383. [Ist. Clin. Pediat., Univ. Messina.]

The method of Brandberg-Zaloziecki with fuming HNO_3 was originally devised for measuring total protein in cerebrospinal fluid. Applied to the estimation of total protein in blood serum, it proved simple and precise. For 35 specimens of serum it gave a mean value 0·33 g. per cent. higher than that given by the Kjeldahl method, a difference attributed to the inevitable slight loss in the latter.

E. M. Hume.

2683

FAWCETT, J. K. and WYNN, V. **A comparison of two commonly used "salt fractionation" methods for differential plasma protein estimation.** *J. Clin. Pathol.*, 1956, **9**, 71–74. [Surg. Unit, St. Mary's Hosp., London.]

A comparison was made of the methods of Howe (*J. Biol. Chem.*, 1921, **49**, 93) and Majoor (*Yale J. Biol. Med.*, 1946, **18**, 419) which employ 22 per cent. and 26 per cent. sodium sulphate, respectively. Majoor's method appeared to be slightly better for separation into diagnostic patterns and the results are said to be more closely comparable with those from electrophoretic analysis.

H. G. Bray.

2684

MACKAY, I. R. **Quantitative filter paper electrophoresis of serum : automatic scanning and integration of the dye-stained strip.** *J. Lab. Clin. Med.*, 1956, **47**, 164–168. [Div. Phys., Sloan-Kettering Inst. Cancer Res., New York.]

The reproducibility of results obtained with a commercially available scanner and integrator was studied. The results were comparable with those obtained with a simple photometer and with those from moving boundary analyses.—H. G. Bray.

2685

OWEN, J. A. **Determination of serum-protein fractions by zone electrophoresis on paper and direct reflection photometry.** *Analyst*, 1956, **81**, 26–37. [Dept. Clin. Chem., Univ. Edinburgh.]

2686

GIRI, K. V. **Zone electrophoresis of serum proteins in agar gel.** *Naturwissenschaften*, 1956, **43**, 36. [Dept. Biochem., Indian Inst. Sci., Bangalore.]

2687

NORPOTH, L., SURMANN, T. and CLÖSGES, J. Zur Analyse der Magensaftelektrophorese. [**Critical study of electrophoresis of gastric juice.**] *Gastroenterologia*, 1956, **85**, 10–19. [Med. Abt., Elisabeth Krankenhaus, Essen.] English and French summaries.

The contradictory findings of the authors and of others are briefly recounted. Experiments are described which show that the results of paper electrophoresis of gastric juice vary with the method of precipitating and concentrating the protein, and such results are therefore to be interpreted with great caution.—W. M. Deans.

2688

IYENGAR, N. K., CHAKRAVARTI, M. D. and BISWAS, H. K. **Estimation of protein-proteoses in crude liver extracts for parenteral use.** *Indian Med. Gaz.*, 1955, **90**, 3–4. [Central Drugs Lab., 3 Kyd St., Calcutta 16.]

The extract is diluted tenfold with water, 9 vol. of picric acid are added and the turbidity of the mixture is measured.—H. G. Bray.

2689

MCINTYRE, R. T. and KYMAL, L. **Extraction of rice proteins.** *Cereal Chem.*, 1956, **33**, 38–44. [Dept. Agric. Chem. Biochem., Louisiana Agric. Exp. Stat., Baton Rouge.]

Three extractions, lasting 2, 4 and 9 hr., with a solution containing 4 per cent. Santomerse No. 3, an anion detergent of the alkyl aryl-sulphonate type, 2 per cent. Na_2CO_3 and 0·2 per cent. sodium bisulphite removed the nitrogen from ground rice almost completely. The protein left after extraction with water, NaCl, ethanol and NaOH was mostly dissolved by a detergent solution.

A. Hepburn.

2690

WILLIAMS, K. T. and LONG, M. C. **Van Slyke manometric apparatus modified for determination of free amino nitrogen in solid samples.** *Anal. Chem.*, 1956, **28**, 144. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 10, Calif.]

2691

ZWEIG, G. **Preservation of ninhydrin-amino acid chromatograms.** *Anal. Chem.*, 1956, **28**, 428. [Charles F. Kettering Found., Yellow Springs, Ohio.]

The developed papers are treated with a dilute ethanolic solution of copper nitrate containing HNO_3, neutralised with ammonia vapour, air-dried and sprayed with an acrylic resin.—H. G. Bray.

2692

PFEIL, E. and GOLDBACH, H. J. Quantitative Mikrobestimmung von α-Aminosäuren. [**Quantitative micro-estimation of α-amino acids.**] *Klin. Wochenschr.*, 1956, **34,** 194–195. [Inst. Gerichtl. Soz. Med., Univ. Marburg a.d. Lahn.]

Details are given of solutions and procedure for estimating amino acids on a paper strip chromatogram on which the components are identified with copper sulphate. A scale of values is provided relating the amounts of the amino acids to the copper content of their complex salts.

A. M. Copping.

2693

KALANT, H. **Colorimetric ninhydrin reaction for measurement of alpha-amino nitrogen.** *Anal. Chem.*, 1956, **28,** 265–266. [Dept. Pathol. Chem., Univ. Toronto.]

The method of Cocking and Yemm (Title 72, Vol. 25) was found to be suitable for use with tungstic acid plasma filtrates. Interference by excess ninhydrin or cyanide or by peroxides and metals was studied.

The average arterial plasma α-amino N of fasted normal dogs was found to be 4·91 mg. per 100 ml.

H. G. Bray.

2694

MÜLLER, R. and KRAMPITZ, G. Beiträge zur Aminosäurebestimmung in biologischem Material. 2. Methodisches und Vorversuche zur Chromatographie von Aminosäuren auf Ionenaustauschersäulen. [**Estimation of amino acids in biological material. 2. Technique and preliminary experiments on the chromatography of amino acids on ion-exchange columns.**] *Ztschr. Tierernährung Futtermittelk.*, 1956, **11,** 44–53. [Inst. Anat. Physiol. Haustiere, Univ. Bonn.] English summary.

For part 1 see Title 1416, Vol. 26.

2. The application of the technique of Moore and Stein (Abst. 4469, Vol. 21) is discussed and an automatic fraction collector is described.

H. G. Bray.

2695

GIRI, K. V. **Perchloric acid as reagent for tryptophan, tyrosine and hydroxyproline in paper chromatography.** *Naturwissenschaften*, 1956, **43,** 18. [Dept. Biochem., Indian Inst. Sci., Bangalore.]

To detect tryptophan the chromatogram is run in *n*-butanol : acetic acid : water (4 : 1 : 5), dried and dipped in a mixture of 60 per cent. perchloric acid in absolute ethanol (1 : 5 v/v) and dried at 60° C. for 10 min. Tryptophan gives an intense yellow-green fluorescence in ultraviolet light : no other amino acid gives this reaction. To identify tyrosine and hydroxyproline the dried chromatogram is treated with 2 per cent. ninhydrin in acetone and dried at 60° C. for 10 min. before treatment with perchloric acid as above. Ninhydrin colours disappear or are replaced by pink or violet colours for all amino acids, except tyrosine and hydroxyproline, which give, respectively, yellow and brick-red colours in white light and brick-red and red-brown in ultraviolet light.

H. G. Bray.

2696

BARAUD, J. and GENEVOIS, L. Dosage iodométrique de la tyrosine, du tryptophan et de la méthionine dans les protéines solubles non hydrolysées. [**Iodimetric estimation of tyrosine, tryptophan and methionine in soluble non-hydrolysed proteins.**] *Bull. Soc. chim. France*, 1955, No. 11–12, 1499–1501. [Lab. Chim. Biol., Fac. Sci., Bordeaux.]

The method (Genevois and Baraud, *Chim. anal.*, 1955, 37) permits the estimation of tyrosine, tryptophan and methionine in about 2 hr. at 20° C. and was shown to be applicable to unhydrolysed soluble proteins. The results are comparable with those of other methods.—H. G. Bray.

2697

JANUS, J. W. **Determination of arginine.** *Nature*, 1956, **177,** 529. [Res. Lab., Kodak, Ltd., Wealdstone, Harrow.]

The substitution of oxines for α-naphthol in the Sakaguchi reaction as described by Macpherson (Abst. 3943, Vol. 16) is discussed.—H. G. Bray.

2698

KUK-MEIRI, S. and LICHTENSTEIN, N. **Colorimetric determination of glutamic acid in protein hydrolysates.** *Anal. chim. Acta*, 1956, **14,** 266–268. [Dept. Biol. Colloidal Chem., Hebrew Univ., Jerusalem.] French and German summaries.

Glutamic acid is removed from protein hydrolysates by adsorption on Amberlite IR–4B at *p*H 3 to 4 and elution with *N* HCl. Glutamic acid in the eluates is converted to the lactone of α-hydroxyglutaric acid, which is then converted to a hydroxamic acid by hydroxylamine. This acid is estimated colorimetrically with $FeCl_3$.

H. G. Bray.

2699

ARONSON, J. N. and ELVEHJEM, C. A. **The hydroxyproline content of animal tissues.** *Food Res.*, 1956, **21,** 109–111. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Hydroxyproline was estimated by a modification of the method of Troll and Cannan (Abst. 3854, Vol. 23). Proline and hydroxyproline react with ninhydrin in phosphate buffer to give a red pigment which is extracted with benzene. A comparison of the absorption of this solution, maximum for hydroxyproline 570 mμ., and

maximum for proline 550 mμ., allowed estimation of hydroxyproline.

Muscle from beef, veal, pork and lamb contained approximately 0·9 g. hydroxyproline per 16 g. N.

A. Hepburn.

2700

LISSITZKY, S. and LAURENT, G. Dosage de la leucine, de l'isoleucine, et de la phénylalanine de protéines par chromatographie sur papier. [**Estimation of leucine, *iso*leucine and phenylalanine in proteins by paper chromatography.**] *Bull. Soc. Chim. biol.*, 1955, **37**, 1177–1182. [Fac. Méd. Pharm., Marseilles.]

These amino acids are separated by chromatography of protein hydrolysates on paper, with *tert.*-amyl alcohol saturated with water in an atmosphere of diethylamine as solvent mixture. The spots are revealed by ninhydrin, marked, cut out and eluted as cadmium complexes and analysed by spectrophotometer.—H. G. Bray.

2701

PASIEKA, A. E. and MORGAN, J. F. **The identification of phenylalanine on paper chromatograms.** *Biochim. biophys. Acta*, 1956, **19**, 366–371. [Lab. Hyg., Dept. Nat. Health Welfare, Ottawa.] French and German summaries.

The method depends on the specific reaction of phenylalanine on paper with ninhydrin; spraying after heating with Hanks's modified Tyrode solution gives a deep blue spot.—H. G. Bray.

2702

FRIEDMAN, S., MCFARLANE, J. E., BHATTACHARYYA, P. K. and FRAENKEL, G. **Quantitative separation and identification of quaternary ammonium bases.** *Arch. Biochem. Biophys.*, 1955, **59**, 484–490. [Dept. Entomol., Univ. Illinois, Urbana.]

A resin (Dowex-50) column is used. The bases are eluted with *N* HCl and identified chromatographically, with methyl ethyl ketone : *iso*propanol : 0·1 *N* HCl (30 : 50 : 20) or *iso*propanol : pyridine : water (50 : 25 : 25) as solvent mixture, and detected by spraying with a 1 : 1 mixture of methyl orange and Congo red and then treating the paper successively with ammonia and HCl vapours. The method was applied to *dl*-carnitine and betaine hydrochlorides, creatinine and trimethylamine oxide.—H. G. Bray.

2703

THOMAS, A. J. and SHERRATT, H. S. A. **The isolation of nucleic acid fractions from plant leaves and their purine and pyrimidine composition.** *Biochem. J.*, 1956, **62**, 1–4. [Dept. Agric. Chem., Univ. Coll. N. Wales, Bangor.]

Mixed nucleic acids were extracted from leaves of sugar beet, bracken, clover, ryegrass and kale and from wheat germ. Pentose nucleic acid and deoxypentose nucleic acid fractions were separated by incubation with 0·3 *N* KOH, which made the second fraction precipitable with perchloric acid. The source of sample made little difference to the proportions of the different bases in the fractions. Deoxypentose nucleic acid had similar amounts of adenine and thymine, the most abundant bases, and a relatively high content of 5-methylcytosine.

A. Hepburn.

2704

BENTINCK-SMITH, J., HYDE, J. L. and BARR, L. M. **A simple technique for urea nitrogen : the xanthydrol reaction evaluated.** *Cornell Vet.*, 1956, **46**, 129–143. [Dept. Pathol. Bacteriol., New York State Vet. Coll., Ithaca.]

The method of Caraway (*J. Amer. Med. Assoc.*, 1955, **157**, 719), in which urea was estimated in serum or plasma by reaction with xanthydrol in acetic acid and measurement of the resulting turbidity, was applied to veterinary work. With 0·2 ml. serum or plasma the estimation was semi-quantitative and could be completed in 10 min. The reaction was specific for urea among normal blood components, but was obscured by severe lipaemia.—A. Hepburn.

2705

DUBBS, C. A., DAVIS, F. W. and ADAMS, W. S. **Simple microdetermination of uric acid.** *J. Biol. Chem.*, 1956, **218**, 497–504. [Res. Serv., Veterans Admin. Centre, Los Angeles, Calif.]

See also Absts. 2905, 3165.

Lipoid Constituents

2706

NICOLAJ, P. La determinazione dei grassi totali nelle feci del lattante. [**Estimation of total fats in the faeces of infants.**] *Boll. Soc. ital. Biol. sper.*, 1955, **31**, 591–592. [Clin. Pediat., Univ. Bologna.]

Gerber's milk butyrometer was used to measure fat in the faeces of infants. To 1 g. of faeces in the Gerber apparatus, 6 ml. distilled water was added, and the whole was well shaken; 1 ml. amyl alcohol and 14 ml. H_2SO_4 (density 1·82) were added and the mixture was shaken again and maintained at 37° C. for 12 hr., after which it was placed in a water-bath at from 80° to 90° C. By inversion and gentle agitation the fat was caused to rise into the narrow, graduated part of the apparatus where the amount could be read.

E. M. Hume.

2707

SAGER, O. S., SANDERS, G. P., NORMAN, G. H. and MIDDLETON, M. B. **A detergent test for the milk fat content of dairy products. 1. Milk cream and ice cream.** *J. Assoc. Off. Agric.*

Chem., 1955, **38**, 931–940. [E. Utilisation Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Washington 25, D.C.]

Fat was estimated in samples of milk, cream and ice-cream by an improved form of the BDI detergent method (Sager and Sanders, *Milk Ind. Found. Conv. Proc., Lab. Sec.*, 1952, **4**, 29). A solution containing sodium tetraphosphate, sodium bicarbonate and a detergent, either Triton X — 100 or Tergitol Dispersant NPX, is added to the sample in a Babcock bottle which is heated in boiling water with frequent shaking. After the addition of methanol, centrifuging and heating to 55° to 60° C. the column of fat is measured. Haziness of the fat column was prevented by the inclusion of bicarbonate. Fat values for milk and ice-cream agreed closely with those obtained by the Babcock and Roese Gottlieb methods and for cream were on the average about 0·75 and 1·0 per cent. higher than with those methods. The higher readings were due to a curved bottom meniscus, but if the bottles were treated with silicone the values obtained were the same as from the Babcock method and 0·25 per cent. higher than from the Roese Gottlieb method.—A. Hepburn.

2708

MECHAM, D. K. and MOHAMMAD, A. **Extraction of lipids from wheat products.** *Cereal Chem.*, 1955, **32**, 405–415. [W. Utilisation Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 10, Calif.]

n-Butanol saturated with water was found effective for extracting lipids from ground whole wheat, flour, bran and gluten, though small amounts of non-lipid materials were also extracted. In contrast to other lipid solvents, butanol did not entirely destroy the cohesive properties of wheat proteins, so that glutens could be washed from extracted flours and glutens and wetted to form a "rubbery mass".—G. A. Garton.

2709

HARTMAN, L. **Analysis of technical monoglycerides with potassium periodate.** *Analyst*, 1956, **81**, 67–68. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

The sample is dissolved in a mixture of chloroform, pyridine and acetic acid and oxidised at ordinary temperature with a solution of potassium periodate in sulphuric and acetic acids. KI is added and the iodine liberated is estimated by titration with thiosulphate. Glycerol may be estimated with an aqueous solution of periodate.

H. G. Bray.

2710

FRANZKE, C. Bemerkungen über die jodometrischen Verfahren zur Bestimmung der Peroxydzahl in Nahrungsfetten. [**Iodimetric process for estimating the peroxide number of food fats.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1956, **103**, 108–112. [Inst. Lebensmittelchem., Humboldt Univ., Berlin.]

When the methods of Lea (Abst. 374, Vol. 1), Taüfel and Rothe (*Angew. Chem.*, 1949, **61**, 84), Hadorn and Jungkunz (Abst. 2749, Vol. 24) and Sully (*Analyst*, 1954, **79**, 86) were compared, those of Taüfel and Rothe and of Sully were found to be the most satisfactory. Modifications of these methods are described.—H. G. Bray.

2711

HENICK, A. S., BENCA, M. F. and MITCHELL, J. H. (Jr.). **Estimating carbonyl compounds in rancid fats and foods.** *J. Amer. Oil Chem. Soc.*, 1954, **31**, 88–91. [Quartermaster Food and Container Inst. Armed Forces, Chicago, Ill.]

The method depends on the formation of 2 : 4-dinitrophenylhydrazones of the carbonyl compounds in the presence of trichloroacetic acid as catalyst, and their colorimetric estimation in alkaline solution. The method is used to follow the artificially induced oxidation of maize oil, soya bean oil and lard.—G. A. Garton.

2712

GIBBLE, W. P., KURTZ, E. B. (Jr.) and KELLEY, A. E. **A semi-micro procedure for the separation and degradation of long-chain fatty acids.** *J. Amer. Oil Chem. Soc.*, 1956, **33**, 66–68. [Dept. Botany, Coll. Agric., Univ. Arizona, Tucson.]

The separation of radio-active fatty acids obtained from a culture of flax fruits *in vitro* in a solution containing acetate labelled with ^{14}C is described. The seeds are dried and extracted with light petroleum, the extract is saponified and the crude fatty acids are fractionated at low temperature. Unsaturated fatty acids are hydrogenated and saturated fatty acids degraded, the carboxyl group being removed and isolated as the carboxyl group of benzoic acid, which is separated by sublimation. The reaction proceeds by way of an alkyl phenyl ketone. The fatty acid containing one carbon atom less than the original is isolated and subjected to the same treatment, and so on until no more fatty acid can be recovered. Yields of from 70 to 75 per cent. fatty acid and benzoic acid can be obtained, so that at least 1 g. fatty acid is needed if 3 carbon atoms are to be degraded.—H. G. Bray.

2713

CORCORAN, G. B. **Chromatographic separation and determination of straight-chain saturated monocarboxylic acids C_1 through C_{10} and dicarboxylic acids C_{11} through C_{16}.** *Anal. Chem.*, 1956,

28, 168–171. [Res. Div., Armour and Co., Chicago 9, Ill.]

The stationary phase is 2 *M* aqueous glycine on silicic acid adjusted to the required *p*H with HCl or NaOH. The mobile phase used in gradient elution is *n*-butanol : chloroform. Three columns, *p*H 2, 8·4 and 10, are used for the separation of monocarboxylic acids from C_1 to C_{10} and two columns, *p*H 8·5 and 9, for dicarboxylic acids from C_{11} to C_{16}.—H. G. Bray.

2714

DESNUELLE, P. and BURNET, M. Comportement chromatographique des acides gras contenant une function oxygénée supplementaire dans leur chaîne. [**Chromatographic behaviour of fatty acids with an oxygen-containing group in their chain.**] *Bull. Soc. chim. France*, 1956, No. 2, 268–274. [Lab. Nat. Matières Grasses, Fac. Sci., Marseilles.]

Chromatography on silicic acid and silica gel and counter-current distribution are considered, but the method recommended is reversed-phase chromatography on rubber powder with light petroleum, b.p. 100° to 130° C., as stationary phase and 30 to 50 per cent. aqueous acetone as mobile phase. After elution the acids are estimated titrimetrically or gravimetrically. The acids studied were ricinoleic, lauric, myristic, palmitic, 12-hydroxy- and 12-keto-stearic and *trans*-9 : 10-dihydroxystearic acids.—H. G. Bray.

2715

DIETRICH, F. Zur Differenzierung der Lipoproteide des Serums mittels präparativer Elektrophoresemethoden. [**Differentiation of lipoproteins of serum by preparative electrophoresis.**] *Hoppe-Seyler's Ztschr.*, 1955, **302,** 227–235. [Med. Klin., Univ. Marburg a.d. Lahn.] English summary.

A column of alumina is used, with mixtures of light petroleum, b.p. 60° to 80° C., and ether as eluting solvents. Esterified and free cholesterol are estimated colorimetrically by means of Tschugaeff's reaction (acetyl chloride and zinc chloride) which was found to be more suitable than the Liebermann Burchard reaction.—H. G. Bray.

2716

DIECKERT, J. W. and REISER, R. **A paper chromatographic procedure for separating 1-mono-, 1, 3-di-, and triglycerides, cholesterol, and cholesteryl esters.** *J. Amer. Oil Chem. Soc.*, 1956, **33,** 123–126. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., College Station.]

Lipids were applied singly or as mixtures to glass-fibre filter paper impregnated with silicic acid and the chromatogram was developed with 1, 2 or 3 per cent. ether in *iso*-octane as solvent. The position of lipids on the paper was located with a spray of 50 per cent. (v/v) aqueous H_2SO_4 ; the sprayed paper was warmed gently to reveal cholesterol-containing lipids as pink spots ; stronger heating revealed glycerides and sterols as brown-black spots.

In all the solvent systems the order of lipids on the chromatogram, from origin to solvent front, was : 1-monoglycerides, 1 : 3-diglycerides, cholesterol, triglycerides and cholesteryl esters. The R_F values of the glycerides were about the same whether the component fatty acids were saturated or unsaturated. Fatty acid chain-length did not affect the R_F value of the cholesteryl esters.

G. A. Garton.

2717

SCHÖN, H. and GEY, F. Zur elutionschromatographischen Trennung des freien und veresterten Cholesterins in Organ- und Serumfetten und direkten kolorimetrischen Bestimmung. [**Chromatographic separation of free and esterified cholesterol in organ and serum fats and direct colorimetric estimation.**] *Hoppe-Seyler's Ztschr.*, 1956, **303,** 81–90. [Med. Forschungsanst., Max Planck Gesellsch., Göttingen.] English summary.

A modification of the method of Kunkel and Slater (*Proc. Soc. Exp. Biol. Med.*, 1952, **80,** 42 ; *J. Clin. Invest.*, 1952, **31,** 677), in which a starch medium is used. The procedure is applicable to 4 ml. serum. It is possible to estimate cholesterol, phospholipins and esterified fatty acids in the same extract.—H. G. Bray.

2718

RIKIMARU, M., TANAKA, Y. and HOSHINO, M. **Paper chromatography of phospholipids.** *Fukushima J. Med. Sci.*, 1955, **2,** 131–133. [Dept. Hyg., Fukushima Med. Coll.]

The separation of phospholipins by paper chromatography was investigated, with several solvent systems, *n*-butanol : dioxan (4 : 1), *n*-butanol : pyridine : water (5 : 3 : 1), *n*-butanol : acetic acid : water (4 : 1 : 2), *n*-butanol : glycerine : water (4 : 1 : 1), chloroform : ethanol : water (800 : 200 : 25), phenol : water (7 : 3), methanol, butyl acetate and acetone. The phospholipins included rice lysolecithin, egg yolk lecithin, lecithin and cephalin from human brain, commercial lecithin and the phospholipins of human placenta. The best separations were obtained with *n*-butanol : glycerine : water. Egg yolk lecithin gave 2 spots of R_F values 0·95 and 0·54 ; both reacted with phosphomolybdate but only the second with ninhydrin. Placenta phospholipins gave 4 spots of R_F values 0·91, 0·52, 0·43 and 0·37, all of which reacted with phosphomolybdate.—G. A. Garton.

2719

MARINETTI, G. V. and STOTZ, E. **Paper chromatographic separation of phospholipids.** *J. Amer. Chem. Soc.*, 1955, **77**, 6668–6670. [Dept. Biochem., Univ. Rochester, N.Y.]

The firm binding of phospholipins to paper is considered to be due to the positive charge on the nitrogen atom. This can be removed by acylation. With this technique complete chromatographic separation of phosphatidylcholines from phosphatidylethanolamines is possible in samples of 300 to 400 μg. Solvent mixtures used in ascending paper chromatography are lutidine : methanol (3 : 2), methanol : lutidine : acetic acid (4 : 16 : 1), and 2-octanol : lutidine : acetic acid (90 : 5 : 5). Phospholipins are detected by the formation of fluorescent compounds with Rhodamine B or G.

H. G. Bray.

2720

BALIGA, B. S. and BASU, K. P. **Phospholipids in milk. 1. A method for the estimation of lecithin, cephalin and sphingomyelin in milk.** *Indian J. Dairy Sci.*, 1955, **8**, 119–128. [Indian Dairy Res. Inst., Bangalore.]

Lipids are extracted from 25 ml. milk with a 3 : 1 mixture of ethanol and ether and the solvents are removed under reduced pressure in an atmosphere of CO_2. The lipids, in solution in light petroleum, are then chromatographed on MgO (Abst. 2903, Vol. 14) in order to separate cephalins from choline-containing phospholipins. Lecithin P is then estimated after selective hydrolysis with mild alkali (Schmidt *et al.*, *J. Biol. Chem.*, 1946, **166**, 505), which does not affect sphingomyelin.

Thus total phospholipin P minus choline-containing phospholipin P gives cephalin P and the difference between choline-containing phospholipin P and lecithin P gives sphingomyelin P. The factors used to convert P content to phospholipin are: lecithin, 25·99; cephalin, 24·00; sphingomyelin, 26·83.—G. A. Garton.

2721

RADIN, N. S., LAVIN, F. B. and BROWN, J. R. **Determination of cerebrosides.** *J. Biol. Chem.*, 1955, **217**, 789–796. [Radioisotope Unit, Veterans Admin. Res. Hosp., Chicago, Ill.]

2722

COLEMAN, D. L., WELLS, W. W. and BAUMANN, C. A. **Intestinal sterols. 2. Determination of coprostanol and certain related sterols.** *Arch. Biochem. Biophys.*, 1956, **60**, 412–418. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

For part 1 see Abst. 763, Vol. 26.

2. The mixed sterols are separated into 2 groups, (1) cholesterol, Δ^7-cholestenol, 7-dehydrocholesterol and cholestanol, (2) coprostanol and an unidentified sterol ("sterol D"), by chromatography on a silicic acid and celite column and the individual sterols are estimated by differential colorimetric analysis. Cholesterol, Δ^7-cholestenol and 7-dehydrocholesterol give colour maxima at different times with the modified Liebermann Burchard reagent. 7-Dehydrocholesterol gives an absorption maximum at 281·5 mμ. Cholestanol gives no colour and is estimated by difference, by a gravimetric digitonin method in conjunction with colorimetric analysis. The unknown component gives a red-purple colour with the reagent, which changes to blue in 3 min., and coprostanol a green colour which reaches maximum intensity in 80 min.

The average daily excretion, by adult male rats on a fat-free diet, of cholesterol, Δ^7-cholestenol, 7-dehydrocholesterol, cholestanol, "sterol D" and coprostanol was found to be 356, 538, 8·8, 164, 358 and 3210 μg., respectively.—H. G. Bray.

2723

HUMMEL, O. Zur Ergosterinbestimmung in Hefen. [**Estimation of ergosterol in yeasts.**] *Ztschr. Lebensmittel - Untersuch. Forsch.*, 1956, **103**, 190–198. [Zellstoff-fabrik Waldhof, Werk Mannheim.]

Colorimetric and gravimetric methods are discussed critically. An ultraviolet absorption method is recommended, the sterols being first precipitated as their digitonin complexes. The conditions necessary for rupturing the yeast cells vary with the strain of yeast and are discussed.—H. G. Bray.

See also Abst. 3173.

Other Organic Constituents

2724

DITTMANN, G. and CREMER, H. D. Chondroitinschwefelsäure in Knorpel, Knochen und Zähnen. [**Chondroitin sulphate in cartilage, bone and teeth.**] *Biochem. Ztschr.*, 1956, **327**, 368–376. [Physiol. Chem. Inst., Johannes Gutenberg Univ., Mainz.]

A micro-method was devised for estimating chondroitin sulphate directly, instead of indirectly by way of hexosamine, by spotting the solution containing it on filter paper and developing with toluidine blue; the colour was measured by photometer and planimeter or, with greater accuracy, 1 per cent. for from 200 to 600 μg. in 0·03 ml., by colorimeter after elution of the spots. A similar method with gentian violet gave an accuracy of 3 per cent. for from 20 to 100 μg. in 0·03 ml. Agreement with the results calculated from estimation of hexosamine by a modification of the method of Einbinder and Schubert (*J. Biol. Chem.*, 1950, **185**, 725) was good for cartilage, which contained from 35 to 36 per cent. chondroitin sulphate, but not for bones and teeth, and

attempts to extract chondroitin sulphate more thoroughly from these failed. Methods for estimating inorganic and total sulphur were investigated also.—W. M. Deans.

2725

EGOROV, I. A. and BORISOVA, N. B. Razdelenie i kolichestvennoe opredelenie ketokislot v vine metodom raspredeletel'noi khromatografii na bumage. [**Separation and estimation of keto acids in wine by paper partition chromatography.**] *Dokl. Akad. Nauk SSSR*, 1955, **104**, 433–435. [Inst. Biokhim. A.N. Bakha, Akad. Nauk SSSR.]

The application of paper chromatography to wine is described. A typical chromatogram is given illustrating 2 forms of pyruvic acid, and ketoglutaric acid, which were identified by their absorption spectra. The amounts of these acids in different wines are tabulated.—D. W. Taylor.

2726

GROTT, J. V. Méthode de dosage de l'acide oxalique dans le plasma, le sérum et les globules rouges du sang. [**Estimation of oxalic acid in blood plasma, serum and red cells.**] *Acta gastro-enterol. belg.*, 1955, **18**, 772–778. [Acad. Méd., Łodz.] Flemish, English, German and Spanish summaries.

The sample is haemolysed if necessary and deproteinised with trichloroacetic acid and the oxalate is precipited as the calcium salt, which is separated by filtration. The precipitate is dissolved in HCl and the solution is treated with H_2SO_4, manganous sulphate and permanganate; the excess of the last is estimated iodimetrically.

H. G. Bray.

See also Absts. 2709, 2873.

Inorganic Constituents

2727

SMEETS, W. T. G. M. **The determination of the concentration of calcium ions in milk ultrafiltrate.** *Nederlands Melk Zuiveltijdschr.*, 1955, **9**, 249–260. [Lab. Vet. Biochem., State Univ., Utrecht.] Dutch summary.

Four methods were investigated, namely, a method depending on the spreading of a unimolecular layer of stearic acid, a conductimetric titration method, a picrolonate method and a murexide method. The last of these was found to be most satisfactory. It consists in measuring the extinctions at 480 mμ. of the ultrafiltrate and standard solutions to which murexide has been added.

The average ionic Ca content of 40 milk ultrafiltrates was found to be 11 $\pm$ 1·6 and the total Ca 34·7 $\pm$ 4·9 mg. per cent. It is calculated that 35 per cent. of the Ca in the ultrafiltrate is ionic, 55 per cent. bound to citrate and 10 per cent. to phosphate. It is suggested that the "Utrecht abnormality" of milk, *i.e.*, a decreased stability of protein-bound Ca, so that the milk flocculates on boiling or even at ordinary temperature, may be due to an increased content of Ca ions, since it was shown that milk to which Ca ions have been added becomes unstable when the concentration exceeds 16 mg. per cent.—H. G. Bray.

2728

SMITH, A. M. and MCCALLUM, E. S. R. **The determination of calcium and magnesium in plant material with disodium ethylenediaminetetraacetate.** *Analyst*, 1956, **81**, 160–163. [Edinburgh and East of Scotland Coll. Agric., Edinburgh 8.]

The sample, 10 g., is dry-ashed and Fe, Mn and phosphate, which interfere with the estimation, are removed by precipitation. Ca and Mg are estimated together by titration with ethylenediamine tetra-acetate with Solochrome black as indicator, and Ca alone with murexide as indicator. Excess ammonium chloride affects the end-point with murexide and is removed by boiling the alkaline solution before titration.—H. G. Bray.

2729

HEMINGWAY, R. G. **The determination of calcium in plant material by flame photometry.** *Analyst*, 1956, **81**, 164–168. [Dept. Agric. Chem., Univ. Glasgow.]

Phosphates interfere with the method, which uses the EEL flame photometer, and are removed from a solution of the ash by the cation-exchange resin Amberlite IR–120 (H). Al, Fe, Mn, Mg and K in the concentrations found in plant material do not interfere. If Na is present in concentration equivalent to that of Ca its interference can be corrected for. The accuracy of the method is $\pm$ 2·2 per cent. and the results agree well with those of an oxalate method.—H. G. Bray.

2730

BÖHLER, K. Erfahrungen mit einer neuen Methode zur Bestimmung des Calciums im Serum. [**A new method for estimating serum calcium.**] *Schweiz. med. Wochenschr.*, 1956, **86**, 68–69. [Lab. Med. Abt., Stadtspital Waid, Zürich.]

Direct titration of calcium with Komplexon III, the disodium salt of ethylenediamine tetra-acetic acid, is described. The method, which depends on the formation of chelated compounds, was simpler, quicker and more accurate than titrating Ca as oxalate with permanganate.

Distribution of serum Ca values in 120 subjects showed a normal pattern with 95 per cent. of all values falling between 8·7 and 10·7 mg. per cent.

A. M. Copping.

2731

CARLSTRÖM, G. **Studies on parturient paresis in dairy cows. 2. Determination of calcium ions in bovine serum.** *Acta Agric. scand.*, 1955, **5**, 357–374. [Res. Stat. Vet. Inst., Skara, Sweden.]

For part 1, see Abst 5981, Vol. 25.

2. Serum is treated with an aqueous solution of murexide and the wavelength corresponding to maximum extinction and the *p*H are measured. The Ca content is found from a nomogram.

H. G. Bray.

2732

RAMSAY, J. A., BROWN, R. H. J. and CROGHAN, P. C. **Electrometric titration of chloride in small volumes.** *J. Exp. Biol.*, 1955, **32**, 822–829. [Zool. Lab., Univ. Cambridge.]

Two methods applicable to biological fluids are described. The first is a titrimetric method with which 1 μg. chloride can be estimated in volumes down to 0·2 μl. In the second method silver ions are produced by passing a current through a silver electrode in series with a condenser on which a charge develops, which is a measure of the chloride titrated. This method is applicable to as little as 10^{-4} μg. chloride in volumes as small as $0{\cdot}5 \times 10^{-3}$ μl. The apparatus used is described in detail.

H. G. Bray.

2733

CASTER, W. O., MACDONALD, R. and ARMSTRONG, W. D. **Methods for the determination of muscle chloride.** *J. Lab. Clin. Med.*, 1955, **46**, 910–913. [Dept. Physiol. Chem., Univ. Minnesota, Minneapolis.]

2734

KEENAN, R. G. and KOPP, J. F. **Spectrochemical determination of trace quantities of cobalt in animal tissues.** *Anal. Chem.*, 1956, **28**, 185–189. [Occupat. Health Field Headquarters, Pub. Health Serv., U.S. Dept. Health, Cincinnati, Ohio.]

Two spectrochemical methods were developed. The first is applicable to the soft tissues of animals containing at least 0·025 μg. Co per g. fresh tissue more than the normal amount. The material is ashed and Co is estimated directly. The second method is suitable for the estimation of Co in bone and in the tissues of normal animals. The tissue is ashed and Co is separated as its 1-nitroso-2-naphthol derivative; this in turn is ashed and the Co in the residue is estimated spectrographically.

H. G. Bray.

2735

KOCH, H. J. (Jr.) and SMITH, E. R. **The determination of copper and zinc in normal and pathologic human thyroid tissue.** *J. Clin. Endocrinol.*, 1956, **16**, 123–129. [Dept. Clin. Invest., Sloan-Kettering Inst., New York.]

Cu and Zn were estimated in tissue ash by a dithizone method and by arc spectrography: Zn was also estimated by neutron activation and separation on a column of Dowex-50 resin.

Values are given for the Zn and Cu content of human thyroid and other tissues.—H. G. Bray.

2736

THOMPSON, H. L., KLUGERMAN, M. R. and TRUEMPER, J. **A method for protein-bound iodine: the kinetics and the use of controls in the ashing technique.** *J. Lab. Clin. Med.*, 1956, **47**, 149–163. [Second Army Area Med. Lab., Fort George G. Meade, Md.]

The colorimetric method of estimation adopted depends on the catalytic action of I on the ceric-arsenite system, and the effective precautions taken to ensure accuracy are described.

B. W. Simpson.

2737

FIELDS, T., KINNORY, D. S., KAPLAN, E., OESTER, Y. T. and BOWSER, E. N. **The determination of protein-bound iodine^{131} with anion exchange resin column.** *J. Lab. Clin. Med.*, 1956, **47**, 333–336. [Radioisotope Unit, Veterans Admin. Hosp., Hines, Ill.]

Close agreement was found when protein-bound iodine was estimated by precipitation with trichloroacetic acid and by separation on the anion-exchange resin Amberlite IRA 400.—H. G. Bray.

2738

SANSHUK, D. and ACONSKY, L. **Correction of erratic reagent blanks in determination of serum protein-bound iodine.** *J. Lab. Clin. Med.*, 1955, **46**, 902–904. [Dept. Biochem., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington 12, D.C.]

Errors due to the use of chloride in the procedure are discussed.—H. G. Bray.

2739

NICHOLAS, D. J. D., LLOYD-JONES, C. P. and FISHER, D. J. **Some problems associated with determining iron in plants.** *Nature*, 1956, **177**, 336–337. [Univ. Bristol Res. Stat., Long Ashton.]

The effect of washing tomato leaves with detergent and distilled water was studied. It was concluded that the only Fe removed is that from the external surface. The formation of soluble Fe complexes, if this occurs, during acid digestion before analysis does not interfere with the estimation of Fe.—H. G. Bray.

2740

MATSUBARA, T. **A new method of serum iron determination and commentary on various methods of determination.** *Kumamoto Med.*

J., 1955, **8**, 81–92. [2. Dept. Int. Med., Coll. Med., Kumamoto Univ.]

Acidified serum is incubated at 37° C. overnight and deproteinised with trichloroacetic acid. The precipitate is separated by centrifuging; the supernatant fluid is neutralised, treated with *o*-phenanthroline or $\alpha\alpha'$-dipyridyl and then with hydroxylamine and incubated overnight before the optical density is measured. The results with this method are comparable with those of other procedures.—H. G. Bray.

2741

GREENBLAU, N. and VAN DER WESTHUYZEN, J. P. **An improved preliminary treatment for the routine estimation of lead in wines and related products.** *J. Sci. Food Agric.*, 1956, **7**, 186–189. [Govt. Chem. Labs., Cape Town.]

2742

SIEDLECKA, J., SŁUŻEWSKA, L., KALINOWSKA, R., GILEWSKA, C., MAZUR, H. and PIEKACZ, H. Zawartość ołowiu, cyny miedzi i cynku w konserwach mięsnych i rybnych. [**Estimation of the content of lead, tin, copper and zinc in meat and fish conserves.**] *Rocz. Państwowego Zakl. Hig.*, 1955, **6**, 277–288. Russian and English summaries.

2743

MANN, C. K. and YOE, J. H. **Spectrophotometric determination of magnesium with sodium 1-azo-2-hydroxy-3-(2, 4-dimethylcarboxanilido)-naphthalene-1′-(2-hydroxybenzene - 5 - sulfonate).** *Anal. Chem.*, 1956, **28**, 202–205. [Pratt Trace Analysis Lab., Dept. Chem., Univ. Virginia, Charlottesville.]

The test solution, made just acid to phenolphthalein and containing from 0·5 to 10 μg. Mg in up to 5 ml., is mixed with a solution of the reagent in 95 per cent. ethanol and 0·5 ml. of 0·08 *M* borax and diluted to 25 ml. with 95 per cent. ethanol. The absorption at 510 mμ. is measured after 30 min. Interference by other ions was studied.—H. G. Bray.

2744

SASSI, L. Sur le dosage du magnésium dans une eau potable. [**Estimation of magnesium in drinking water.**] *Arch. Inst. Pasteur Tunis*, 1955, **32**, 287–306. [Inst. Pasteur, Tunis.]

The difficulties of estimating Mg in drinking water when other ions are present which cause interference are discussed. Methods for eliminating these ions and precipitating Mg as the double iodide of Mg and hexamethylenetetramine are described.—E. M. Hume.

2745

STRZEMIEŃSKI, K. (with WILLIAMS, R. M.) **Total and radioactive phosphorus determination in small plant samples using the gravimetric method of Lorenz.** *N.Z. J. Sci. Technol.* [*B*], 1955, **37**, 243–257. [Soil Bur., D.S.I.R., Wellington.]

The gravimetric method used consists in the precipitation of ammonium phosphomolybdate in the presence of a large excess of reagents: this reduces interference by other constituents of soil, fertiliser and plants. The precipitate is washed with acetone, dried and weighed. Radio-activity is measured after conversion of phosphomolybdate to magnesium ammonium phosphate. In an appendix a method is given for the estimation of the technical error arising from experimental procedures as distinct from that due to random fluctuations in radio-activity.—H. G. Bray.

2746

RICKEY, G. F. and AVENS, A. W. **Photometric determination of total phosphorus in feeding stuffs and fertilizers.** *J. Assoc. Off. Agric. Chem.*, 1955, **38**, 898–903. [New York Agric. Exp. Stat., Cornell Univ., Geneva.]

Samples of feedingstuffs and fertilisers were digested with HNO_3 and perchloric acid, and total P was estimated spectrophotometrically after reaction with a vanadomolybdate mixed colour reagent. The method was accurate enough for routine analyses and took much less time than the A.O.A.C. method.—A. Hepburn.

2747

TANAKA, M. and KANAMORI, S. Une méthode de dosage colorimétrique du phosphore dans les matières organiques. [**A method for the colorimetric estimation of phosphorus in organic materials.**] *Anal. chim. Acta*, 1956, **14**, 263–265. [Lab. Chim. Anal., Inst. Chim., Fac. Sci., Nagoya Univ., Japan.] English and German summaries.

A new type of flask is described in which organic matter can be destroyed without bumping. Ferric chloride is included in the reagents used. After ashing, the digestion mixture is neutralised, the precipitate formed is dissolved in H_2SO_4 and phosphate is estimated in the solution by a molybdate method. The procedure is applicable also to natural waters.—H. G. Bray.

2748

FLASCHKA, H. and HOLASEK, A. Über die komplexometrische Bestimmung des Kaliums im Blutserum. [**Complexometric estimation of potassium in blood serum.**] *Hoppe-Seyler's Ztschr.*, 1956, **303**, 9–13. [Med. Chem. Inst., Univ. Graz.] English summary.

Potassium is precipitated from 1 ml. serum by a reagent containing sodium nitrite, cobalt nitrate and acetic acid and the precipitate is separated by centrifuge. The washed precipitate is treated with HCl and urea in a boiling-water bath, ammonia and murexide are added and the solution is titrated with disodium ethylenediaminetetra-acetate. The maximum variation of the results was found to be 0·7 mg. per cent. and the mean error 0·2 mg. per cent.—H. G. Bray.

2749

NEWFIELD, O. E. and TILSON, F. A. **The determination of sodium and potassium in the "Beckman model DU" flame spectrophotometer.** *Med. J. Austral.*, 1955, i, 751–752. [Repatriation Gen. Hosp., Heidelberg West, Victoria.]

A Beckman Model DU quartz spectrophotometer and flame attachment, supplied with an all-metal palladium-tipped injection system, gave high values for serum K and low values for serum Na when compared with results obtained by a modification of Abul-Fadl's chemical method (Abst. 1742, Vol. 19; Neufeld, Abst. 120, Vol. 22). No improvement resulted from preliminary precipitation of the serum protein, but a 1 in 50 dilution of the serum and standards with a lithium chloride solution, made from 26·617 g. lithium carbonate per 1000 ml. and diluted 1 in 250, gave excellent results at wavelength 767 mμ. and slit width 0·2 mm., the 20 mg. per 100 ml. standard being set at 50 per cent. transmission. For estimating Na the use of a standard closely approaching the concentration in the serum under study was necessary.—M. H. Pierce.

2750

BERNSTEIN, R. E. **The role of atomization in the accurate flame photometric determination of cations in biological fluids.** *S. African J. Med. Sci.*, 1955, **20**, 57–70. [Dept. Physiol., Med. Sch., Univ. Witwatersrand, Johannesburg.]

2751

BOLT, W., MALLINCK RODT, H. v., VALENTIN, H. and VENRATH, H. Methodische und fehlerkritische Betrachtung der flammenphotometrischen Bestimmung von Natrium, Kalium und Calcium im menschlichen Serum. [**Critical study of the flame photometer method of estimating sodium, potassium and calcium in human serum.**] *Ztschr. ges. exp. Med.*, 1955–56, **126**, 526–530. [Med. Klin., Univ. Cologne.]

2752

LEVEEN, H. H. **Analysis of micro quantities of sweat for sodium chloride by conductivity method.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90**, 535–537. [Dept. Surg., Chicago Med. Sch.]

See also Title 2784, Vol. 26.

2753

SASSI, L. Sur le dosage de la silice dans les eaux. [**Estimation of silica in water.**] *Arch. Inst. Pasteur Tunis*, 1955, **32**, 283–286. [Inst. Pasteur, Tunis.]

The method elaborated depended on the reduction of yellow ammonium silicomolybdate with hydroxylamine chloride in presence of diammonium citrate to give a blue colour which could be measured photometrically.—E. M. Hume.

2754

MAYNARD, J. P. and MATHERS, A. P. **Determination of added distinctive cations in whisky. 1. Flame photometric determination of strontium. 2. Flame photometric determination of lithium.** *J. Assoc. Off. Agric. Chem.*, 1956, **39**, 225–235; 236–241. [Alcohol and Tobacco Tax Div., Lab. Int. Rev. Serv., Washington, 25.]

2755

CASSIDY, N. G. **An electrometric method for determining sulphate ion.** *Analyst*, 1956, **81**, 169–175. [Dept. Agric., Suva, Fiji Islands.]

Sulphate is precipitated by lead nitrate in ethanolic solution and excess Pb is estimated by electrometric titration with potassium chromate.

H. G. Bray.

See also Abst. 3198.

Miscellaneous

2756

SHAW, T. M. and ELSKEN, R. H. **Determination of water by nuclear magnetic absorption in potato and apple tissue.**

PALMER, K. J. and ELSKEN, R. H. **Determination of water by nuclear magnetic resonance in hygroscopic materials containing soluble solids.** *J. Agric. Food Chem.*, 1956, **4**, 162–164; 165–167. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 10, Calif.]

The method depends on measurement of the magnetic resonance absorption of hydrogen nuclei in water (Shaw and Elsken, *Anal. Chem.*, 1955, **27**, 1983). The presence of soluble solids causes results to be too high, but this can be corrected for. Data are given for potato and apple tissues, sugar solutions, milk samples and apple juice concentrates.—H. G. Bray.

2757

CROWHURST, B. **The determination of milk solids not-fat in ice-cream.** *Analyst*, 1956, **81**,

123–124. [10 Lewes Rd., N. Finchley, London, N.12.]

Milk proteins are estimated by formol titration and a value is obtained for milk solids-not-fat on the assumption that skimmed milk powder contains on the average 30 per cent. protein.—H. G. Bray.

2758

DEN HERDER, P. C. **Detection of adulteration of butter with foreign fats by examination of the sterols.** *Nederlands Melk Zuiveltijdschr.*, 1955, **9,** 261–274. [Govt. Dairy Stat., Leyden.] Dutch summary.

The detection of plant sterols ("phytosterol") in butter by examination of total and bound sterols was studied in detail. The microscopical examination of sterol mixtures is considered, and also the isolation of the sterols and their acetylation.

H. G. Bray.

2759

LOUW, D. F. and VAN BERGEN, W. E. L. **The estimation of peanut meal in a premix for bread enrichment.** *J. Amer. Oil. Chem. Soc.*, 1955, **32,** 712–714. [Nat. Nutrit. Res. Inst., Counc. Sci. Indust. Res., Pretoria.]

2760

SONDHEIMER, E., PHILLIPS, W. F. and ATKIN, J. D. **Bitter flavor in carrots. 1. A tentative spectrophotometric method for the estimation of bitterness.** *Food Res.*, 1955, **20,** 659–665. [New York State Agric. Exp. Stat., Cornell Univ., Geneva.]

2761

STIFFEY, A. V. and WILLIAMS, W. L. **The separation of aureomycin, chlortetracycline and oxytetracyline in feeds by paper chromatography.** *J. Assoc. Off. Agric. Chem.*, 1955, **38,** 870–874. [Nutrit. Sect., American Cyanamid Co., Pearl River, N.Y.]

2762

LINDBERG, W. Nachweis und Identifizierung fettlöslicher Teerfarbstoffe in Nahrungsmitteln durch Extraktion mit Säuremischungen und Chromatographie auf imprägniertem Papier. [**Detection and identification of fat-soluble aniline dyes in foods by extraction with mixtures of acids and chromatography on impregnated paper.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1956, **103,** 1–14. [Inst. Hyg., Univ. Oslo.]

Filter paper impregnated with liquid paraffin is used, with methanol : water : acetic acid (80 : 15:5) as solvent mixture. R_F values are given for 9 dyes.—H. G. Bray.

See also Abst. 2811.

MICROBIOLOGICAL

2763

HORN, M. J. and BLUM, A. E. **A microbiological method for determination of cystine in foods.** *Cereal Chem.*, 1956, **33,** 18–28. [Human Nutrit. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Washington 25, D.C.]

The organism used was *Leuconostoc mesenteroides* P-60 and the basal medium contained as amino acid source an acid hydrolysate of "lanthionised" casein, *i.e.*, casein boiled with 2 per cent. sodium carbonate to convert cystine to lanthionine, plus added tryptophan and arginine. Values are given for the cystine content of 60 proteins and foodstuffs.—H. G. Bray.

2764

RUEBNER, B. **The biologic assay of L-methionine using a mutant of Bact. coli strain K-12.** *J. Lab. Clin. Med.*, 1956, **47,** 140–144. [Dept. Pathol., Postgrad. Med. Sch., London.]

L-Methionine was estimated in protein - free plasma by measuring turbidimetrically the growth of a mutant of *Bacterium coli* and comparing it with a standard curve. Methionine was essential for the mutant and could not be replaced, except by cystathionine or homocysteine. These were apparently not present in amounts sufficient to affect the assay, as similar results were obtained with another mutant which required both methionine and proline and could not utilise cystathionine or homocysteine in place of methionine.

The method was used to study abnormal methionine metabolism in patients with cirrhosis of the liver.—A. Hepburn.

CLINICAL AND EXPERIMENTAL

2765

DONOVAN, P. B. and TIGHE, W. J. **A quantitative modification of the "tubeless" gastric analysis.** *J. Lab. Clin. Med.*, 1955, **46,** 895–899. [Clin. Res. Lab., Rees-Stealy Clin., San Diego, Calif.]

A resin, Amberlite XE–96, in which the exchangeable hydrogen ions are replaced by quinium radicals, is swallowed and the free HCl of the gastric juice displaces the quinium ions, which form quinine hydrochloride. This is rapidly absorbed and excreted, so that the urinary excretion is a measure of the acidity of the gastric juice. In 101 patients a simple quantitative correlation was found between 2-hr. urinary excretion of quinine and the results of conventional gastric analysis.

H. G. Bray.

2766

KROMREY, W. Die indirekte Aciditätsbestimmung des Magensaftes ohne Einführung einer Sonde mit Hilfe eines Chininaustauschers. [**Indirect measurement of acidity of gastric juice, without stomach tube, with a quinine exchange substance.**] *Gastroenterologia*, 1956, **85**, 20–26. [Berlin.] English and French summaries.

2767

GALAMBOS, J. T. and KIRSNER, J. B. **Tubeless gastric analysis. An evaluation of azure A indicator compound.** *Arch. Int. Med.*, 1955, **96**, 752–756. [Dept. Med., Univ. Chicago.]

In patients given azure A by mouth after adequate stimulation of gastric secretion, the presence of 0·3 mg. or more azure A in the first hour test urine or 0·5 mg. or more in the second hour test urine indicated secretion of HCl. The test differentiated between presence and absence of HCl, but was not quantitative.—F. C. Aitken.

2768

SCHMIDT-KESSEN, W. Eine Methode zur Druckmessung im Magen-Darmlumen. [**Method for measuring pressure in the lumen of the gastrointestinal tract.**] *Gastroenterologia*, 1955, **84**, 252–258. [Med. Klin., Univ. Greifswald.] English and French summaries.

2769

DOW, P. **Estimations of cardiac output and central blood volume by dye dilution.** *Physiol. Rev.*, 1956, **36**, 77–102. [Dept. Physiol., Med. Coll. Georgia, Augusta.]

2770

SMALL, W. J. and VERLOOP, M. C. **Determination of the blood volume using radioactive Cr^{51}: modifications of the original technique.** *J. Lab. Clin. Med.*, 1956, **47**, 255–260. [Ziskind Labs., New England Centre Hosp., Boston, Mass.]

Errors due to the adsorption of chromium on glassware can be corrected by using a non-radioactive chromium chloride carrier.—H. G. Bray.

2771

COOPER, M. and OWEN, C. A. **Labeling human erythrocytes with radiochromium.** *J. Lab. Clin. Med.*, 1956, **47**, 65–71. [Mayo Found., Rochester, Minn.]

The kinetics of the process were studied by inhibiting the reaction at different times with ascorbic acid. The effect of anticoagulants, temperature and haematocrit value on the degree of labelling was studied.—H. G. Bray.

2772

MCFARLANE, A. S. **Labelling of plasma proteins with radioactive iodine.** *Biochem. J.*, 1956, **62**, 135–143. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

Four methods of iodinating plasma proteins are described: (1) iodine is liberated from iodide by H_2O_2 in the presence of protein at *p*H 7; (2) free iodine in KI is mixed with the protein in a bicarbonate buffer at *p*H 9·5 to 10·0; (3) a mixture of iodide and iodate is acidified and added to an ammoniacal solution of the protein; (4) a jet injection of free iodine is made into the protein dissolved in a glycine buffer at *p*H 9·3, and excess iodine is removed by ion exchange.

The labelled proteins produced are in general eliminated more rapidly by the rabbit than ^{14}C-labelled plasma proteins, especially if 6 or more atoms of iodine per molecule of protein are present. A method is described for substituting 0·5 atom iodine per molecule so that the labelled albumin and globulin behave in the rabbit in a way comparable to that of ^{14}C-labelled protein.

H. G. Bray.

2773

ARMSTRONG, S. H. (Jr.), MCLEOD, K., WOLTER, J., and KUKRAL, J. **The persistence in the blood of the radioactive label of albumin, gamma globulins, globulins of intermediate mobility studied with S^{35} and paper electrophoresis: methods and preliminary results.**

ARMSTRONG, S. H. (Jr.), KUKRAL, J., HERSHMAN, J., MCLEOD, K., WOLTER, J. and BRONSKY, D. **2. Comparison of gamma globulins labeled with S^{35} and I^{131} in the same subjects.**

ARMSTRONG, S. H. (Jr.), BRONSKY, D. and HERSHMAN, J. **3. Comparison of die-away plots following oral and intravenous administration of the S^{35} label to the same subjects.** *J. Lab. Clin. Med.*, 1954, **43**, 918–937; 1955, **45**, 51–60; **46**, 857–870. [Hektoen Inst. Med. Res., Cook County Hosp., Chicago, Ill.]

2774

JONES, A. R. **A device for rapidly deriving the hematocrit of blood centrifuged in ungraduated tubes.** *New Engl. J. Med.*, 1956, **254**, 172–174.

[Dept. Paediat., Harvard Med. Sch., Boston, Mass.]

2775

McCALL, K. B. **Spectrophotometric determination of total hemoglobin in plasma.** *Anal. Chem.*, 1956, **28**, 189–191. [Div. Labs., Michigan Dept. Health, Lansing.]

Haemoglobin is converted to methaemoglobin and the absorption of the solution is measured before and after treatment with cyanide, which converts methaemoglobin into cyanohaemoglobin. The change in absorption is directly proportional to the total Hb present.—H. G. Bray.

2776

NAHAS, G. G. Dosage spectrophotométrique rapide de l'hémoglobine et de l'oxyhémoglobine. [**Rapid spectrophotometric estimation of haemoglobin and oxyhaemoglobin.**] *J. Physiol., Paris*, 1955, **47**, 867–881. [Centre Chirurg., Marie-Lannelongue, Paris.]

The method described is applicable to 0·3 ml. blood and depends on measurements of optical density at 505 and 605 mμ. Results were found to be comparable with those given by the Van Slyke manometric technique.—H. G. Bray.

2777

KOUS, J. C., JOUVENAZ, G. H. and WADMAN, S. K. Een nauwkeurige micro-ijzerbepaling in bloed; ijking van de haemoglobinebepaling. [**Accurrate micro-estimation of iron in blood; calibration of the estimation of haemoglobin.**] *Nederland. Tijdschr. Geneesk.*, 1955, **99**, 2983–2988. [Zuiderziekenhuis, Rotterdam.] English summary.

An accurate and simple method for colorimetric estimation of Fe in blood is described.

The Hb concentration in venous blood samples from 11 adult men calculated from the Fe content was from 15·1 to 16·9 g. per 100 ml. and that of packed red cells from 30·2 to 33·2 g. per 100 ml. In 16 schoolchildren the ranges were 12·6 to 14·2 and 30·4 to 33·8 g. per 100 ml.—D. Duncan.

2778

WADSWORTH, G. R. and LEE, T. S. **Estimation of haemoglobin concentration in the tropics by means of oxyhaemoglobin solutions.** *Med. J. Malaya*, 1955, **10**, 87–91. [Dept. Physiol., Univ. Malaya, Singapore.]

2779

JOHNSON, V. L. and DUNLAP, J. S. **Electrophoretic separation of hemoglobins from the chicken.** *Science*, 1955, **122**, 1186. [Dept. Vet. Physiol. Pharmacol., State Coll. Washington, Pullman.]

Two haemoglobins in approximately the same relative proportions were detected by paper electrophoresis of samples of blood from age groups ranging from embryos of 13 days to 2-year-old fowls. It is considered unlikely that they represent embryonic and adult forms of the pigment.

H. G. Bray.

2780

WILLEBRANDS, A. F. and GROEN, J. Verdere ervaringen met de bepaling van insuline in bloedserum met behulp van het geïsoleerde rattediafragma. [**Further studies on the estimation of insulin in blood serum with the isolated rat diaphragm.**] *Nederland. Tijdschr. Geneesk.*, 1956, **100**, 817–823. [2. Klin. Inw. Ziekten, Wilhelmina Gasthuis, Amsterdam.] English summary.

For previous work see Title 5515, Vol. 20.

For each test the diaphragms of 8 rats that have fasted for 24 hr. are used. Four flasks are set up and incubated, each with one-quarter of each of the 8 diaphragms, buffer solution and glucose alone, or with insulin in a concentration of 10^{-4} or 10^{-3} unit per ml., or with the serum to be tested. Disappearance of glucose per 100 ml. diaphragm is the measure of insulin present. The method is not sensitive but will demonstrate gross departures from normal.—I. Leitch.

2781

WELLINGTON, G. H., REID, J. T., BRATZLER, L. J. and MILLER, J. I. **Use of antipyrine in nutritional and meats studies with cattle.** *J. Animal Sci.*, 1956, **15**, 76–85. [Cornell Univ., Ithaca, N.Y.]

Holstein cattle of both sexes were fed on low, medium or high planes of nutrition from birth until slaughter at 16, 48, 64 or 80 weeks of age. Close agreement was found between values for total body water estimated by the degree of dilution of a known quantity of antipyrine injected intravenously, and by estimation of moisture in all the body tissues. For 20 animals of different ages and degrees of fatness the average difference between the methods was 0·48 per cent.; the correlation coefficient was 0·939.—T. R. Preston.

2782

SCHAMBYE, P. **Experimental estimation of the portal vein blood flow in sheep. 1. Examination of an infusion method and results from acute experiments. 2. Chronic experiments in cannulated sheep applying infusion and injection methods.** *Nord. Vet.-Med.*, 1955, **7**, 961–973; addendum 974–975; 1001–1016. [Dept. Special Pathol. Therap., Royal Vet. Agric. Coll., Copenhagen.] German and Dutch summaries.

1. The procedure described is based on the indicator-dilution principle. Blood labelled with ^{32}P (erythrocytes) or the dye T 1824 (plasma) was infused into the peripheral branch of the portal vein and samples of carotid and portal blood were taken for estimation. The underlying theory is discussed in detail. Values are given for the average portal flow in acute experiments on sheep, calves and goats.—H. G. Bray.

2. Ewes were prepared by stitching a London cannula to the portal vein and exteriorising the left carotid artery. A polythene tube was inserted into a peripheral branch of the mesenteric vein. Cardiac output and circulating blood volume could then be estimated without anaesthesia by injection of T 1824 into the jugular vein, portal flow by injection of T 1824 into the mesenteric vein or by infusion of blood containing either T 1824 or red cells labelled with ^{32}P or both.

Values for portal flow when both indicators were used together were closely similar. The mean value for 5 sheep was 37·1 and the range 31·1 to 43·9 ml. per min. per kg. bodyweight, or about 26 per cent. more than in the acute experiments described in part 1. The mean portal flow could also be expressed as 266 ml. per min. per 100 g. liver. The portal flow made up from 26 to 40 per cent. of the total cardiac output, in one experiment 52 per cent. The results of injection experiments were more variable than those obtained by infusion, but close agreement was sometimes shown.

The mean circulation time from peripheral portal vein to carotid artery was 24 to 28 sec., and that from carotid to portal main trunk 12 sec., giving a mean circulation time from portal vein to heart to lungs to heart to aorta to portal vein of 40 sec., and a mean time for portal vein through liver to heart of 15 sec.

The value of 37 ml. per min. per kg. bodyweight for portal flow is thought to be the closest approximation so far obtained for sheep.—D. Duncan.

2783

BECKER, E. L. and JOSEPH, B. J. **Measurement of extracellular fluid volumes in normal dogs.** *Amer. J. Physiol.*, 1955, **183**, 314–316. [Dept. Int. Med., U.S. Air Force Sch. Aviation Med., Randolph Air Force Base, Tex.]

The volume of extracellular fluid was measured in 10 normal, adult, female mongrel dogs with 2 substances, inulin and thiosulphate, one metabolised slowly, the other rapidly. The volume of distribution of inulin, estimated by total recovery from urine after prolonged constant infusion, was 16 to 20 per cent. of bodyweight. The simultaneous volume of distribution of thiosulphate, calculated from plasma content extrapolated to zero time after a single intravenous injection over a 10-min. period, was 20 to 25 per cent. of the bodyweight. Similar results were obtained with both substances in repeated studies in the same dog. Fifty-three per cent. of the injected thiosulphate was excreted in the urine in the first hour, with a maximum recovery of 57 per cent. in 5 hr.

G. F. Garton.

2784

LEVEEN, H. H. **A method for collection of micro quantities of rapidly secreted local sweat.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90**, 537–539. [Dept. Surg., Chicago Med. Sch., Ill.]

See also Title 2752, Vol. 26.

2785

EDWARDS, D. A. W. **Estimation of the proportion of fat in the body by measurement of skin-fold thickness.** *Amer. J. Clin. Nutrit.*, 1956, **4**, 35–36. [Med. Res. Counc., Dept. Clin. Res., University Coll. Hosp. Med. Sch., London, W.C.1.]

Accurate measurements of skin-fold thickness are needed if such thickness is to be taken as a measure of total body fat. Recommendations are made for calliper design based on the results of experiments reported fully elsewhere (Abst. 5545, Vol. 25).—F. C. Aitken.

2786

SUÁREZ, M. Valoracion radiologica de la obesidad. **[Radiological evaluation of obesity.]** *Rev. española Pediat.*, 1955, **11**, 563–570. [Cat. Pediat. Puericult., Santiago de Compostela.]

X-ray techniques were used to estimate the excess of adipose tissue in obese children. From X-ray photographs of the leg the muscular area was calculated and from it the theoretical true bodyweight; the difference between this and the actual bodyweight was taken to be excess fat. The muscle : fat index expressed the relation between the panniculus adiposus and the musculature on X-ray shadows. In infants the anterior abdominal fat thickness was estimated from X-ray photographs.

The paper includes illustrative examples and photographs.—D. Duncan.

2787

WEIJERS, H. A. and VAN DE KAMER, J. H. **Coeliac disease. 6. A rapid method to test wheat sensitivity.** *Acta paediat.*, 1955, **44**, 536–540. [Wilhelmina Child. Hosp., Utrecht.] French, German and Spanish summaries.

For part 5, see Abst. 2415, Vol. 26.

In children with coeliac disease given gliadin by mouth the maximum increase in blood glutamine over the fasting value almost always exceeded 50 per cent. In normal children values ranged from

— 7 to + 40 with a mean of 15. It is suggested that wheat sensitivity may be tested for on this basis.—F. C. Aitken.

2788

BRUTON, O. C., METZGER, J. F. and SPRINZ, H. **Experience with needle biopsy of the liver in infants and children.** *Pediatrics*, 1955, **16**, 836–841. [Paediat. Serv., Walter Reed Army Hosp., Washington, D.C.]

2789

WILSON, R. H., JAY, B. E. and HAGEDORN, M. B. **Comparison of the Roughton - Scholander syringe and polarographic methods for measuring tension of oxygen in plasma and whole blood.** *J. Appl. Physiol.*, 1956, **8**, 513–518. [Dept. Med., Univ. Texas Southwestern Med. Sch., Dallas.]

2790

JOVY, D. Kritische Untersuchungen zur titrimetrischen Bestimmung der Alkalireserve nach H. Lestradet. [**Critical investigation of the titrimetric estimation of alkali reserve by the method of H. Lestradet.**] *Deutsch. med. Wochenschr.*, 1956, **81**, 241–243. [Sporthochsch., Cologne.]

2791

MILLER, J. and HOBSON, P. **Determination of the presence of caries in fissures.** *Brit. Dent. J.*, 1956, **100**, 15–18. [Dept. Child. Dentistry, Turner Dent. Sch., Manchester.]

2792

DALDERUP, L. M. and JANSEN, B. C. P. **Evaluation of dental caries in the rat in non-decalcified sections of the molars.** *Internat. Ztschr. Vitaminforsch.*, 1955, **26**, 235–257. [Netherland Inst. Nutrit., Amsterdam.] German and French summaries.

A method, for which the criteria were accuracy and rapidity, was devised for easy evaluation of the number and extent of carious lesions and their detection at an early stage by microscopic examination at magnification × 40. As a rule 2 sections were made by a sagittal cut of the tooth without decalcification, with saw equipment which is described. The types of lesion likely to be encountered, fissure, approximal, at the cusp summit or more rarely on the smooth buccal and lingual surfaces, are described, and a system of scoring based on measurements of the average length (mesio-distal) and average thickness (occluso-cervical) of the lesion as seen in the section with an estimate of 1 or 2 for the bucco-lingual dimension according as the lesion appeared in one or both halves.

The advantages and the limitations of the technique are fully discussed.—D. Harvey.

2793

SPROULL, D. H. **A hand-operated tissue chopper.** *Biochem. J.*, 1956, **62**, 372–376. [Med. Res. Counc. Clin. Chemotherap. Res. Unit, Western Infirmary, Glasgow.]

2794

BURR, W. W. (JR.), MARCIA, J. A. and TIDWELL, H. C. **A modified restraining cage for isotopic studies.** *J. Lab. Clin. Med.*, 1956, **47**, 326–328. [Dept. Biochem., Univ. Texas Southwestern Med. Sch., Dallas.]

The device described is for use in experiments with rats, permitting respiratory CO_2 to be completely recovered and blood samples to be taken from the tail.—H. G. Bray.

2795

ZHULENKO, V. N. Novyi metod izolyatzii uchastka tonkogo otdela kishechnika. [**New method of isolating a loop of small intestine.**] *Fiziol. Zh. SSSR Sechenova*, 1955, **41**, 586–587. [Zoovet. Inst., Novocherkassk.]

A detailed description is given of the fashioning of an intestinal loop with intact nerve- and blood-supply and with 2 apertures, permitting simultaneous study of secretory and motor activity.

D. W. Taylor.

2796

GUBAR, V. L. Sposob izolirovaniya uchastka tolstoi kishki. [**Apparatus for use in isolating a loop of large intestine.**] *Fiziol. Zh. SSSR. Sechenova*, 1955, **41**, 587–588. [Ist. Pitan., Akad. Med. Nauk SSSR.]

The operative details are given.—D. W. Taylor.

2797

MOSQUEDA SUÁREZ, A. Estudio de los métodos "recolección" y "oxido crómico" en la rata. Sus aplicaciones para conocer la digestibilidad de la arepa. [**The recovery and chromic oxide methods with the rat. Application to the estimation of the digestibility of "arepa".**] *Arch. venezol. Nutricion*, 1955, **6**, 71–80. [Inst. Nac. Nutrición.] English and German summaries.

For the composition and preparation of Venezuelan maize bread, arepa, see Abst. 5534, Vol. 25. The digestibility of arepa was studied in experiments with growing rats of initial weight 50 to 55 g. The arepa was dried, ground and fortified with minerals and vitamins and then given to appetite with water. Experiments lasted 14 days, and were made by a total balance method and a chromic oxide method.

Apparent digestibility of protein was 77·6 and true digestibility 95·0 per cent. Total digestibility by the recovery method was 95·0 and by the chromic oxide method 93·6 per cent. The chromic oxide method is considered to have practical advantages over the recovery method.

D. Duncan.

2798

MUELLER, W. J. **Feasibility of the chromic oxide and the lignin indicator methods for metabolism experiments with chickens.** *J. Nutrition*, 1956, **58,** 29–36. [Swiss Poultry Breeding Sch., Zollikofen-Berne.]

Percentage recovery of chromic oxide from the excreta of birds given rations ground to pass a 1-mm. sieve ranged from 95·0 ± 1·46 to 101·2 ± 1·40. Percentage recovery was only 90·6 ± 1·47 when the indicator was mixed in a coarsely ground ration. Significant differences were found between the Cr_2O_3 content of the dry matter of day and night excreta, probably because of the difference in relative amounts of indicator in the intestines and caeca, and the daily emptying of the caeca about a particular time.

Percentage recovery of dietary lignin, which was greatly affected by small alterations in concentration of the H_2SO_4 used for its estimation, ranged from 95·8 ± 1·03 to 105·0 ± 3·42. The diurnal variation in lignin content of the dry matter excreted was less pronounced than in that of Cr_2O_3.

In view of the diurnal variation found, aliquot samples of excreta voided over complete 24-hr. periods are required for accurate measurements of digestibility with indicators such as Cr_2O_3 and lignin.—J. Davidson.

2799

LAZAREV, G. I. Modifikatziya slyunnoi kanyuli u zhvochnykh zhivotnykh. [**Modification of salivary cannula for ruminants.**] *Fiziol. Zh. SSSR Sechenova*, 1955, **41,** 582–583. [Sel'skokh. Inst., Kostroma.]

The technique of inserting a T-shaped cannula into the ruminant parotid duct, permitting sampling without continuous loss of saliva and resulting harmful effects, is described.—D. W. Taylor.

2800

KING, K. W. and SMITH, P. H. **Comparisons of two media proposed for the isolation of bacteria from the rumen.** *J. Bacteriol.*, 1955, **70,** 726–729. [Dept. Biochem. Nutrit., Virginia Agric. Exp. Stat., Blacksburg.]

The media investigated were similar to those used by Gall *et al.* (Absts. 4614, Vol. 17 ; 112, Vol. 23) and by Hungate (*J. Bacteriol.*, 1947, **53,** 631 ; *Bacteriol. Revs.*, 1950, **14,** 1) for the isolation of rumen bacteria. Medium 1 contained much organic nitrogen, with yeast and beef extract ; medium 2 contained rumen fluid. Reducing conditions and CO_2 supply, as well as the inoculation technique, were similar.

With a roll tube technique, the total number of colonies developing, and the numbers and variety of cellulolytic colonies, were greater on medium 2. The rate of cellulose digestion by isolated organisms was also greater on medium 2. This medium, therefore, appeared to be the more suitable.—J. C. Appleby.

2801

VAN DER KLEY, F. K. Methoden ter bepaling van de voedselopname door weidend vee. [**Methods for measuring herbage consumption by grazing cattle.**] *Landbouwdocumentatie*, 1956, **12,** pp. 18. [Afd. Graslandcult., Landbouwhogesch., Wageningen.] English summary.

A review and discussion of recent work.

2802

HARDISON, W. A., ENGEL, R. W., LINKOUS, W. N., SWEENEY, H. C. and GRAF, G. C. **Fecal chromic oxide concentration in 12 dairy cows as related to time and frequency of administration and to feeding schedule.** *J. Nutrition*, 1956, **58,** 11–17. [Virginia Agric. Exp. Stat., Blacksburg.]

Greater variation was found in the ratio of chromic oxide to dry faeces when Cr_2O_3 was given once daily instead of twice daily. When it was given twice daily the random error of grab samples was one-fifth to one-sixteenth of that when it was given once daily. The time when it was given was without effect. Because variation was found to be greater between cows than between successive experimental periods, it is suggested that in digestibility studies observations should be made on a large number of animals over a short period rather than on a small number over a long period.

J. Davidson.

2803

MABON, R. M. **A simple method of assessing the moisture exuded through the skin of cattle.** *Nature*, 1956, **177,** 284–285. [Livestock Res. Sect., Vet. Res. Lab., Mpwapwa, Tanganyika Territory.]

A modified Assman psychrometer is used to measure the difference between the humidity of the atmosphere and that of the air passing close to the skin of cattle. The technique is claimed to demonstrate minor fluctuations in skin moisture even under relatively dry conditions.

T. R. Preston.

See also Absts. 3240, 4008.

COOKING, STERILISATION AND PRESERVATION OF FOOD

2804

BHATIA, D. S. and NATARAJAN, C. P. **Chemistry and technology of foods.** *Annu. Rev. Biochem. Allied Res. India*, [1954 ?], **25**, pp. 13. [Div. Food Processing, Central Food Technol. Res. Inst., Mysore.]

2805

FINCKE, H. Natürliche und künstliche Lebensmittelfarbstoffe. Die Färbung von Zuckerwaren. [**Natural and artificial food pigments. The colouring of sugar confectionery.**] *Lebensmittel u. Ernährung*, 1956, **9**, No. 1, 13–15. [Cologne.]

Report of a lecture given at a meeting of the International Union of Confectionery Manufacturers, with some details of colours and surface colouring agents which it is proposed to allow in Germany.—W. M. Deans.

2806

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD, FOOD STANDARDS COMMITTEE. **Recommendations relating to the colouring matters in foods.** *Med. Officer*, 1955, **94**, 392.

A supplementary report (cf. Title 4667, Vol. 25).

2807

GOODING, C. M., MELNICK, D., LAWRENCE, R. L. and LUCKMANN, F. H. **Sorbic acid as a fungistatic agent for foods. 9. Physico-chemical considerations in using sorbic acid to protect foods.**

LUCKMANN, F. H. and MELNICK, D. **10. Spectrophotometric determination of sorbic acid in foods in general.** *Food Res.*, 1955, **20**, 639–648 ; 649–654. [Res. Labs., The Best Foods, Inc., Bayonne, N.J.]

2808

GALESLOOT, T. E. De invloed van de pasteurisatietemperatuur op de duurzaamheid van depasteuriseerde melk. [**Influence of heat treatment on the keeping quality of pasteurised milk.**] *Nederlands Melk Zuiveltijdschr.*, 1955, **9**, 237–248. [Nederlands Inst. Zuivelonderzoek (N.I.Z.O.), Ede.] English summary.

2809

FERLAZZO, A., LOMBARDO, G. and CUZZOCREA, G. Azione degli ultrasuoni sulle reduttasi e perossidasi del latte vaccino. [**Action of ultrasonic vibrations on the reductases and peroxidases of cow's milk.**] *Lattante*, 1955, **26**, 504–515. [Ist. Clin. Pediat., Univ. Messina.] English summary.

Five samples of cow's milk were exposed for periods of from 1 to 30 min. to ultrasonic vibrations of 1, 2 and 4 watts. For estimation of peroxidase activity, the fat was removed by centrifuging. Reductase and peroxidase activity were decreased by the treatment. High intensity of ultrasonic vibrations was more effective than long exposure. The changes are attributed to the bacterial action of the ultrasonic vibrations, and it is considered that the method could be applied to the sterilisation of milk.—E. M. Hume.

2810

RICHTER, K. and SCHILLER, K. Untersuchungen zur Bestimmung der Verdaulichkeit und der biologischen Wertigkeit des Milcheiweisses in Magermilchpulvern, die nach verschiedenen Systemen getrocknet wurden. [**Estimation of the digestibility and biological value of milk protein in skimmed milk powder dried by different processes.**] *Ztschr. Tierernährung Futtermittelk.*, 1956, **11**, 32–37. [Inst. Tierernährung, Völkenrode, Brunswick.] English summary.

The quality of 22 different dried milk samples was compared in chemical tests, by bacteriological assay and in digestibility trials with rats. By chemical estimation the crude protein ranged from 34·8 to 38·7 and the true protein from 32·3 to 37·8 per cent. There was no relation between the protein content and the biological quality. Spray-dried milk was much more soluble than roller-dried. All the samples were free from pathogenic bacteria and usually had low counts of other types, though 2 samples had counts high enough to suggest inadequate pasteurisation before drying.

All the samples had good biological value, especially the spray-dried samples, which were almost as valuable as the egg powder used for comparison. Roller-dried samples processed at low temperatures, 90° and 50° to 60° C., were almost as valuable as spray-dried. Solubility in water had no relation to digestibility.

D. Duncan.

2811

LEPPER, H. A., BARTRAM, M. T. and HILLIG, F. **Authentic packs of edible and inedible frozen eggs and their organoleptic, bacteriological and chemical examination.** *J. Assoc. Off. Agric. Chem.*, 1956, **39**, 185–194. [Food Drug Admin., Dept. Health, Washington 25.]

The results of an official test by smell for edibility of frozen egg were compared with the bacterial counts and contents of formic, acetic, lactic and succinic acids in egg, good, inferior or with admixture of inedible egg, canned in St. Louis in 1941 and in Chicago in 1952 and kept hard frozen.

The findings are tabulated; they confirmed the reliability of the smell test and the conclusions of an earlier study (Abst. 937, Vol. 14), and demonstrated the detrimental effects of delay in freezing, especially with egg mixtures initially of poor quality.—W. M. Deans.

2812

MONZINI, A. and LISSONI, A. La tachipessi applicata alla conservazione delle carni. 3. Digeribilità e modificazioni biochimiche delle carni congelate e conservate a — 25° C e — 40° C per 48 mesi. [**Quick freezing in meat conservation. 3. Digestibility and biochemical modification of meat frozen and stored at — 25° C. and — 40° C. for 48 months.**] *Ann. Sper. agrar.*, 1955, **9**, 1093–1106. [Staz. Sper. Freddo, Milan.] English summary.

3. Veal and beef stored at — 25° and — 40° C. for 10 and 48 months were compared with fresh samples. After 10 months at either temperature the meat contained detectable amounts of ammonia N, not found in fresh samples, and considerably more amino N than fresh meat. Between 10 and 48 months ammonia N rose and free amino N fell. Digestibility by pepsin and trypsin *in vitro* was not much affected by storage for 10 months, but was significantly less after 48 months. Increases in the content of minerals and phosphate extractable by water after cold storage were similar to those found after maturation of fresh meat for 7 days at 2° C. Vitamin B_1 and riboflavin contents were less in frozen than in fresh meat, but the loss of riboflavin was less than the loss during maturation. Catalase activity was reduced by cold storage.

D. Duncan.

2813

HAMM, R. Über die Proteolyse der Fleischproteine. 3. Der Einfluss von Bindegewebs-Kollagen auf die Proteolyse des Fleisches. [**Proteolysis of meat proteins. 3. Effect of connective tissue collagen on the proteolysis of meat.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102**, 417–426. [Chem. Phys. Inst., Bundesforschungsanst. Fleischwirtsch., Kulmbach.]

For previous parts see Abst. 105, Vol. 23; Title 65, Vol. 25.

3. Results of experiments on the proteolysis of minced muscle, minced tendons or mixtures with pepsin and HCl are presented in tables and graphs. Breakdown products of tendons inhibited the activity of pepsin more strongly than did those of muscle, and fluid taken up by tendons on swelling was less capable of dissolving protein breakdown products than free fluid. In mixtures, the presence of tendons did not affect the rate at which muscle was brought into solution but did retard the breakdown of peptides.—W. M. Deans.

2814

WANG, H. and MAYNARD, N. **Studies on enzymatic tenderization of meat. 1. Basic technique and histological observations of enzymatic action.** *Food Res.*, 1955, **20**, 587–597. [Div. Histol., Amer. Meat Inst. Found., Univ. Chicago, Ill.]

2815

SOLA, E. Forsøk på en driftsøkonomisk vurdering av fiskemelanlegg av S-M-typen med og uten utstyr for opparbeidelse av fett råstoff. [**Attempt to assess the economics of a fishmeal plant of the S-M type with and without apparatus for processing fat.**] *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1955, **3**, No. 2, pp. 41.

See Abst. 3314, Vol. 25. The analysis is made in considerable detail with reference to capital outlay, type and amount of raw material, extent of recovery of oil aimed at, and capacity, and is illustrated by 14 graphs.—I. Leitch.

2816

GOLUBCHUK, M., SORGER-DOMENIGG, H., CUENDET, L. S., CHRISTENSEN, C. M. and GEDDES, W. F. **Grain storage studies. 19. Influence of mold infestation and temperature on the deterioration of wheat during storage at approximately 12 per cent. moisture.**

PETERSON, A., SCHLEGEL, V., HUMMEL, B., CUENDET, L. S., GEDDES, W. F. and CHRISTENSEN, C. M. **22. Influence of oxygen and carbon dioxide concentrations on mold growth and grain deterioration.** *Cereal Chem.*, 1956, **33**, 45–52; 53–66. [Dept. Agric. Biochem., Inst. Agric., Univ. Minnesota, St. Paul.]

2817

LUCIFERO, M. Tentativo di classificazione dei sottoprodotti della molitura del grano. [**Classification of milling by-products.**] *Riv. Zootec.*, 1955, **28**, 354–355.

Based on a paper by Martel, E., in *Les industries de l'alimentation animale*, No. 52.

2818

COOKSON, M. A. and COPPOCK, J. B. M. **The role of lipids in baking. 3. Some breadmaking and other properties of defatted flours and of flour lipids.** *J. Sci. Food Agric.*, 1956, **7**, 72–87. [Brit. Baking Indust. Res. Assoc., Chorleywood, Herts.]

For previous parts see Title 2831, Vol. 24.

Literature on flour lipids and their role in breadmaking is reviewed.

Experiments with 80 per cent. extraction flour treated with different solvents for 20 hr. at 15° to 25° C. showed that the properties of the lipids and

of the defatted flours depended on the solvent. Flours extracted with ether or light petroleum had similar dough properties, and also flours extracted with carbon tetrachloride, ether and alcohol, or acetone ; there was little difference between them. Flour extracted with alcohol gave a dough with too low a ratio of extensibility to resistance. Breads made from the other extracted floors were superior to that from unextracted flour in texture and crumb colour, and, except for that from acetone-extracted flour, in loaf volume. The lipids removed by carbon tetrachloride, ether and light petroleum had similar physical and analytical properties ; so had those removed by ether and alcohol or alcohol alone ; those removed by acetone resembled the second group in some ways but not in others. Similar results were obtained with flours of 70 and 100 per cent. extraction.

In further work on flour treated with carbon tetrachloride it was found that defatted flour did not show the usual reduction of extensibility with ageing, and required less of potassium bromate or other improver. Addition of shortening impaired the volume and crumb softness of bread made from defatted flour.

Treatment of flours of 75 or 76 per cent. extraction with chlorine dioxide or agene reduced the amount of lipid removed by solvent, and increased the peroxide value of the lipid extracted from the bread. Bread lipid differed from flour lipid ; it had less free acid, more unsaponifiable matter, a higher peroxide value and a lower, more constant, molar N : P ratio. The ultraviolet absorption spectra of flour lipids were affected by treatment of flour with agene or chlorine dioxide, extraction rate, and baking.

It is concluded that any theory of the mechanism of oxidative improvement of flour must take account of the lipids as well as the proteins. It is suggested that the effect may be due to oxidation of a lipoprotein, not a free lipid or protein. The lipid component essential to the action of shortening is probably not the same. Further work on the fractionation of flour lipids is in progress.

G. F. Garton.

2819

GOLDSTEIN, S. Über den Wirkungsmechanismus der Mehlverbesserungsmittel. [**Mode of action of flour improvers.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag. Prof. Crasemann, 47–51. [Mühlen-Aktiengesellsch., Interlaken.]

A short review with numerous references. A footnote states that the only flour improver allowed in Switzerland is ascorbic acid.

W. M. Deans.

2820

VEENBAAS, A. Het gebruik van keukenzout en fosfaten bij de bereiding van erwten. [**Use of cooking salt and phosphates in the cooking of peas.**] *Voeding*, 1956, **17**, 85–92. [Centraal Inst. Landbouwk. Onderzoek, Wageningen.] English summary.

Peas were steeped and then boiled ; the experiments extend Swedish work (Abst. 3040, Vol. 17). Steeping in 2 per cent. NaCl and boiling without salt improved the physical quality of the boiled pea with 3 varieties, but not the taste, and 1 per cent. had similar effects. With 0·5 per cent. the water need not be changed. Di- and tri-sodium phosphates also made cooking easier, but impaired taste and might destroy more vitamin B_1 than is lost with NaCl.—I. Leitch.

2821

DATE, W. B. **Antioxidant property of some legume flours.** *Science and Culture*, 1955, **21**, 106. [Central Food Technol. Res. Inst., Mysore.]

Legume flours from field bean (*Dolichos lablab*), green gram (*Phaseolus radiatus*), black gram (*P. mungo*), tur (*Cajanus indicus*), pea (*Pisum sativum*), lentil (*Lens esculenta*) and Bengal gram (*Cicer arietinum*) were used to make a sweet product by the method described by Date and Bhatia (*Bull. Central Food Technol. Res. Inst., Mysore*, 1953, **2**, 237). Samples kept in air-tight jars at 37° C. were examined after 2, 4 and 6 months. No sign of rancidity was detected after 2 months, and only in the product from Bengal gram were there traces of rancidity after 4 months. After 6 months all samples were slightly rancid, and the Bengal gram definitely so. The phospholipin content of the flours was estimated and gave similar indications of the keeping quality.—T. D. Bell.

2822

EMILSSON, B. **Treating ware potatoes with sprout-inhibiting chemicals. Research in Sweden 1948-1954.** *Acta Agric. scand.*, 1955, **5**, 390–406. [Inst. Plant Res. Cold Storage, Nynäshamn, Sweden.]

A survey was made of the results of trials on the effect on sprout inhibition, occurrence of disease and cooking quality of potatoes of 6 chemicals : 2 : 3 : 5 : 6-tetrachloro-1-nitrobenzene (TCNB), *iso*-propyl-N-phenylcarbamate (IPC), methyl ester of α-naphthaleneacetic acid (MENA), α-methylnaphthylmethyl ether (METER), phenyl urethane (PU) and maleic hydrazide (MH). The advantages and disadvantages of each are discussed and it is concluded that TCNB and IPC are to be recommended, under Swedish conditions, for sprout inhibition. With all chemicals there was less darkening of the potatoes after cooking, as compared with untreated tubers, but the difference was most marked with TCNB, IPC and PU.—J. S. Thomson.

2823

SHEWFELT, A. L., BROWN, D. R. and TROOP, K. D. **The relationship of mealiness in cooked potatoes to certain microscopic observations of the raw and cooked product.** *Canad. J. Agric. Sci.*, 1955, **35,** 513–517. [Div. Hortic., Exp. Farms Serv., Canada Dept. Agric., Morden, Manitoba.]

2824

HURKA, W. Die Konservierung von Orangen für den Transport. [**The preservation of oranges for transport.**] *Lebensmittel u. Ernährung*, 1956, **9,** No. 2, 8–9. [Mikrobiol. Lab., Arcana KG, Lieserbrücke.]

Losses of oranges during shipment can be cut from 10 to under ½ per cent. by wrapping the fruit in paper impregnated with diphenyl; the amount of the latter in the peel of an orange of average size ranges from 2·4 mg. after 14 days to 5·6 mg. after 62 days. Although short-term experiments with rats at the National Institute for Medical Research have shown that diphenyl at the rate of 200 mg. per kg. bodyweight is not demonstrably toxic, it is considered that diphenyl and similar substances should not be used until tests lasting much longer have proved them to be harmless.—W. M. Deans.

2825

ARROYAVE, G., PINEDA, O. and SCRIMSHAW, N. S. **The stability of potassium iodate in crude table salt.** *Bull. World Health Organiz.*, 1956, **14,** 183–185. [Div. Clin. Biochem., Inst. Nutric. Centro América y Panamá (INCAP), Guatemala.] French summary.

In many areas where goitre is endemic, the iodisation of salt by conventional methods with NaI or KI is not practical because of losses due to impurities, moisture, light and heat. The data presented show that addition of KIO_3 is easier and more reliable. A mixture of 1 part KIO_3 with 9 parts $CaCO_3$ was added to salt obtained by solar evaporation of sea water; the final product contained approximately 1 part added I per 10,000 parts of salt. To test the stability of the I a sample of 50 kg. was stored in a hemp fibre sack in an open room from January to August, a period which included 4 dry- and 4 rainy-season months when average humidities were 70 and 84 per cent., respectively. Samples for analysis were taken from the upper, middle and lower parts of the sack. Only 3·5 per cent. of the added I was lost during the whole period and there was no shift of I from one layer to another.—B. W. Simpson.

2826

JAHN, W. Haltbarkeit von Procain-Penicillin für Futterzwecke in verschiedenem Milieu. [**Stability in different media of procaine penicillin for feeding.**] *Ztschr. Tierernährung Futtermittelk.*, 1956, **11,** 53–64. [Farbwerke Hoechst AG.] English summary.

The stability of penicillin in different feedingstuffs was tested bacteriologically. The "Hoechst" commercial penicillin concentrate was stable in pig and poultry feeds for at least a year, and also in mineral mixtures. In fishmeals stored at room temperature it was stable for about 6 months. It was rapidly affected by molasses.—D. Duncan.

2827

LUCIFERO, M. La conservazione dei foraggi: vecchi e nuovi metodi. [**Conservation of forage: old and new methods.**] *Riv. Zootec.*, 1956, **29,** 7–10; 50–54. [Lab. Zootec., Fac. Agrar., Florence.]

2828

GOETZ, O. Die künstliche Grünfuttertrocknung in der Schweiz: Rückblick und Ausblick. [**Artificial drying of fodder in Switzerland: retrospect and prospect.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag Prof. Crasemann, 22–24.

2829

LANDIS, J. Veränderungen der stickstoffhaltigen Grünfuttersubstanz bei Konservierungsvorgängen. [**Changes in nitrogenous constituents of green fodder in conservation processes.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag. Prof. Crasemann, 76–78. [Inst. Haustierernährung, Eidg. Tech. Hochsch., Zürich.]

2830

DIJKSTRA, N. D. and DAMMERS, J. Bewaringsproeven met gemoesde bieten. [**Tests in preservation of beet pulp.**] *Landbouwvoorlichting*, 1954, **11,** 377–379. [Rijkslandbouwproefstat., Hoorn.]

When fodder or sugar beet is stored for pig feeding it would be convenient to store it as pulp. Tests in which beet pulp alone, and equal quantities of beet pulp and steamed potatoes, were stored in small concrete silos gave percentage losses as follows: dry matter 27·2 and 45·8; organic matter 37·1 and 54·4; crude protein 33·3 and 27·8; N-free extract 40·6 and 60·9 and crude fibre 8·4 and 10·4. Storage as pulp is therefore not recommended.—I. Leitch.

2831

DIJKSTRA, N. D. and SPRENGER, J. J. I. Proefnemingen over de achteruitgang van de verteerbaarheid bij het kunstmatig drogen van lucerne. [**The influence of artificial drying on the**

digestibility of lucerne.] *Versl. Landbouwk. Onderzoek.*, 1955, No. 61·11, pp. 30. [Rijkslandbouwproefstat., Hoorn.] English summary.

At one centre a single lot of lucerne was chopped and dried and analysed fresh and dried as chopped, ground and cubed. At another, lucerne was cut early, at the usual time, and late, dried in a high- and a low-temperature drier and analysed fresh and as dried and ground. Also of that cut at the normal time and dried in the high-temperature drier, samples were analysed, chopped, ground and cubed. Digestibility was estimated *in vitro* and *in vivo* at the Hoorn research station.

For earlier similar work with grass see Abst. 197, Vol. 26. Results with lucerne were similar. Digestibility fell over the growing season. High-temperature drying reduced digestibility of protein by, on the average, 9·5 per cent. Grinding and cubing further reduced it. Loss was less in the early-cut crop dried in the low-temperature drier, 4·7 per cent., and higher in the normal- and late-cut dried in the high-temperature drier, 19·8 and 10·3 per cent. Loss of digestibility of organic matter was much less; in the chopped lucerne, 1·0, in meal 2·7 and in cubes 5·1 per cent. on the average.

Digestible crude protein estimated *in vitro* was about 1·5 per cent. more than that estimated with wethers.—I. Leitch.

2832

RULIFFSON, W. S., MILNER, M. and MITCHELL, H. L. **Feedstuffs values and chemical changes in spontaneously heated alfalfa pellets.** *J. Agric. Food Chem.*, 1956, **4**, 167–170. [Kansas State Coll., Manhattan.]

Samples of alfalfa pellets at different stages of decomposition were obtained from a commercial elevator bin in which spontaneous combustion had occurred. Round the sides of the bin the pellets were normal but at the centre they had become a black congealed mass, with intermediate stages of degeneration between. Chemical analyses showed a tendency to a decrease of moisture content as deterioration progressed, a marked increase of ash, an increase of crude protein until the last stage of decomposition, a marked increase of crude fibre, with a concomitant decrease of available carbohydrate, and a gradual decrease of ether extract till near the final stage, when the decrease became very marked. Changes in amino acid N and in N.P.N. were not rapid until the final stages of deterioration. Carotene was lost rapidly but there was an apparent increase of riboflavin at the intermediate stages, followed by a rapid fall. Fluorescence rose rapidly till near the final stage, indicating a reaction between protein and sugar.

J. S. Thomson.

2833

KING, W. H., WOLFORD, L. T., THURBER, F. H., ALTSCHUL, A. M., WATTS, A. B., POPE, C. W. and CONLY, J. **Effect of *p*H during the cooking of cottonseed on the properties of meals and oils.** *J. Amer. Oil Chem. Soc.*, 1956, **33**, 71–74. [S. Reg. Res. Lab., New Orleans.]

Cottonseed meats were cooked for 30 min. with stirring in water at a temperature rising to not more than 212° F. Moisture was kept high at the beginning in order to break down the pigment glands and release gossypol. Variation of *p*H was obtained by the addition of orthophosphoric acid or NaOH. The resulting meals were high in soluble N and their nutritive values, measured by the growth rate of day-old chicks, surpassed at the optimum *p*H levels, about 5·0 and 7·0, those of meal extracted with butanone to remove gossypol. The amount of gossypol in the meals increased as *p*H rose. Free gossypol in alkali-cooked meals ranged from about 0·02 to 0·05 and in the acid-cooked meals from about 0·03 to 0·08 per cent. Total gossypol ranged from 0·4 for acid-cooked to 1·2 for alkali-cooked meals. The bleached oils from meats cooked at a low *p*H were subject to colour reversion; those cooked at a high *p*H were not.

See Absts. 5613, Vol. 21; 1739, Vol. 25.

A. Hepburn.

2834

MCDONALD, P. and PURVES, D. **Effects of the addition of molasses on the composition and digestibility of field silages.** *J. Sci. Food Agric.*, 1956, **7**, 189–196. [Edinburgh and East of Scotland Coll. Agric., 13 George Sq., Edinburgh 8.]

Silage was made from grass, chiefly perennial ryegrass, and clover sown in 1952 under oats and cut in 1954 when the grass seed heads had fully emerged. Two small concrete silos, capacity 750 kg. fresh crop, were filled in one day, with consolidation of each load. One silo had molasses diluted with about the same amount of water added at the rate of 1·34 kg. per quintal of fresh herbage. The silage was covered with paper, soil and a lid. Temperatures rose initially to 23° and 22° C. and were stabilised at approximately 14° and 15° C. at 14 days. The ordinary silage was removed after 11 and the molassed silage after 14 weeks.

Composition and digestibility by wethers of the grass as cut and of the silages are recorded in terms of the usual components, soluble sugars and fructosan. Losses were extremely small; the only proportionately substantial changes were apparent gains of ether extract and crude fibre. The ordinary silage lost 23·3, molassed silage 49·5 per cent. of soluble sugar; untreated silage lost 82·6 per cent. of fructosan; molassed silage gained 39 per cent. Total weights of lactic and acetic acids were, in kg., in ordinary silage 12·53

and 1·52 ; in molassed silage 14·07 and 2·21, and greatly outweighed the total loss of soluble carbohydrates.

There was no difference in digestibility or calculated feeding value between grass and either silage, or ordinary silage with added molasses.

I. Leitch.

2835

DE VUYST, A., VANBELLE, M., VERVACK, W. and IMBERECHTS, R. Analyse critique de la qualité des ensilages réalisés en région herbagère. [**Critical analyses of silage quality in pasture - producing regions.**] *Rev. Agric., Brussels,* 1955, **8,** 1159–1172. [Centre Recherches Zootech., Univ. Louvain.] English and German summaries.

In the Fagne pasture region of the south of Belgium silage is made usually in stacks from wilted herbage built up, a load at a time, with intervals of 1 or 2 days. To build a stack may take 15 days to a month. When complete it is covered with a layer of earth supported by a wooden frame. The sides are not protected : no preservative is used and heating is not controlled.

Samples were taken from 83 silos, 69 stack silos, 12 concrete silos and 6 tower silos of steel ; 75 had no preservative and of these 62 were stack silos; *p*H, lactic, acetic and butyric acids and total and ammonia N were estimated. The results are analysed statistically. Quality was equally bad in stack and closed silos if, as was usual, heating was not controlled ; *p*H was high, average 5·35 ; butyric acid was high and lactic acid low ; in two-thirds of the silos more than 15 per cent. of protein was lost and the ratio of ammonia to total N was above 30 per cent. The recommendation is to make " cold " silage from chopped, wilted herbage.

I. Leitch.

2836

BRATZLER, J. W., COWAN, R. L. and SWIFT, R. W. **Grass silage preservation with sodium metabisulfite.** *J. Animal Sci.,* 1956, **15,** 163–176. [Pennsylvania State Univ., University Park.]

The 1952 experiments described in the first part of the paper have been more fully reported elsewhere (*Pennsylvania Agric. Exp. Stat. Bull.* 597 (1955)) ; for preliminary reports see Absts. 3322, Vol. 25 ; 201, Vol. 26). Materials, unwilted, and additions per ton were : orchard grass, chopped, 8 lb. sodium metabisulphite or 80 lb. molasses, or nothing ; alfalfa and bromegrass, 7·5 or 10·5 lb. bisulphite or 70 lb. molasses, or nothing ; alfalfa, chopped, 9·4 or 36·4 lb. bisulphite (excessive) or nothing ; alfalfa, chopped, 8 lb. bisulphite or 5 lb. gaseous SO_2. The silages were examined and tested with sheep and cattle after 4 summer or 6 winter months. All the silages made with sodium metabisulphite, except that with the highest amount, had better colour and odour, and the first 2 kinds had more carotene, than the silages made with molasses or without addition, and losses of carbohydrate were generally at least halved, with a saving more than enough to pay for the chemical. Trials with sheep showed that total digestible nutrients exceeded those of silage made without addition, and cattle readily ate the bisulphite silages.

Further experiments were made in 1953 on alfalfa, with 8 lb. bisulphite or nothing ; red clover, with 7 lb. bisulphite, 112 lb. molasses or nothing ; and a mixture of the two with dried beet pulp, with or without 11 lb. bisulphite. The addition of bisulphite again improved silage quality and reduced losses ; molasses and dried beet pulp improved quality somewhat, but did not reduce losses.

W. M. Deans.

2837

SUTTER, A. Silierungsversuche mit einem streufähigen Sicherungszusatz. [**Silage experiments with a powder preservative.**] *Schweiz. Landwirtsch. Monatsh.,* 1956, No. 1, Sonderheft 60. Geburtstag. Prof. Crasemann, 66–71. [Chem. Fabrik Uetikon.]

In spring and autumn 1954 trials were made on 17 farms with Conservit, a powder based on salts containing SO_2 with other preservatives, added at the rate of 500 g. per 100 kg. to grass, clover-grass or other mixtures, generally fresh and unchopped. In 16 of the 24 trials similar material was ensiled with A.I.V. acid or formic acid for comparison. Samples were taken after 6 to 8 weeks and from the spring silages also in late autumn.

All but 3 of the silages were considered good ; the failures were ascribed to loose packing. The Conservit silage was greenish, darkening rapidly on exposure ; the smell was grassy rather than aromatic and not so penetrating as that of the comparison silages. It was readily eaten without ill effect. The mean *p*H was 4·6 compared with 4·0 for the comparison silages, but the usual limiting value of 4·2 does not apply to Conservit silage. The amounts of ammonia and lactic acid were about the same, but the Conservit silage had less acetic and butyric acids. Small-scale tests not reported in detail suggested that losses of nutrients would be of the same order as from A.I.V. silage, about 10 per cent. The crop can be ensiled wet or dry ; wilting is not recommended.—W. M. Deans.

2838

KEMBLE, A. R. **Studies on the nitrogen metabolism of the ensilage process.** *J. Sci. Food Agric.,* 1956, **7,** 125–130. [Dept. Chem., King's Bldgs., Univ. Edinburgh.]

With quart milk bottles as containers, bad and good silage was made from young perennial ryegrass (4·71 per cent. N in the dry matter) by adding a suspension of anaerobic bacteria, or a

suspension of lactobacilli along with glucose solution. After storage at 30° C. for 1 and 3 days and 1, 3, 8 and 21 weeks, total and soluble N, volatile base, total amide, glutamine, α-amino N, alcohol-insoluble peptide N and free amino acids were estimated by methods described earlier (Absts. 304, 305, Vol. 25). Also, young timothy from a sterile growth chamber, ensiled in a test tube, was examined after 16 days.

The results are tabulated and show a rapid rise of amino acids in the first 3 days; even in the good silage, about one-third of the protein was broken down at this stage. Later, even at *p*H 3·8 there was a slow steady rise of soluble N, so that it was possible to have a silage with the *p*H, volatile base content and odour of good silage although half the original protein had been broken down. The amounts of amino acids found, except for alanine in the bad silage, were less than those calculated from the rate of protein breakdown. Results for the silage from sterile grass indicated that the excess alanine, and the rapid initial breakdown of protein, are due to the plant enzymes, not to micro-organisms.—W. M. Deans.

2839

ANDERSON, K. J. **Microbiology of silage.** *Nature*, 1956, **177**, 96–97. [Dept. Agric. Botany, King's Coll. (Univ. Durham), Newcastle upon Tyne.]

About 40 g. mixed perennial ryegrass and white clover was packed under sterile conditions into small glass tubes. Lactobacilli were present in relatively small numbers in the fresh grass. After 7 weeks the numbers in long or chopped grass packed without addition had greatly increased. Addition of sterile water or 0·2 g. sodium metabisulphite resulted in a higher *p*H. Water increased the numbers of coliform bacilli and anaerobic spore formers. Metabisulphite considerably reduced the total bacterial count.

The best silage was from long grass without addition and the worst from wet long grass; that made with metabisulphite had a pleasant smell but an unnaturally bright green colour.

J. L. Corbett.

See also Absts. 2711, 2856, 2872, 2904, 2919, 2957, 3015, 3111, 3800.

CULTURE OF MICRO-ORGANISMS FOR FOOD

2840

CHALLINOR, S. W. and DANIELS, N. W. R. **Fat production by inositol-deficient yeast.** *Nature*, 1955, **176**, 1267–1268. [Dept. Appl. Biochem., Univ. Birmingham.]

Yeast cells growing in a medium deficient in inositol became unhealthy in appearance and were easily ruptured to liberate fat. The yield of fatty substances from cells harvested after 5 days, dried, ground and extracted with light petroleum was 24·5 per cent., compared with only 1·6 per cent. from normal cells. When the source of N, ammonium hydrogen phosphate (0·237 per cent.), in the medium was decreased the fat was not so easily liberated and extraction was not quite complete, although the yields were not greatly different. Only about 9 per cent. less fat was obtained when grinding was omitted.—A. Hepburn.

2. CHEMICAL COMPOSITION OF FOODSTUFFS

(*Except Vitamins, for which see Section* 3)

ENERGY VALUE, PROXIMATE PRINCIPLES AND INORGANIC CONSTITUENTS

GENERAL

2841

TITUS, H. W. **Energy values of feedstuffs for poultry.** Reprinted from *The Scientific Feeding of Chickens*, Interstate Printers and Publishers, Inc., Danville, Ill., 1955, pp. 245–267, by Limestone Products Corporation of America, Newton, N.J.

Credit is given to G. S. Fraps of the Texas Agric. Exp. Stat. for most of our knowledge of *productive energy* of feeds for poultry. His definitions are discussed. Fraps ignores crude fibre in making his computations, although 10 per cent. or more of the crude fibre of many grains and 40 per cent. or more of the crude fibre of a mixed feed may be digested. His calculations of metabolisable energy are faulty in that they assume that protein and starch have the same value, 4·2 Cal. per g. and fat has 2·25 times that value. But protein has on the average a value of only 3·84 Cal. per g. and a carbohydrate such as sucrose, found in appreciable quantity in some feeds, has a value of only 3·96 Cal. per g. And again, crude fibre is ignored. Productive energy is defined as

net energy as measured by stored protein and fat. Storage can never be measured accurately, since it cannot be estimated in the same chicks, and maintenance requirements cannot be accurately distinguished. Fraps's equations involve assumptions that are not correct. Further, productive energy value differs with what is produced ; there are no data for productive energy values for eggs.

There are other reasons why Fraps's productive energy values should not be used blindly. The data he uses for composition are not always *generally* valid and hence his " factors " for computing " effective digestible nutrients " and energy value are unreliable.

Tables 15 to 19 make comparisons between data for digestibility as given in the textbook from which this chapter is reprinted, p. 14, and some of Fraps's data and the derived data for total digestible nutrients, metabolisable and productive energy; factors for computing energy values ; protein, total and digestible, T.D.N., Fraps's productive energy calculated with digestibility data from the textbook, and (textbook) metabolisable energy for a list of the common poultry feeds, and finally Fraps's productive energy as originally given for much the same list.—I. Leitch.

2842

CARPENTER, K. J. and CLEGG, K. M. **The metabolizable energy of poultry feeding stuffs in relation to their chemical composition.** *J. Sci. Food Agric.*, 1956, **7**, 45–51. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Brown Leghorn × Light Sussex hens were used in metabolism experiments with a 13-hr. day, a temperature of 50° F. and 6-day collections. Cereals were given with Ca and P, NaCl and cod liver oil, or with these supplements and 8 per cent. casein. There was little difference between the results. Cereals studied were maize, sorghum, wheat (2 samples), barley (2), oats (3), wheat offals (3 grades) and maize gluten feed ; mixed rations were maize and fishmeal, maize and soya bean meal, barley and fishmeal, and mixed cereals. Table 2 shows the composition in terms of crude protein, ether extract, fibre, ash, nitrogen-free extract, starch and sugars ; and gross energy by bomb calorimeter, metabolisable energy as estimated from the digestion experiments by deduction of the gross energy of the excreta, and metabolisable energy as computed from the formula 53 + 38 (per cent. crude protein + 2·25 × per cent. ether extract + 1·1 × per cent. starch + per cent. sugar).

Metabolisable energy as a percentage of gross energy was least for coarse bran and greatest for maizemeal. The proportion of N-free extract from starch plus sugars varied from 27 per cent. for coarse bran to 87 per cent. for sorghum. The prediction formula underestimated metabolisable energy in 7 of the 9 cereal samples and overestimated it in wheat offal and 3 of the 4 mixed rations. Alternative formulae, including one with a correction for crude fibre, did no better. Comparisons are made with earlier data.

When requirements, *e.g.*, for protein as estimated with different rations are re-computed in relation to metabolisable energy instead of weight of ration, discrepancies disappear.—I. Leitch.

2843

DAVIS, G. K. **Trace elements from feed to food.** *J. Agric. Food Chem.*, 1956, **4**, 124–127. [Florida Agric. Exp. Stat., Gainesville.]

See also Abst. 2763.

FOODSTUFFS OF ANIMAL ORIGIN

Milk and Milk Products

2844

OSMOND, A. **The composition of mature human milk in southern Tasmania.** *Med. J. Austral.*, 1953, i, 811–814. [Pub. Health Dept., Tasmania.]

In child welfare centres in and around Hobart 24-hour samples of milk were collected in the late autumn and winter from 24 healthy nursing mothers, aged from under 20 to over 40 years, with infants aged between 8 and 24 weeks. All continued to feed their babies for at least 3 weeks after the sample was taken. Milk was expressed from one breast in an amount equal, if possible, to that taken by the infant from the other breast. The expressed milk was well mixed ; 1/5 of it was taken for analysis, and all the fractions were pooled and stored in the refrigerator.

The range within which 95 per cent. of the values for nutrients, in g. per 100 g., might be expected to fall was for protein (Kjeldahl) 0·94 to 1·30, fat (Gerber) 3·16 to 5·88 and carbohydrate (by difference) 6·75 to 7·55. The calculated energy value was 16·7 to 23·8 Cal. per 100 g. Ca, P and ash were estimated also.

The babies were weaned when from 15 to 40 weeks of age ; no relation existed between the duration of lactation or age of the baby and the composition of the milk at the time of sampling. The age of the mother had no influence on any constituent except fat, which was lower in mothers under 20 years of age.

From other data collected during the investigation, it was concluded that a single test feed, or the analysis of an isolated 24-hour-sample of milk from a nursing mother, is of doubtful value for any practical purpose.—M. H. Pierce.

2845

MONTREUIL, J. Structure de deux triholosides isolés du lait de femme. [**Structure of two triholosides isolated from human milk.**] *C.R. Acad. Sci.*, 1956, **242,** 192–193.

Two trisaccharides isolated from human milk (see Abst. 250, Vol. 25) were treated with dilute Na_2CO_3 solution at 100° C. for 5 min. This procedure transformed the reducing group into a ketose (fructose), which was then degraded to leave a disaccharide. One trisaccharide so treated was shown by chromatography to yield a trisaccharide containing fucose, galactose and fructose and a disaccharide containing fucose and galactose. The structure was concluded to be α-L-fucosido-2β-D-galactosido-4-D-glucose. The other trisaccharide yielded only galactose and fucose and the structure was concluded to be β-galactoside-4 $\left.\begin{matrix}\\ \beta\text{-fucosido}\end{matrix}\right\rangle$glucose.

A. Hepburn.

2846

MONTREUIL, J. Structure d'un tétraholoside isolé du lait de femme. [**Structure of a tetraholoside isolated from human milk.**] *C.R. Acad. Sci.*, 1956, **242,** 828–829.

A tetrasaccharide isolated from human milk was shown to have the structure

$$\left.\begin{matrix}\text{fucosido-galactosido}\\ \text{fucosido}\end{matrix}\right\rangle\text{glucose.}$$

A. Hepburn.

2847

RAPI, G. and ROSSI, R. Ricerca degli ormoni steroidi nel latte umano ; (alcuni rilievi sulla reazione di Porter e Silber). 1. Indagini sul colostro. [**Steroid hormones of human milk, with comments on the reaction of Porter and Silber. 1. Experiments on colostrum.**] *Riv. Clin. pediat.*, 1955, **56,** 267–280. [Ist. Chim. Organ., Univ. Florence.] English and French summaries.

Steroid hormones were extracted from a pooled sample of from 500 to 600 ml. human colostrum by the method of Kuizenga and Cartland (*Endocrinology*, 1939, **24,** 526). The extract was tested for power to promote the survival of immature mice weighing from 9 to 11 g. from which the adrenal glands had been removed. The presence of adrenocortical steroids was demonstrated. Chemical tests were made on the extract of colostrum by the methods of Heard and Sobel (*J. Biol. Chem.*, 1946, **165,** 687), Porter and Silber (*J. Biol. Chem.*, 1950, **185,** 201) and Zimmerman [no reference], but failed to identify the steroids. It was found that a positive reaction in the test of Porter and Silber was given by dehydro*iso*androsterone as well.—E. M. Hume.

2848

LING, E. R. **The composition of milk and dairy products and methods of analysis.** *J. Dairy Res.*, 1956, **23,** 144–157. [Univ. Nottingham Sch. Agric., Sutton Bonington.]

A review.

2849

ASCHAFFENBURG, R. **Milk proteins and enzymes.** *J. Dairy Res.*, 1956, **23,** 134–143. [Nat. Inst. Res. Dairying, Univ. Reading.]

A review.

2850

WAITE, R., WHITE, J. C. D. and ROBERTSON, A. **Variations in the chemical composition of milk with particular reference to the solids-not-fat. 1. The effect of stage of lactation, season of year and age of cow.**

ROBERTSON, A., WAITE, R. and WHITE, J. C. D. **2. The effect of heredity.** *J. Dairy Res.*, 1956, **23,** 65–81 ; 82–91. [Hannah Dairy Res. Inst., Kirkhill, Ayr ; Inst. Animal Genetics, Edinburgh.]

1. Between February 1950 and November 1953 over 6000 samples of milk were collected from 33 milk-recorded farms in south-west Scotland. The cows were 814 pedigree Ayrshires, 374 dams and 504 daughters ; some dams had more than 1 daughter and, in a few cases, 3 generations were represented. The samples were composite ones of proportional amounts from consecutive evening and morning milkings, and numbered 6 from each cow at intervals of about 5 weeks. Estimations were made of total solids, fat, crude protein, casein and lactose and of solids-not-fat (SNF) by difference. Feeding and management followed local practice ; nearly half the cows calved in the first 4 months of the year, and winter feeding was with hay, straw and roots for maintenance and concentrates for production ; in summer there was grazing with only very small amounts of concentrates. The data for 4988 samples of milk were analysed statistically in order to study separately the effects on milk composition of stage of lactation and of season.

With advancing lactation there was for yield and lactose content a rise to a maximum 45 days after calving and thereafter a steady fall. Values for the other constituents moved in the opposite direction to a minimum at 45 days for SNF, crude protein and casein and at 75 days for total solids and fat, and thereafter rose steadily until the end of lactation. The effects of season were both smaller and more irregular. Yield rose in the early part of the year to a maximum in May or June and then fell to a minimum in October or November. Fat was highest in October and lowest in June. The curves for crude protein and casein showed

peaks in May-June and September; their lowest levels were between January and March. Lactose varied little between January and June and after falling remained at a lower level from August to December. Both total solids and SNF were lowest in March and April, but while SNF were highest in May and June, total solids were so in October.

There was no evidence from cell counts of inflammatory disease having had any appreciable effect on the composition of the milk. In comparison with those of Tocher, "Variations in the Composition of Milk", H.M.S.O., Edinburgh, 1925, the data support the view that there has been little change in the last 30 years in the composition of milk from Ayrshire cows in Scotland (see also Davis, Abst. 1411, Vol. 23). Among the 4988 samples 782 with less than 8·5 per cent. were deficient in SNF and 97 with less than 3 per cent. were deficient in fat. The proportion of samples low in SNF increased with the number of lactations.

2. The lactation records were used to estimate heritability by the dam-daughter correlations within herds. The variation of SNF was determined largely by that of casein. The correlation between lactose and casein also was positive. There were positive and significant genetic correlations between casein and both fat and lactose; selection for fat content and yield may check a decline in SNF. Analyses for SNF are desirable where the aim is to raise the level in a herd.

D. Harvey.

2851

NICHOLS, L. E. and FEW, F. G. **Seasonal variation in the composition of milk.** *Queensland Agric. J.*, 1955, **81**, 295–300.

A brief account of work already published (Abst. 1696, Vol. 22), with additional curves showing the improvement in butterfat content of milk during summer and autumn when cows were given up to 7 lb. daily of long hay from grass or Sudan grass.

W. M. Deans.

2852

MEREGALLI, A. La variabilità del contenuto proteico del latte vaccino. [**Variability of the protein content of cow's milk.**] *Riv. Zootec.*, 1955, **28**, 350–351.

A discussion of Dutch work.

2853

SCHÄFER, K. H., BREYER, A. M., HORST, W., KARTE, H. and LENZ, W. Die Proteinbindung des Eisens in der Milch. [**Binding of iron by protein in milk.**] *Klin. Wochenschr.*, 1956, **34**, 300–304. [Kinderklin., Univ. Hamburg, Eppendorf.]

The nature of the iron complex in human and cow's milk was studied by precipitation with ammonium sulphate and sodium sulphate, by electrophoresis in solution and on paper and by ultra-centrifuging. The protein carrying the Fe was identified in the globulin component and not in the lactalbumin. The complex containing Fe showed a pale red colour in centrifuged samples and the colour was increased in milk from subjects receiving treatment with Fe. The capacity of milk protein to bind Fe was less than that of serum protein. The coloured protein-iron complex was separated by paper electrophoresis in the region which was associated with β-globulin in serum electrophoresis. The possible similarity of the proteins capable of binding Fe in milk and blood is discussed.

A. M. Copping.

2854

MULDER, H. De smaak van melk. [**The taste of milk.**] *Voeding*, 1956, **17**, 45–50. [Landbouwhogesch., Wageningen.]

The true taste of milk comes from lactose, not from its protein or fat, except in late lactation when salt content rises and lactose falls, and then milk tastes salty, or watery. Secondary tastes derive from abnormalities of the cow, *e.g.*, ketosis, from feed (hay is good, silage, roots and leafy crucifers are bad), from chemical changes due to enzyme action or processing, or from contaminants. Temperature greatly affects acceptibility; flavouring has little effect.—I. Leitch.

2855

BHIMASENA RAO, M. and DASTUR, N. N. **Hydrogen-ion concentration of milk. 1. *p*H of milk of animals of different breeds and individuals.** *Indian J. Dairy Sci.*, 1955, **8**, 158–172. [Nat. Dairy Res. Inst., Karnal.]

2856

MAURON, J., MOTTU, F., BUJARD, E. and EGLI, R. H. **The availability of lysine, methionine and tryptophan in condensed milk and milk powder. *In vitro* digestion studies.** *Arch. Biochem. Biophys.*, 1955, **59**, 433–451. [Res. Lab., Nestlé's Products, Vevey, Switzerland.]

The destruction, taken as the amount not recovered by acid hydrolysis, and the inactivation, taken as the amount liberated by this treatment but not by enzymic hydrolysis, of α-amino groups, tryptophan, tyrosine, methionine and lysine were estimated in fresh and boiled milk, spray-dried and roller-dried milk, sweetened condensed milk and evaporated milk. The inactivation was measured by a digestibility test with pepsin and pancreatin *in vitro*.

Tryptophan, tyrosine and methionine were not destroyed in any milk. The percentage destruction of lysine was spray-dried milk 3·6, sweetened condensed milk 4·8, evaporated milk 8·4, roller-dried milk 13·3, slightly scorched roller-dried milk 26·5. The inactivation of lysine in the last 3 was 11·2, 20·0 and 45·8 per cent. Six per cent.

destruction and 12·4 per cent. inactivation of α-amino groups was found in the scorched roller-dried milk. Tryptophan and tyrosine were not inactivated and methionine was slightly inactivated in roller-dried milks only.

Destruction and inactivation of lysine were closely correlated. Both were attributed to a sugar-amine condensation. The availability of lysine was calculated by deducting total deterioration, *i.e.*, destruction plus inactivation, from 100, the value given to fresh milk. The lysine availability (y) in industrial milks could be estimated from the lysine destruction (x) by means of the regression equation

$$y = 109{\cdot}58 - 3{\cdot}099\,x.$$

A. Hepburn.

2857

HEINEMAN, H. E. O. and WEGNER, M. I. **Developments in consumer dairy products.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 115–118. [Res. Div., Pet Milk Company, St. Louis, Mo.]

Report of a lecture dealing with non-fat dried milk solids, modified fluid milks and low-fat dairy spreads and frozen desserts.

2858

SHORLAND, F. B., GERSON, T. and HANSEN, R. P. **Branched-chain fatty acids of butterfat. 7. Investigation of the C_{13} acids.** *Biochem. J.*, 1955, **61,** 702–704. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

For part 6 see Abst. 3355, Vol. 25.

7. By ester fractionation and low-temperature crystallisation, the straight-chain fatty acid *n*-tridecanoic acid and the branched-chain acids (+)-10-methyldodecanoic acid and 11-methyldodecanoic acid were identified in butterfat in amounts of approximately 0·03, 0·01 and 0·05 per cent., respectively, of the total fatty acids.—G. A. Garton.

2859

SCHORMÜLLER, J., GLATHE, M. and HUTH, H. Beiträge zur Biochemie der Käsereifung. [**Biochemistry of cheese ripening.**] 15. Das Verhalten des Serins und Threonins im Verlaufe der Reifung. [**15. Behaviour of serine and threonine during ripening.**]

SCHORMÜLLER, J. and LAHMANN, E. 16. Die Phosphatasensysteme des Sauermilchkäses und ihre Entwicklung während der Reifung. [**16. The phosphatase systems of sour milk cheese and their development during ripening.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1956, **103,** 14–32; 211–238. [Inst. Lebensmittelchem., Tech. Univ., Berlin-Charlottenburg.]

For references to previous parts see Abst. 171, Vol. 26.

15. For the estimation of serine and threonine in ripening Harz cheese the methods of Rees (Abst. 3812, Vol. 16) and of Neidig and Hess (Abst. 1232, Vol. 23), were tested and the former was adopted.

Nearly 20 per cent. of the serine was lost during normal ripening or ripening without added salts; much less during rapid ripening. Only about 7 per cent. of the threonine was lost during normal ripening; much more during rapid ripening or ripening without salt. In view of the biological importance of threonine, rapid ripening is not recommended. Only small amounts of the free amino acids were found in ripe cheese.

The enzymic breakdown of serine and threonine in cheese suspensions with or without added B vitamins was also studied. In the first few days of ripening pyridoxal phosphate affected serine and threonine equally, but later it increased the loss of serine much more than that of threonine. Biotin also had 3 times as great an effect on serine as on threonine. Pantothenic acid, and to a less extent folic acid, affected both equally. The breakdown products α-alanine and α-aminobutyric acid were detected by paper chromatography. In the discussion it is suggested that, though the presence of B vitamins in cheese is desirable on nutritional grounds, too great amounts may interfere with the normal ripening process and lead to breakdown of essential amino acids.

16. Phosphatase activity was measured with disodium phenyl phosphate as substrate by the method previously described (Abst. 3259, Vol. 25). Ripe cheese contained an alkaline phosphatase, *p*H optimum 9·95 to 10·2, and smaller amounts of an acid phosphatase, *p*H optimum 5·2 to 5·7. The alkaline phosphatase was not that of the milk but developed during ripening, rising to a maximum after 10 to 14 days and starting in the rind. The acid phosphatase was present in the curd and rose to a plateau after 10 or 11 days. There was also a pyrophosphatase, *p*H optimum 6·3. Their properties are described in detail. The power of the acid phosphatase to split fructose diphosphate and pyridoxal phosphate indicates that it may play an important part in cheese ripening.—W. M. Deans.

2860

RANDOIN, L. and CAUSERET, J. La valeur nutritive des produits laitiers. 3. Les fromages. [**Nutritive value of milk products. 3. Cheeses.**] *Bull. Soc. sci. Hyg. aliment.*, 1955, **43,** 227–257.

For previous parts see Titles 4020, Vol. 23; 210, Vol. 24.

See also Absts. 2727, 3130.

Eggs

2861

GREENWOOD, A. W. and BOLTON, W. **Variations in the amounts of thick and albumen in**

hen's eggs with the age of the bird. *J. Agric. Sci.*, 1956, **47**, 40–43. [Poultry Res. Centre, West Mains Rd., Edinburgh 9.]

See also Abst. 2718.

Meat (All Kinds)

2862

NOTTINGHAM, P. M. **The connective-tissue content and toughness of sheep muscles.** *J. Sci. Food Agric.*, 1956, **7**, 51–56. [Dominion Lab., D.S.I.R., Wellington, N.Z.]

In rectangular blocks of semimembranosus, rectus femoris, gluteus superficialis, longissimus dorsi and psoas muscle taken 24 hr. after slaughter from sheep between 1 and 2 years old, mostly Southdown × Romney crosses, shear force parallel to and across the muscle fibres was measured and connective tissue content was ascertained by extraction with cold 0·1 *N* NaOH and estimation of N in the residue.

Connective tissue ranged from 0·39 to 0·64 per cent. of wet weight and connective tissue N formed on the average from 2·14 to 3·60 per cent. of total protein N, varying with the muscle and from animal to animal. When the results from 17 muscles of 7 sheep were combined, the correlation coefficient between connective tissue content and shear force parallel to the fibres was + 0·784, but connective tissue content and shear force across the fibres were not related. As meat is usually carved across the grain, this suggests that connective tissue content is one of the factors affecting the toughness of mutton.—W. M. Deans.

2863

BAKER, L. C. **The chemical composition and nutritional value of bacon.** *J. Sci. Food Agric.*, 1956, **7**, 179–186. [Lyons Labs., Cadby Hall, Kensington, London, W.14.]

A lecture review.

2864

EHEART, M. S., THOMAS, H. R. and TAYLOR, J. C. **Palatability and chemical differences in cooked Smithfield hams from full-fed hogs on peanut and corn rations.** *Food Res.*, 1955, **20**, 548–553. [Dept. Biochem. Nutrit., Virginia Agric. Exp. Stat., Blacksberg.]

Cooked hams from pigs fed on groundnuts were judged to be juicier, more tender and less salty, and had a less compact lean and a less desirable fat layer than hams from pigs fed on maize. There was little difference in chemical composition except for a higher vitamin B_1 content of the hams and a higher iodine number of the fat in the pigs fed on groundnuts.—J. S. Thomson.

2865

PRESTON, R., CHENG, E., STORY, C. D., HOMEYER, P., PAULS, J. and BURROUGHS, W. **The influence of oral administration of diethylstilbestrol upon estrogenic residues in the tissues of beef cattle.** *J. Animal Sci.*, 1956, **15**, 3–12. [Iowa Agric. Exp. Stat., Ames.]

A method capable of detecting 2 μg. stilboestrol per kg. tissue by its effect on weight of the mouse uterus showed no residue of oestrogen in tissues of beef cattle given stilboestrol.—T. R. Preston.

2866

TURNER, C. W. **Biological assay of beef steer carcasses for estrogenic activity following the feeding of diethystilbestrol at a level of 10 mg. per day in the ration.** *J. Animal Sci.*, 1956, **15**, 13–24. [Dept. Dairy Husb., Missouri Agric. Exp. Stat., Columbia.]

Samples of edible meat, glands and organs, depot fat, blood and digestive tract from 20 Hereford steers given stilboestrol and 10 controls given none, were tested for oestrogenic residues by the mouse uterine weight technique. No oestrogen was detected in any of the tissues except the kidney and lungs of treated animals, which contained 0·004 and 0·012 p.p.m. oestrogen, respectively. Tests on the feeds demonstrated the oestrogenic potency of the ration containing stilboestrol and also revealed a surprisingly high oestrogenic activity of the control diet. Faeces from dairy cattle given 10 mg. stilboestrol daily revealed oestrogenic activity comparable with that of the feed containing stilboestrol.—T. R. Preston.

2867

WOOD, T. **Some applications of paper chromatography to the examination of meat extract.** *J. Sci. Food Agric.*, 1956, **7**, 196–200. [Res. Dept., Bovril, Ltd., 148 Old St., London, E.C.1.]

Protein (12 per cent.) was removed by dialysis and inorganic salts (29 per cent.) electrolytically. The chief solvent mixture used for chromatography was butanol : acetic acid : water (60 : 15 : 25). Glutamic acid, serine, α- and β-alanines, glycine, proline, methylhistidine, carnosine, anserine, creatinine, creatine, methylguanidine, guanidine, choline, carnitine, hypoxanthine, inosine, urea and citrulline were identified: betaine and sugars were not detected.—H. G. Bray.

2868

HANSEN, R. P., SHORLAND, F. B. and COOKE, N. J. **The branched-chain fatty acids of ox fat. 3. The isolation of 14-methylpentadecanoic acid (*iso*palmitic acid) from ox perinephric fat.**

Biochem. J., 1955, **61,** 547–549. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

3. From the hydrogenated ox perinephric fat used in previous studies (Absts. 245, Vol. 22; 222, Vol. 26), 14-methylpentadecanoic acid was isolated, by ester-fractionation and low-temperature crystallisation, in amount corresponding to 0·1 per cent. of the total fatty acids.—G. A. Garton.

2869

HARTMAN, L., SHORLAND, F. B. and MCDONALD, I. R. C. **The *trans*-unsaturated acid contents of fats of ruminants and non-ruminants.** *Biochem. J.*, 1955, **61,** 603–607. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

The *trans* fatty acid content of the depot fats of several species of animals was estimated by infrared spectrophotometry. The depot fats of ruminants (ox, cow, fallow deer, sambur, goat and sheep) contained from 3·5 to 11·2 per cent. of *trans*-acids, and that of non-ruminants (rat, pig, horse, rabbit and pheasant) not more than 0·9 per cent. Certain marsupials, *e.g.*, wallaby and quokka, had depot fats in which the proportion of *trans*-acids ranged from 18·1 to 21·0 per cent.

It is concluded that *trans*-acids arise by hydrogenation by bacteria of dietary unsaturated fatty acids in the rumen or in the rumen-like stomach of the marsupial.—G. A. Garton.

2870

HART, P. C. Onderzoekingen omtrent de zachtheid van bacon. 2. Spekhardheid en chemische samenstelling. [**Studies on the softness of bacon. 2. Hardness of fat and chemical composition.**] *Landbouwk. Tijdschr.*, 1956, **68,** 307–313. [Inst. Veeteeltk. Onderzoek TNO, Utrecht.] English summary.

For part 1 see Abst. 57, Vol. 26.

2. Analysis of 345 samples of lard showed that method of extraction did not affect the results, nor did the curing process alter either iodine or thiocyanate value. These increased together, with increase in percentage of linoleic acid, and were inversely related to saturated fatty acids and to oleic acid, which showed little variation. Hardness of fat as assessed by thumb pressure was closely related inversely [not directly as stated in the English summary] to linoleic acid content.

I. Leitch.

See also Absts. 2699, 3196.

Fish

2871

HAMOIR, G. **Fish proteins.** *Advances in Protein Chem.*, 1955, **10,** 227–288. [Lab. Gen. Biol., Univ. Liège.]

2872

LAHIRY, N. L. and PROCTOR, B. E. **The microbiological determination of the essential amino acids in fish protein.**

PROCTOR, B. E. and LAHIRY, N. L. **Evaluation of amino acids in fish processed by various methods.** *Food Res.*, 1956, **21,** 87–90; 91–92. [Dept. Food Technol., Massachusetts Inst. Technol., Cambridge.]

(*a*) The 10 essential amino-acids were estimated microbiologically in the muscle of haddock, shad and pomfret. The values were comparable to those reported for beef and pork muscle.

(*b*) Dehydration or canning did not significantly affect the essential amino-acid composition of haddock or shad.—A. Hepburn.

2873

DOLORES GARCIA, M., LOVERN, J. A. and OLLEY, J. **The lipids of fish. 6. The lipids of cod flesh.**

OLLEY, J. **7. Phosphate esters in the lipids of haddock and cod flesh.** *Biochem. J.*, 1956, **62,** 99–107; 107–114. [Food Invest. Organiz., D.S.I.R., Torry Res. Stat., Aberdeen.]

For previous parts see Absts. 4042, Vol. 23; 229, 1642, Vol. 24; 274, Vol. 25.

6. Solvent extracts were prepared from 43·74 kg. cod flesh and fractionated as described for haddock flesh (Abst. 4042, Vol. 23). The total lipid, about 0·6 per cent., consisted of lecithin 35, waxes and alcohols 13, free cholesterol 8, phosphatidyl ethanolamine 7, free fatty acids 6, cholesterol esters 5, inositol lipids 2 and unidentified lipids 21 per cent. The unidentified lipids contained at least 2 types of phospholipins; one type had a fatty acid : glycerol : P ratio approximating to 4 : 2 : 1 and the other had a fatty acid : P ratio of about 4 : 1; its P : glycerol ratio has not yet been determined.

7. Phospholipin fractions from haddock and cod muscle were hydrolysed with KOH. The resulting K salts of phosphate esters from these hydrolysates were fractionated by different methods, including paper chromatography, differential solubility and stability to hydrolysis. These studies revealed the presence of a series of phosphate esters based on glycerol and small amounts of H_3PO_4 in some other combination.

A micro-chromatographic method for the estimation of glycerol was developed and by its application the ethanol-soluble phospholipins were shown to contain phosphate esters with more than 1 glycerol residue per P atom, suggesting bisphosphatidic acid structures.

The acid-periodate oxidation procedure was found to be a completely non-specific method for estimating glycerophosphate in biological material.

C. A. Garton.

2874

JOSHI, S. and MAGAR, N. G. **Nutritive value of some Bombay fish. 3. Phospholipids in fish.** *J. Univ. Bombay*, 1955, **23,** No. 5, 27–33. [Dept. Biochem., Inst. Sci., Bombay.]

See Absts. 4391, Vol. 24; 3363, Vol. 25.

3. Analyses of brain and muscle tissue from 22 different varieties of Bombay fish yielded the following range of data expressed as a percentage of dry weight: total phospholipins, 17·2 to 27·5 and 4·3 to 5·7; amino phospholipins, 14·8 to 29·9 and 3·7 to 5·3; total cholesterol, 4·8 to 8·9 and 0·3 to 0·8; free cholesterol, 4·7 to 9·8 and 0·2 to 1·15; ester cholesterol, 0·1 to 0·4 and 0·11 to 0·34; lecithin, 4·5 to 9·9 and 2·3 to 3·6; cephalin, 6·4 to 13·4 and 0·9 to 2·2; sphingomyelin, 2·4 to 4·3 and 0·2 to 0·6. The water ratio, *i.e.*, wet weight : dry weight, ranged from 3·9 to 4·4 and 4·2 to 4·9.

In contrast to fish muscle, the concentration of lipids in the brain did not vary within individuals of the same species.—A. Hepburn.

2875

SVASTI, K. **The mineral contents of *bilis*, a marine fish of Malaya.** *Philippine J. Sci.*, 1954, **83,** 365–379. [Dept. Chem., Univ. Malaya, Singapore.]

Several species of *Stolephorus* are eaten whole in Malaya under the name of *bilis*, fresh or more commonly dried. *S. pseudoheterolobus* is less than 9 cm. long; it is always on sale in the markets. The whole fish was analysed, fresh, cooked and dried. Statistical analysis of the results showed that the dried fish contained, per 100 g., moisture not less than 29·1, ash 16·6, protein 45·3, Ca 0·98 g. and Fe 8·5 mg. The contribution made to the diet by the fish was compared with different sets of standard allowances, and it was found to be a cheap and common source of protein, Ca and Fe. It contributes P also, but very little fat.—E. M. Hume.

2876

MORICE, I. M. and SHORLAND, F. B. **The isolation of *n*-pentadecanoic and *n*-heptadecanoic acids from shark (*Galeorhinus australis* Macleay) liver oil.** *Biochem. J.*, 1955, **61,** 453–456. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

By techniques which included fractional vacuum distillation of methyl esters and low-temperature crystallisation from organic solvents, *n*-pentadecanoic acid and *n*-heptadecanoic acid were isolated from the combined liver lipids of 31 male sharks in amounts corresponding to 0·28 and 0·17 per cent. of the total fatty acids.

G. A. Garton.

Other Types

2877

PATHAK, S. P. and DEY, L. M. **The fatty acid composition of Indian turtle fat.** *Biochem. J.*, 1956, **62,** 448–451. [Dept. Indust. Chem., Banaras Hindu Univ., India.]

The component fatty acids of the body fat of an Indian marine turtle (*Erthmochelies imbricata*) were estimated by ester fractionation. The fat was characterised by its high content of unsaturated acids, which accounted for 66·3 per cent. of the total, made up of C_{14} 1·3, C_{16} 12·9, C_{18} 23·9, C_{20} 20·7, C_{22} 4·6 and C_{24} 2·9 per cent. The saturated acids consisted of lauric 0·1, myristic 10·2, palmitic 15·0, stearic 7·2, arachidic 1·1 and behenic 0·1 per cent. of the total acids.—G. A. Garton.

FOODSTUFFS OF VEGETABLE ORIGIN

General

2878

OYENUGA, V. A. **The composition and nutritive value of certain feedingstuffs in Nigeria. 2. Concentrates.** *Empire J. Exp. Agric.*, 1955, **23,** 171–187. [Div. Animal Nutrit., Fac. Agric., Univ. Coll., Ibadan.]

See Abst. 239, Title 240, Vol. 26.

2879

KATALYMOV, M. V. Soderzhanie mikroelementov v urozhayakh sel'skokhozyaistvennykh kul'tur. [**Trace element content of agricultural produce.**] *Dokl. Akad. Nauk SSSR.*, 1955, **104,** 584–586. [Inst. Udobren. Insectofungid. MKhP, USSR.]

Trace element contents of a large number of vegetable and cereal crops are tabulated and compared for 2 different types of soil.—D. W. Taylor.

See also Abst. 2703.

Cereals

2880

BOURDET, A. Nos connaissances actuelles dans le domaine des protides des céréales. [**Present knowledge of the proteins of cereals.**] *Rev. Ferment. Indust. aliment.*, 1955, **10,** 235–244 (to be continued).

2881

FOLKES, B. F. and YEMM, E. W. **The amino acid content of the proteins of barley grains.** *Biochem. J.*, 1956, **62,** 4–11. [Dept. Botany, Univ. Bristol.]

The 4 chief protein components of barley, albumin, globulin, hordein (prolamin) and hordenin (glutelin), were analysed quantitatively for amino acids. The globulin, and especially the albumin, had an amino-acid composition similar to that of the protoplasmic protein of young barley seedlings

(Abst.1654, Vol. 24), but hordein and hordenin contained much more amide, glutamic acid and proline and less aspartic acid, glycine, lysine and arginine.

A. Hepburn.

2882

ADRIAN, J. Les plantes alimentaires de l'Ouest Africain. 1. Les mils et les sorghos. Valeur alimentaire. Usages. [**Food plants of West Africa. 1. Millets and sorghums. Food values. Uses.**]

ADRIAN, J. and SAYERSE, C. (with OSPITAL, T.) 2. Composition des mils et sorghos du Sénégal. [**2. Composition of millets and sorghums from Senegal.**] Organisme de Recherches sur l'Alimentation et la Nutrition Africaines, Dakar, 1954, pp. 167.

1. The greater part of this monograph (121 pp.) is a review of the literature on agronomy, chemical composition, physiological value, with special reference to amino acid supplementation, and the use in human or animal nutrition of millets (*Pennisetum* spp.) and sorghum. From theoretical considerations a mixture of extracted soya bean flour, milk and yeast, 94, 3 and 3 parts, is proposed as a suitable supplement to a diet of which these cereals are the main constituents.

2. Data are given for analyses of 32 samples of these grains, 17 of sorghum and 15 of millet, of which 21 were from the Agricultural Research Station at Bambey, Senegal and 11 were grown by the local people. The results refer to physical character of the grains, total composition except for fibre content, ash constituents Ca, P, Na and K, 11 amino acids, and vitamin B_1, riboflavin, nicotinic acid and vitamin B_{12}. Cultivation under the better conditions appeared to lead to higher contents of total protein, phenylalanine and threonine, and nicotinic acid in both cereals and of vitamin B_1 in sorghum; there was some evidence that Ca also was increased in millet.

There is as an appendix a reprint of Adrian's technique for estimating amino acids; see Title 4636, Vol. 25. [Some errors have been noted in the bibliography and in the names of authors.]

D. Harvey.

2883

ROHRLICH, M. and RASMUS, R. Versuche zur chemischen Differenzierung der Eiweiss-stoffe des Weizens und Roggens. 2. Untersuchungen über die Aminosäurezusamensetzung der Eiweiss-stoffe aus Aleuronzellen, Endosperm und Keim von Weizen und Roggen. [**Chemical differentiation of the proteins of wheat and rye. 2. Amino-acid composition of the proteins of aleurone cells, endosperm and germ of wheat and rye.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1956, **103,** 89–96. [Versuchsanst. Getreideverwertung, Berlin.]

For part 1 see Abst 34, Vol. 26.

2. Much of the protein could not be extracted from the aleurone cells of wheat or rye by water, 10 per cent. NaCl, 2 per cent. HCl or 72 per cent. alcohol at room temperature and is therefore assumed to be bound in the cells. Of the total protein of wheat and rye brans, albumin formed 21·3 and 18·1, globulin 13·7 and 16·6 and prolamin 9·8 and 17·0 per cent. Extracts and grain fractions were hydrolysed with 57 per cent. hydriodic acid and subjected to circular paper chromatography with a 4 : 1 : 5 mixture of *n*-butanol, glacial acetic acid and water as solvent and ninhydrin and other reagents for detection; several chromatograms are reproduced. Cysteine, lysine, histidine, arginine, glycine, serine, aspartic acid, glutamic acid, threonine, alanine, proline, tyrosine, valine, methionine, tryptophan, phenylalanine, leucine and *iso*leucine were always found. Germ and bran of wheat, and of rye, differed little in amino acid composition except that germ had a little more cysteine and lysine. Wheat gluten had very little lysine or arginine but was rich in glutamic acid; rye endosperm was rich in glutamic acid and also in arginine. No difference was detected between the amino acid compositions of albumin and prolamin from aleurone cells of wheat and those of rye. Since different fractions of endosperm protein of wheat or rye did not differ in amino acid composition, it was concluded that endosperm protein was an entity.—W. M. Deans.

2884

GILLES, K. A. and SMITH, F. **The carbohydrates of the Gramineae. 6. The nature of the water-soluble polysaccharides of the flour of wheat** (*Triticum vulgare*). *Cereal Chem.*, 1956, **33,** 29–37. [Minnesota Agric. Exp. Stat.]

For part 5 see Montgomery and Smith, *J. Amer. Chem. Soc.*, 1955, **77,** 2834, and for parts 3 and 4 see Abst. 1798, Vol. 25.

6. Wheat gums were extracted from the flour of spring and winter wheat by cold and warm water and by aqueous $(NH_4)_2SO_4$. The method of extraction greatly influenced the type of gum isolated. Extraction with $(NH_4)_2SO_4$ yielded a gum with the highest content of crude protein and pentosan. All the gums contained arabinose, xylose and glucose.—A. Hepburn.

2885

JA[C]QUOT, R., RAULIN, J., ADRIAN, J. and RERAT, A. Composición y valor alimenticio de las Lágrimas de Job (Lágrimas de San Pedro o trigo Adlay) (*Coix Lacryma-jobi*). [**Composir tion and feeding value of Job's tears grass o- adlay** (*Coix lacryma jobi*).] *Arch. venez. Nutricion,* 1955, **6,** 3–21. [Lab. Bioch. ..., Centre Nat. Recherche Sci., Bellevue ... unc., English and German summaries.

The percentage composition of the grain of Job's tears grass (adlay) is moisture 12·49, ash 1·92, protein 14·98, lipids 7·34, assimilable carbohydrates, mainly starch, 60·40 and indigestible carbohydrates 2·95 ; it compares well with medium French wheat. The bran contains ash 18·04, P 0·097 and Ca 0·194 per cent. and 35·5 per cent. cellulose, which makes it useless for non-ruminants. The protein composition of the grain is much like that of maize ; it is rich in leucine and deficient in other essential amino acids, especially tryptophan and lysine. The vitamin content is comparable to that of other cereals.

In digestibility studies with rats a diet consisting solely of whole flour of Job's tears for 15 days allowed slow growth and positive balances of N, Ca and P. The digestibility was identical with that of wheat, but Ca and P were relatively poorly utilised, perhaps because of a high content of phytic acid. In growth experiments with rats Job's tears was less valuable than wheat, even when supplemented with lysine or methionine. The biological value of the protein was only 20, the lowest of any cereal studied.—D. Duncan.

See also Absts. 2670, 2818, 3505.

Roots

2886

BLACKETT, R. D. **Dry-matter distribution in the fodder-beet root.** *Empire J. Exp. Agric.*, 1955, **23,** 202–205. [Univ. Sch. Agric., King's Coll., Newcastle upon Tyne.]

The results showed great variations in distribution of dry matter within the root. The pattern of distribution differed with variety. It was concluded that a diagonal core gave the most satisfactory estimate of dry matter but that at least 20 roots should be sampled.—J. L. Corbett.

2887

ANDERSON, D. M. W. and GREENWOOD, C. T. **Carbohydrates of the roots of the parsnip, *Pastinaca sativa*.** *J. Chem. Soc.*, 1956, January, 220–221. [Dept. Chem., Univ. Edinburgh.]

See also Abst. 2666.

Leafy Vegetables

2888

IMPERIAL CHEMICAL INDUSTRIES LTD. **The cultivation, composition and utilization of the kales.** *Bull.* No. 5 (revised), July 1955, pp. 46. [Jealott's Hill Res. Stat., Bracknell, Berks.]

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Legumes

2821, 2832, 3799.

Fruits

2889

ANTONIANI, C. and SERINI, G. Correlazione tra tenore in 2–3 butilenglicole e stato di maturazione dei prodotti frutticoli. 1. *Pyrus malus* Linn. [**Correlation between 2: 3-butyleneglycol content and ripening of fruit. 1. *Pyrus malus*, Linn.**] *Ann. Sper. agrar.*, 1955, **9,** 1167–1173. [Staz. Sper. Freddo, Milan.] English summary.

2890

MARAÑON, L. T., CRUZ, A. O. and TUASON, A. M. **Composition of pili pulp and pili-pulp oil from the fruit of *Canarium ovatum*.** *Philippine J. Sci.*, 1954, **83,** 359–363. [Inst. Sci. Technol., Manila.]

Canarium ovatum, Engl. (Burseraceae), is a tree which bears large nuts surrounded by pulp. The pulp was found to contain 72·8 per cent. moisture. When dried the percentage composition was protein 8·0, ether extract 33·6, crude fibre 3·4, ash 9·2 and carbohydrate by difference 45·8, and the energy value was 533 Cal. per 100 g. The composition resembled that of the flesh of the avocado pear. The amount of extract with different fat solvents was about the same. Physical and chemical constants for the purified oil were established. The iodine number was 72·2. To the glycerides of fatty acids, oleic contributed 56·7 per cent. and linoleic 13·5 ; the rest were saturated.

E. M. Hume.

2891

SUBRAHMANYAN, V., BAINS, G. S., NATARAJAN, C. P. and BHATIA, D. S. **The carbohydrates of tender kernel of palmyra palm (*Borassus flabellifer*, L.)** *Arch. Biochem. Biophys.*, 1956, **60,** 27–34. [Div. Food Processing, Central Food Technol. Res. Inst., Mysore, India.]

The tender kernels of the palmyra palm are relished in India for their thirst-quenching properties. On analysis they yield 92·7 per cent. moisture and sucrose 0·38, fructose 1·46 and glucose 3·21 per cent. The polysaccharide present yielded D-galactose and D-mannose.—J. S. Thomson.

2892

DELPHAUT, J., MOURGUE, M. and DOKHAN, R. Étude de la toxicité des proteines des graines de Ricin. [**The toxicity of the proteins of castor seed.**] *C.R. Soc. Biol.*, 1955, **149,** 1582–1585. [Lab. Pharm., Fac. Méd., Marseilles.]

2893

BABAKHODZHAEV, N. K. Usvoyaemost pishchevogo khlopkovogo masla. [**Digestibility of edible cottonseed oil.**] *Vop. Pitan.*, 1956, **15,** 43–44. [2. Med. Inst. I.V. Stalina, Moscow.]

Cottonseed oil is an important item of human diet in the Central Asian republics. A sample of bottled refined oil from Tashkent had sp. gr. 0·9192, viscosity 48·5, refractive index 1·4728, iodine number 105·1, acid number 0·216 and saponification number 194·3. The organoleptic properties after heating were good.

The digestibility of the oil, in 3-day tests with 3 healthy men, was 95·88 per cent., compared with butterfat, 95·31 per cent. The high digestibility may be due to the high content of unsaturated fatty acids.—D. Duncan.

Other Types

2894

MABROUK, A. F. and BROWN, J. B. **The *trans* fatty acids of margarines and shortenings.** *J. Amer. Oil Chem. Soc.*, 1956, **33**, 98–102. [Dept. Agric. Biochem., Ohio State Univ., Columbus.]

The *trans* fatty acid content of 6 samples of margarine and 5 samples of shortenings was estimated by infrared spectrophotometry. Calculated as trielaidin, the margarines contained from 32·9 to 4·17 per cent. of *trans*-components and the shortenings, with 1 exception, from 22·7 to 36·6 per cent. The exception was a blend of meat and vegetable fats (" Swift'ning ") the *trans*-glyceride content of which was 0·4 per cent.; unlike other fats examined, this blend had not been subjected to hydrogenation.

Methyl esters prepared from 1 sample of shortening and 1 sample of margarine were distilled *in vacuo* and the fractions were analysed by ultraviolet and infrared spectrophotometry. All the fractions contained *trans*-acids, though the largest amounts were present in the C_{18} group of acids; low-temperature crystallisation of the combined C_{18} esters from the margarine sample yielded a fraction containing 90 per cent. of *trans*-acids.

It is concluded that the unsaturated fatty acids of most commercial margarines and shortenings (prepared by hydrogenation of vegetable oils, especially cottonseed and soya bean oils) are an extremely complex mixture of many of the theoretically possible geometric and positional isomers of oleic and linoleic acids. It is estimated that the consumption by the population of the United States is about 1 billion [American] pounds of *trans*-acids per year; preliminary studies on human body fat have shown the presence of *trans* fatty acids.—G. A. Garton.

Pasture, Hay and Silage

2895

BROUGHAM, R. W. **A study in rate of pasture growth.** *Austral. J. Agric. Res.*, 1955, **6**, 804–812. [Grasslands Div., D.S.I.R., Palmerston North, N.Z.]

The experimental design permitted mathematical separation of irregular weather effects from main growth effects. A short-rotation sward of ryegrass and clover was studied during a 9-week period in spring 1953. Growth curves were sigmoid, and during 5 weeks when rate of growth was constant, dry matter production approached 150 lb. per acre daily.—J. L. Corbett.

2896

JOHNS, A. T. **Pasture quality and ruminant digestion. 1. Seasonal change in botanical and chemical composition of pasture.** *N.Z. J. Sci. Technol.* [*A*], 1955, **37**, 301–311. [Grasslands Div., D.S.I.R., Palmerston North, N.Z.]

1. A short-rotation pasture of ryegrass and clover was sampled and then grazed intensively by sheep at short intervals over a 17-month period. Total N, N.P.N., free and bound amino N and soluble carbohydrate in both ryegrass and clovers were estimated. Concentrations of individual amino acids varied widely but bore no relation to season. Similar analyses were also made on a sample of ryegrass to determine variations in composition at different heights from the ground. Estimates of the standard error of the sampling procedure and of chemical estimations are given.—J. L. Corbett.

2897

TODD, J. R. **Investigations into the chemical composition and nutritive value of certain forage plants at medium altitudes in the tropics. 1. Seasonal variation in the chemical composition of the grasses *Bothriochloa insculpta*, *Chloris gayana* and *Brachiaria dictyoneura*, under rotational light grazing, with a note on the persistence of the grasses. 2. The digestibility and nutritive value of three grasses at different stages of growth.** *J. Agric. Sci.*, 1956, **47**, 29–34; 35–39. [East African Vet. Res. Organiz.]

1. Samples were collected at intervals over a year from 3 pairs of plots, each pair carrying, at the beginning of the experiment, a pure stand of one species. The pairs of plots were grazed alternately for 2 weeks by sheep. In 2 cases the stands remained pure; the pair with *Chloris gayana* were invaded by a " couch " grass, *Digitaria scalarum*, about halfway through the period. Crude and true protein, ether extract, fibre, total and acid-soluble ash, Ca, P and K were estimated and, except for Ca and P, the data are tabulated along with the previous month's rainfall.

Protein and P contents were closely associated with rainfall. Fibre remained relatively high even in the vegetative phase. The content of insoluble ash was high and that of P low.

2. Digestibility data from 9 trials with s[illegible]2, are presented. In 5 *Bothriochloa insc*[illegible]dnc.,

different stages of growth was studied, in 2 Rhodes grass (*Chloris gayana*) in early flowering and early dry season stages and in 2 Kikuyu grass (*Pennisetum clandestinum*) in the young vegetative 3-in. stage and in a later 9- to 12-in. vegetative stage.

Bothriochloa insculpta and Rhodes grass were relatively poor in digestive protein. Kikuyu grass had a high digestible protein content in the early stage and maintained it in the later vegetative stage. It resembled British pasture grasses in providing a surplus of protein over starch equivalent for milk production.—D. Harvey.

2898

CURASSON, M. G. Études sur les pâturages tropicaux et subtropicaux. [**Studies of tropical and subtropical pastures..**] *Rev. Élevage méd. vét. Pays trop.*, 1955, **8**, 357–391.

A review. For previous instalments see Title 4301, Vol. 24; *Rev. Élevage méd. vét. Pays trop.*, 1954, **7**, 37; Abst. 294, Titles 2842, 5776, Vol. 25.

2899

HASLER, A. and ZUBER, R. Beitrag zur Kenntnis des Kobaltgehaltes im schweizerischen Wiesenfutter. [**Cobalt content of Swiss pasture.**] *Schweiz. Landwirtsch. Monatsh.*, 1955, No. 5, pp. 11. [Eidg. Agrikulturchem. Versuchsanst., Liebefeld-Berne.]

Cobalt was estimated by a modification of the method of Arthur *et al.* (Abst. 2685, Vol. 23) in 161 samples, mainly of first and second-cut hay of the years 1949, 1950 and 1951, from over 30 farms in the Institute's area. The results are discussed in conjunction with the literature. The Co content ranged from 0·07 to 0·42 p.p.m. of the dry matter, mean 0·16; the results were in good agreement with those from other countries. There was little difference between cuts or between years but considerable difference between farms. Some of the values were low enough to suggest a risk of Co deficiency in livestock, but none was found. In preliminary studies on the plants of an old sown pasture and a poor alpine pasture, grass was found to contain less Co and other minerals than clover and clover less than other pasture plants, and on poor acid soil all had more Co and Mn than on a richer soil. In pot trials with cocksfoot, Fe and Mn were decreased by additional P, but Co was unaffected.—W. M. Deans.

2900

HUNGERBÜHLER, K. and SCHÜRCH, A. Der Einfluss der Düngung auf den Nährstoffertrag einer Magerwiese. [**Effect of manuring on the yield of nutrients from a poor pasture.**] *Schweiz. Landwirtsch. Ztschr. "Die Grüne"*, 1955, No. 17, pp. 3. [Inst. Haustierernährung, Eidg. Tech. Hochsch., Zürich.]

Of 6 plots, each of 0·01 hectare, on a poor pasture on sandy calcareous loam at an altitude of 600 m., 2 were treated in spring with basic slag, potash and 3 kg. ammonium sulphate, 2 had an additional 3 kg. ammonium sulphate, and 2 had nothing at all. The yields some 2 months later in kg. were: dry matter 35, 52, 57; crude protein 3·8, 6·4, 8·8; true protein 3·0, 5·3, 7·1. Grass from the manured plots contained more moisture, but the protein content of the dry matter was higher, 12·5 and 15·5 per cent. crude protein compared with 10·9 for the unmanured plots.—W. M. Deans.

2901

FABRIS, A. and ALBONICO, F. Indagine preliminare sulla composizione chimica dei foraggi dell'Italia meridionale. [**Preliminary study on the chemical composition of forages of southern Italy.**] *Ann. Sper. agrar.*, 1955, **9**, 1115–1130. [Ist. Indust. Agrar. Univ. Naples, Portici.] English summary.

The 38 samples of hay were obtained in 1952 from the provinces of Avellino, Campobasso, Chieti, Teramo, Catanzaro and Pescara. Their botanical composition varied considerably. The range of percentage composition, on dry matter basis [taken from the tables] was ash 6·01 to 14·42, crude protein 7·27 to 17·42, digestible protein 4·16 to 12·89, crude fat 0·73 to 1·75, crude fibre 20·74 to 33·88, N-free extract 43·12 to 55·58, pentosans 11·7 to 22·4, CaO 0·64 to 3·49, MgO 0·17 to 0·80, P_2O_5 0·15 to 0·81 and alkaline earth alkalescence according to Wellmann (Abst. 890, Vol. 1) [the name is given incorrectly] + 19·5 to + 129·5 m. equiv. Lignin was estimated by several methods (see Abst. 2674, Vol. 26).

It was concluded that most of the samples were deficient in protein and P and contained excessive proportions of fibre and lignin. These are ascribed to poverty of the soil, insufficient manuring, washing out of the hay by rain, and late mowing.

D. Duncan.

2902

NEALES, T. F. **Components of the total magnesium content within the leaves of white clover and perennial ryegrass.** *Nature*, 1956, **177**, 388–389. [Dept. Biol. Sci., Wye Coll. (Univ. London), Ashford, Kent.]

Chlorophyll, which was extracted by acetone and estimated spectrophotometrically, was present as 1·13 and 1·18 per cent. on a dry weight basis, 0·219 and 0·199 on a fresh weight basis, in the leaves of white clover and perennial ryegrass. The ratios of chlorophyll a to chorophyll b were 2·88 : 1 and 3·07 : 1. The Mg as chlorophyll, calculated from these ratios and the formulae of the chlorophylls, was 12·86 and 17·75 per cent. of the total Mg in the leaves; in the fibrous material left after extraction it was 62·47 and 53·29 per cent.—A. Hepburn.

2903

SCHOCH, W. Über die Beziehung zwischen den Trockensubstanzverlusten und dem Gehalt an Gesamtbuttersäure silierter Malztreber. [**Relation between losses of dry matter and total butyric acid of ensiled brewer's grains.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag. Prof. Crasemann, 13–16. [Eidg. Landwirtsch. Versuchsanst., Liebefeld, Berne.]

Brewer's grains were ensiled in round concrete silos, 4 each of capacity 5 and 0·8 c.m., and kept for from 4 to 8 months. The losses of weight were from 7·04 to 20·9 per cent. and the butyric acid contents from 0·18 to 0·91 per cent. There was a positive linear relation between loss of weight and total butyric acid content,

$$y = 3{\cdot}01 + 17{\cdot}79\,x,$$

where x was the mean percentage of butyric acid and y the percentage loss of dry matter during ensilage. It was estimated that the loss of dry matter in silage without butyric acid is about 3 per cent.—D. Duncan.

2904

DIJKSTRA, N. D. Over de verteerbaarheid en voederwaarde van verse en geënsileerde zoete lupine. [**Digestibility and feeding value of fresh and ensiled sweet lupins.**] *Versl. Landbouwk. Onderzoek.*, 1955, No. 61.16, pp. 22. [Rijkslandbouwproefstat., Hoorn.] English summary.

Since data were last reviewed (Abst. 5735, Vol. 7) further work has been done abroad and in the Netherlands. Here the assembled results are tabulated and discussed with special reference to the relation of feeding value to chemical composition. In Holland, silage was made at two centres without addition or with 5 per cent. dried ground sugar beet at one and with A.I.V. fluid at the other. That without addition was of relatively poor quality; with sugar beet the quality was excellent, p_H 3·96, no butyric acid, 1·70 per cent. lactic acid, and relatively little loss of crude protein, 19 as against 33 per cent. without addition. The lupin crop from which the sugar-beet silage was made had much less protein than that from which the A.I.V. silage was made and its digestibility was less.

Regression formulae and graphs give the relation of crude to digestible crude protein, and the inverse relation of digestible organic matter to crude fibre. With these, starch equivalent can be computed.

I. Leitch.

See also Absts. 2835, 2837, 2838, 3808, 3809, 3984.

3. VITAMINS

GENERAL

2905

LACOURT, A., DELANDE, N. and DEPADUWA, G. Identification spécifique des acides aminés et des vitamines par l'indice de réfraction et la température eutectique. Application à la chromatographie sur papier et au contrôle. [**Specific identification of amino acids and vitamins by refractive index and eutectic temperature. Application to paper chromatography and to identification.**] *Anal. chim. Acta*, 1956, **14**, 100–108. [Serv. Microchim., Univ. Brussels.] English and German summaries.

Values are given for the refractive index of 38 amino acids and 14 vitamins and for the melting-point of a large number of eutectic mixtures. It is considered that sublimation at from 100° to 200° C. in a moist chamber is preferable to elution for the removal of amino acids from paper chromatograms.

H. G. Bray.

2906

CHICK, H. and HUME, M. **Recent research on vitamins. The work of the Accessory Food Factors Committee.** *Brit. Med. Bull.*, 1956, **12**, 5–8. [Lister Inst. Prevent. Med., London.]

2907

SINCLAIR, H. M. **Recent research on vitamins. Vitamins and the skin.** *Brit. Med. Bull.*, 1956, **12**, 24–26. [Lab. Human Nutrit., Univ. Oxford.]

2908

SINCLAIR, H. M. **Recent research on vitamins. Vitamins and the nervous system.** *Brit. Med. Bull.*, 1956, **12**, 18–23. [Lab. Human Nutrit., Univ. Oxford.]

2909

HOLMAN, W. I. M. and MCCANCE, R. A. **Recent research on vitamins. Recent work on vitamins: bones.** *Brit. Med. Bull.*, 1956, **12**, 27–31. [Dept. Exp. Med., Med. Res. Counc., Cambridge.]

2910

COATES, M. E., KON, S. K. and PORTER, J. W. G. **Recent research on vitamins. Vitamins in animal nutrition.** *Brit. Med. Bull.*, 1956, **12**, 61–66. [Nat. Inst. Res. Dairying, Univ. Reading.]

2911

BEST, C. H., LUCAS, C. C. and RIDOUT, J. H. **Recent research on vitamins. Vitamins and the protection of the liver.** *Brit. Med. Bull.*, 1956, **12**, 9–13 ; 14. [Banting and Best Dept. Med. Res., Univ. Toronto.]

2912

ALBERT, A. **Recent research on vitamins. Anti-vitamins, antimetabolites and chemotherapy.** *Brit. Med. Bull.*, 1956, **12**, 67–72. [Dept. Med. Chem., Australian Nat. Univ., at 183 Euston Rd., London.]

2913

GOLDSMITH, G. A. **Current status of the clinical use of antibiotic-vitamin combinations.** *New Engl. J. Med.*, 1956, **254**, 165–172. [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

A lecture review with 70 references.

2914

AMBROSIONI, P. and MASONI, S. Ricerche sperimentali su conigli sani ed infettati con *Candida albicans* sottoposti a trattamento con clorotetraciclina [aureomicina]. 1. Sensibilità del coniglio alla clorotetraciclina ed azione di questa sull' andamento di una micosi sperimentale. [**Experiments with healthy rabbits and rabbits infected with *Candida albicans* and treated with chlortetracycline (aureomycin). 1. Sensitivity of the rabbit to chlortetracycline and action of it on experimental mycosis.**] 2. Tentavi di profilassi mediante sominstrazione di vari gruppi di vitamine e di germi del gruppo enterico. [**2. Attempts at prophylaxis by giving different groups of vitamins and organisms of the enteric group.**] *Bol. Ist. sieroterap. milan.*, 1955, **34**, 408–417 ; 418–424. [Ist. Igiene, Univ. Modena.] English summaries.

1. Aureomycin was highly toxic to rabbits. Of 4 weighing 1400 g. and given a daily oral dose of 14 mg. aureomycin per kg. bodyweight, all died between the 14th and the 15th day with great congestion of the organs.

Seven similar rabbits were given aureomycin daily in the same way, and from 3 to 7 days later they were inoculated intravenously with a culture of *Candida albicans*. The result did not differ from that obtained with aureomycin alone. Six similar rabbits, inoculated with the fungus only, lived from 20 to 45 days. They had diarrhoea but no congestion of the organs. Histological examination was made of organs and tissues from all 3 groups.

2. Four rabbits were given aureomycin as just described but only for 3 days, after which the inoculation with *C. albicans* was given. At the same time daily oral administration was started of vitamin B_1 20 mg., riboflavin 0·004 mg., vitamin B_6 0·04 mg., Ca pantothenate 0·08 mg. and extract of liver and yeast 0·8 mg. until the rabbits died from 6 to 16 days after the inoculation with *C. albicans*. They showed severe visceral congestion. Another 4 rabbits were treated in the same way with, in addition, biotin, nicotinamide and vitamins A, D, E, K and C, but the result was not affected. Substitution of a culture of organisms of the enteric group for the vitamins was equally without effect.—E. M. Hume.

2915

SYURINA, N. A. Bor'ba s avitaminozom serebristo-chernykh lisitz v usloviyakh Krainego Severa. [**The control of avitaminosis affecting silver foxes under conditions in the Far North.**] *Karakul. i Zver.*, 1955, **8**, No. 3, 41–42.

Some of the fox farms in the Far North had for 3 to 5 years failed to reach the required standards of production. On the farm studied the ration in 1952 provided 600 to 650 Cal. daily, with half the energy value supplied by deer meat and the rest from groats, fish, milk and supplements of fish oil and sprouted oats to provide vitamin A and vitamins of the B complex.

In 1954 the foxes intended for breeding were given in December supplements of 10 g. hydrolysed yeast, 4 g. vitaminised fish oil and cranberries. When the breeding season began male foxes were given liver, egg powder and vitamin E. Pregnant vixens received 700 to 750 Cal. and supplements of 50 g. deer liver, 12 g. hydrolysed yeast and 4 g. fish oil. Any weak cubs received special care and were given ascorbic acid.

The number of cubs obtained from each vixen rose from 1·4 in 1951 to 4·28 in 1954, and losses of young foxes were reduced.—D. Duncan.

2916

JOYNER, L. P. and DAVIES, S. F. M. **Sulphaquinoxaline poisoning in chickens.** *J. Comp. Pathol.*, 1956, **66**, 39–48. [Vet. Lab., Minist. Agric., Weybridge.]

The effect of age and state of nutrition on the reaction of chickens given sodium sulphaquinoxaline in drinking water as a treatment for coccidiosis was studied. Absorption and excretion of the drug followed different patterns in old and young birds; signs of toxicity were most severe in

birds between 4 and 8 weeks old. In all the birds that died there was fluid in the body cavity, haemorrhages in the muscles, and lesions of the spleen. Clotting was delayed in all the birds receiving the drug and was restored to normal with vitamin K or its analogues. Vitamin K did not prevent other manifestations of toxicity, and dietary supplements or injections of ascorbic acid, vitamin B_1, riboflavin, pyridoxine, pantothenic acid or vitamin A or D did not decrease the incidence of the lesions.—A. M. Copping.

2917

MEKHANIK, F. Ya. O znachenii vitaminov dlya ryb. [**The significance of vitamins for fish.**] *Priroda*, 1955, No. 10, 102–104.

When young rainbow trout were fed on a diet containing 1 part fishmeal, 1 part meat-and-bone meal and 2 parts wheat bran they made only 56 per cent. of the growth of trout fry normally fed on fresh fish. Addition of 20 ml. liver extract and 5 g. baker's yeast per kg. basal diet slightly improved growth, and liver extract and fish liver oil, or yeast and fish liver oil, gave 74 per cent. of normal growth, but all 3 additions were required for full normal growth. The vitamin requirements of fish are not well understood.—D. Duncan.

2918

KRESHOVER, S. J. **Further observations on the effect of tobacco on epithelial tissues of vitamin-deficient mice.** *J. Dent. Res.*, 1955, **34,** 798–807. [Sch. Dent., Med. Coll. Virginia, Richmond.]

2919

MAPSON, L. W. **Recent research on vitamins. Effect of processing on the vitamin content of foods.** *Brit. Med. Bull.*, 1956, **12,** 73–77. [Low Temp. Res. Stat., Univ. Cambridge.]

2920

EHEART, J. F., YOUNG, R. W., MASSEY, P. H. (Jr.) and HAVIS, J. R. **Crop, light intensity, soil pH, and minor element effects on the yield and vitamin content of turnip greens.** *Food Res.*, 1955, **20,** 575–581. [Virginia Agric. Exp. Stat., Blacksburg.]

Yield, dry matter and ascorbic acid content were estimated for turnip greens of a single variety grown on the same ground in the spring and autumn of 1950 and the autumn of 1952; in the last crop, carotene, vitamin B_1 and riboflavin also were estimated. The methods were those of the Southern Cooperative Group ("Studies of sampling techniques and chemical analyses of vegetables", *Southern Coop. Series, Bull.* No. 10, 1951, p. 129). The experiment was of split factorial design, with 72 plots in each year including replications. The conditions studied were: low soil *p*H, 4·8 to 5·1, and high soil *p*H, 6·6 to 6·9, achieved by applying lime; shading and no shading; and application of trace elements (Mn, Cu, Zn, Fe, Mg, Ca and B) by spraying the leaves 2 weeks before harvesting, or as a soil dressing after thinning, or no application of trace elements. Results which were statistically significant are tabulated.

There were considerable variations between the 3 crops, greater than those due to difference in conditions. Yield was favoured by high soil *p*H, dry matter by absence of shading. Contrary to numerous reports in the literature, ascorbic acid content was not significantly affected by light. It was greater in the spring crop than in either of the autumn crops. Carotene content was favoured by shading, vitamin B_1 by trace elements applied to the soil and by a combination of low soil *p*H and no shading, and riboflavin by absence of shading, especially when trace elements were applied to the soil. The mean values found, per g. on a dry basis, were for carotene 665·30 μg., vitamin B_1 14·40 μg., riboflavin 37·45 μg. and ascorbic acid 11·58 mg.; they did not agree with those in the tables of Watt and Merrill (Abst. 4782, Vol. 20), the first 2 in the present study being much higher and the last 2 lower.—W. M. Deans.

2921

BANERJEE, S., ROHATGI, K., BANERJEE, M., CHATTOPADHYAY, D. and CHATTOPADHYAY, H. **Pyridoxine, inositol and vitamin K contents of germinated pulses.** *Food Res.*, 1955, **20,** 545–547. [Dept. Physiol., Presidency Coll., Calcutta.]

In the same 7 pulses as before (see Abst. 3000, Vol. 24), vitamin B_6 and inositol were estimated microbiologically with *Saccharomyces carlsbergensis* (see Abst. 1099, Vol. 13) and vitamin K by the colorimetric oxidation-reduction method of Scudi and Buhs (Abst. 2910, Vol. 11) before and after germination for 2 or 4 days.

The tabulated results, in mg. per 100 g., showed that vitamin B_6 in ungerminated pulses ranged from 0·14 in *Pisum sativum* to 0·65 in *Lathyrus sativus*, and increased on germination considerably in some and to some extent in all but *L. sativus*. Inositol ranged from 70 in *Phaseolus radiatus* to 240 in *Cicer arietinum* and increased on germination in all. Vitamin K ranged from 0·13 in *Phaseolus mungo* to 0·30 in *P. radiatus* and *Cicer arietinum*, and it too increased on germination in all.

W. M. Deans.

2922

BRÆKKAN, O. R. (with HANSEN, K. and SKOGLAND, T.) Vitaminer i norsk fisk. 2. Vitaminer i forskjellige organer fra makrellstørje (*Thunnus thynnus*) fanget utenfor Norges vestkyst. [**Vitamins in Norwegian fish. 2. Vitamins in**

some organs of tunny (*Thunnus thynnus*) caught off the west coast of Norway.] *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1955, **3**, No. 3, pp. 18. English summary.

For part 1 see Abst. 4313, Vol. 24.

Literature is reviewed. The samples of organs were taken at gutting from about 100 fish, and of muscle as the fish were prepared for freezing experiments, from 4 or 5 fish, except for neck muscle. Nicotinic acid, riboflavin, pantothenic acid and vitamin B_{12} were estimated by microbiological methods, vitamin B_1 by the thiochrome method, vitamin A by spectrophotometry with conversion factor 1900, dry matter by oven drying, fat as Soxhlet ether extract, ash by incineration, and N by macro-Kjeldahl. There were 3 series of samples from fish of different sizes. The tables give means for the series separately and together, for muscle, liver, pyloric caeca, stomach, intestine, spleen, kidneys, heart (auricle and ventricle separately), gills, roe and milt (both immature).

Dry matter varied with fat both when organs and when series of fish were compared. Vitamin contents in μg. per g. for muscle and liver, respectively, were for pantothenic acid 4·4 and 25·4, nicotinic acid 84·4 and 88·0, riboflavin 1·0 and 44·8, vitamin B_{12} 0·037 and 3·53, vitamin B_1 2·10 and 4·17. Vitamin A in I.U. per g. was in liver from 6700 to 22,500, mean 13,400, and in neck muscle 10, pale fillet 30 and dark fillet 35. The vitamin A value for muscle and the vitamin B_{12} value for liver were outstandingly high.—I. Leitch.

VITAMIN A

2923

DUBOULOZ, P. and MARTINET, H. Sur le dosage biologique de la vitamine A au moyen du poussin. 1. Recherches préliminaires. [**Biological estimation of vitamin A with chicks. 1. Preliminary research.**] *Ann. Zootech.*, 1955, **4**, 201–213. [Lab. Phys., Fac. Méd., Marseilles.]

Day-old Rhode × Sussex chicks were given a diet deficient in vitamin A. Curves were constructed of the growth response by groups of male birds to graded prophylactic doses of the vitamin. In general, weight increase reflected increase of the dose; the average weight of groups of 10 birds after 45 days was 338 g. with 10 I.U., 424 g. with 20 I.U. and 459 g. with 40 I.U. Tests in which therapeutic doses were given to birds deprived of vitamin A were unsatisfactory because of the high mortality, which was not reduced by giving penicillin. A tentative method is described for estimating vitamin A activity in feeds. Results were not entirely satisfactory because of the lack of uniformity among the animals normally available. It is hoped to produce an improved method.

I. M. Sharman.

2924

NAKAGAWA, T. **Applications of solubilisation to pharmacy. 6. Solubilisation of vitamin A palmitate by ionic surfactants.** *J. Pharm. Soc. Japan*, 1955, **75**, 997–1000. [Res. Lab., Shionogi and Co., Imafuku, Amagasaki, Hyogo-ken.]

2925

SCHOCH, H. Über die Methodik der Karotinbestimmung. [**Technique for estimating carotene.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag. Prof. Crasemann, 85–88. [Inst. Haustierernährung, Eidg. Tech. Hochsch., Zürich.]

Carotene was extracted from materials having a low fat content, with a cold mixture of ether and light petroleum. Aluminium oxide standardised by Brockmann's method, a mixture of magnesium oxide and diatomaceous earth, and a mixture of aluminium oxide with sodium sulphate were tested as adsorbents. The first was preferred, with a 1 : 1 mixture of benzene and light petroleum as developing solvent. It was necessary that the moisture content of the aluminium oxide should not exceed 2 per cent. It is considered that the different biological activities of the *cis*- and *trans*-forms of β-carotene might make it advisable to estimate only the *trans*-form.—V. H. Booth.

2926

KALER, H. A. **Determination of carotene in dehydrated alfalfa meal treated with *N*, *N'*-diphenyl-*p*-phenylenediamine.** *J. Agric. Food Chem.*, 1956, **4**, 70–71. [National Alfalfa Dehydrating and Milling Co., Lamar, Colo.]

For extraction and chromatography the A.O.A.C. method was followed for estimating carotene in alfalfa meal. Five ml. of stannous chloride reagent were added to the eluate which was then made up to 100 ml. in the standard manner, and the density was read within an hour on the spectrophotometer. The reagent was freshly prepared each day by dissolving 0·1 g. $SnCl_2 . 2H_2O$ in 50 ml. ethanol.

Solutions of carotene eluates, with and without *N*, *N'*-diphenyl-*p*-phenylenediamine, and stannous chloride had closely similar spectral absorption curves, which showed that the reagent had no effect on carotene, but destroyed all the pigment

formed by reaction between the diamine and the magnesia used for chromatography in the A.O.A.C. method.—V. H. Booth.

2927

MOFFITT, R. A. and MEHL, J. W. **Comparison of the phasic and chromatographic methods for analysis of carotene in dehydrated alfalfa.** *J. Assoc. Off. Agric. Chem.*, 1956, **39,** 255–259. [Dept. Biochem. Nutrit., Univ. S. California, Los Angeles 7.]

When " carotene " from alfalfa is estimated by the phasic and by the chromatographic method, the results may be up to 25 per cent. higher by the phasic method. The nature of the pigments included as " carotene " by the former method, but excluded by the latter, was studied. An extract from dehydrated alfalfa was purified by the phasic method and then chromatographed on MgO. The β-carotene was removed with 3 per cent. acetone, after which the remaining pigments had separated into 4 zones. The column was extruded and dissected, and the 4 coloured zones were eluted separately into carbon disulphide. The pigment from the 4 zones was compared spectrophotometrically and chemically with known pigments and identified from the top of the chromatogram downwards as " xanthophylls " that had not been removed by the phasic separation, zeaxanthol or a similar pigment or pigments, *neo*-β-carotene B, and *neo*-β-carotene U. When the experiment was repeated with an extract from fresh alfalfa, the 2 lowest zones of pigment did not appear, and it is supposed that those 2 pigments had been formed by isomerisation during dehydration of the alfalfa.—V. H. Booth.

2928

ISLER, O., LINDLAR, H., MONTAVON, M., RÜEGG, R. and ZELLER, P. Synthesen in der Carotinoid-Reihe. 1. Die technische Synthese von β-Carotin. [**Syntheses in the carotenoid series. 1. The industrial synthesis of β-carotene.**]

ISLER, O., MONTAVON, M., RÜEGG, R. and ZELLER, P. 2. Über den Aufbau der Ringkomponenten. [**2. The synthesis of the ring components.**]

ISLER, O., LINDLAR, H., MONTAVON, M., RÜEGG, R. and ZELLER, P. 3. Die Synthese von 3, 4; 3′, 4′-Bisdehydro-β-carotin und 3, 4-Monodehydro-β-carotin. [**3. The synthesis of 3: 4: 3′: 4′-bisdehydro-β-carotene and 3: 4-monodehydro-β-carotene.**] *Helv. chim. Acta*, 1956, **39,** 249–259; 259–273; 274–282. [Lab. F. Hoffmann-La Roche and Co., Basle.] English summaries.

1. The commercial synthesis of β-carotene is described.

The synthetic β-carotene was compared with natural β-carotene for melting-point, elementary analysis, shape of crystals, and other characteristics. Each chemical and physical constant studied was the same for both compounds; the biological values also were the same. Very large doses of the synthetic carotene had no toxic effect on rats or rabbits. Absorption curves in infrared light for β-carotene and some related compounds are given and photomicrographs of their crystals are shown in colour.

2. Detailed methods are given for the preparation of C_{19}-aldehydes that could be used for the synthesis of new carotenoids.

3. Synthesis of two new dehydrocarotenes and some related compounds is described. Absorption curves in visible light and in the infrared region, melting-points, and other characteristics of the two carotenes are given. In growth tests with vitamin-A-depleted rats, the bisdehydrocarotene had 38 per cent., and the monodehydrocarotene 75 per cent., of the activity of β-carotene.—V. H. Booth.

2929

MORTON, R. A. and GOODWIN, T. W. **Recent research on vitamins. Carotenoids and vitamin A.** *Brit. Med. Bull.*, 1956, **12,** 37–43; 44. [Dept. Biochem., Univ. Liverpool.]

2930

FRANK, S. **Carotenoids.** *Sci. Amer.*, 1956, **194,** 80–86. [Washington Square Coll. Arts Sci., Univ. New York.]

An illustrated, semi-popular article discusses the theory that the function of carotenoids in green leaves is to provide the phytol moiety for the biosynthesis of chlorophyll.

The spectral absorption maxima of protochlorophyll, a precursor of chlorophyll, were at the same wavelengths as those most effective in reducing the content of carotenoids in leaves and in promoting synthesis of chlorophyll. When seedlings were germinated and grown in the dark, no chlorophylls were produced but carotenoids increased. When green plants were removed to the dark, the chlorophylls soon disappeared but there was no increase in carotenoids. It is suggested, therefore, that the biosynthesis is not reversible, carotenoids not being produced by the degradation of chlorophyll.—V. H. Booth.

2931

CURL, A. L. and BAILEY, G. F. **Orange carotenoids. 1. Comparison of carotenoids of Valencia orange peel and pulp. 2. Carotenoids of aged canned Valencia orange juice.** *J. Agric. Food Chem.*, 1956, **4,** 156–159; 159–162. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 10, Calif.]

1. The pulp and peel of California Valencia oranges obtained in May were separately extracted with acetone and the pigments were transferred to light petroleum. Pulp and peel yielded total carotenoids approximately equivalent to 24 and 98 p.p.m., respectively, on the basis of colorimetric equivalence with β-carotene. The peel, after storage for 4 months at 6° C., yielded 34 p.p.m., a retention of 35 per cent. The carotenoids in each solution were examined in detail by counter-current distribution between light petroleum and 99 per cent. methanol, by chromatography on magnesia, and by spectrophotometry.

The 24 pigments from pulp and peel are identified or described as "like" a known carotenoid. The pigments in pulp and peel were qualitatively similar though quantitatively different. Phytofluene, luteoxanthins, auroxanthin and cryptoxanthin together made up nearly half the total carotenoids in pulp. Violaxanthin accounted for nearly half the carotenoids in fresh peel, with luteoxanthins making a considerable contribution. Carotenes, including α- and β-, were present in small amounts in both pulp and peel. One constituent found in early-season (May) pulp and peel, but not found in late-season (autumn) orange juice, was cryptoxanthin furanoxide.

2. Carotenoids from canned juice which had been stored for 3 years at room temperature were similarly examined for comparison with those from fresh juice. Twenty-seven carotenoids are listed. Zeaxanthin and mutatoxanthins made up nearly half the total. Epoxides had disappeared, the diether diol fraction was reduced, and furanoxides had increased. There had been no significant hydrolysis of esters during storage. There was no evidence of more than a small degree of isomerisation to *cis*-forms.—V. H. Booth.

2932

GRANGAUD, R. and MASSONET, R. Recherches sur la biogénèse de la vitamine A des poissons. 1. L'astaxanthine, provitamine A pour *Gambusia holbrooki* Grd. **[Biogenesis of vitamin A in fishes. 1. Astaxanthin, provitamin A for *Gambusia holbrooki*, Grd.]** *Arch. Sci. physiol.*, 1955, **9**, 245–256. [Lab. Chim. Biol., Fac. Méd., Algiers.]

The advantages of the tiny carnivorous fish *Gambusia holbrooki*, Grd., as experimental animal for feeding studies are detailed. A group of the fishes was maintained on a vitamin-A-deficient diet of potato flour or white breadcrumbs, casein, yeast, and vitamin D. After 35 days, when some were killed, no vitamin A could be detected in the whole fish or in the organs including the eyes. The food of the others was then supplemented with tissues from *Aristeus antennatus*, devoid of vitamin A and carotene, or with astaxanthin prepared from those crustaceans and dissolved in oil. After 26 days the fishes were killed, and vitamin A was found, by the Carr Price test, almost entirely in the eyes. Similar results were obtained in several other experiments.

It was concluded that astaxanthin is a provitamin A for *Gambusia*. The possibility that vitamin A_2 is produced from the enolic form of astaxanthin is discussed.—V. H. Booth.

2933

GRANGAUD, R. and MASSONET, R. Conversion de l'astaxanthine en vitamine A chez *Gambusia holbrooki* Grd. **[Conversion of astaxanthin to vitamin A in *Gambusia holbrooki*, Grd.]** *C.R. Acad. Sci.*, 1955, **241**, 1087–1089.

See preceding Abst.

2934

GANGULY, J., KRINSKY, N. I. and PINCKARD, J. H. **Isolation and nature of echinenone, a provitamin A.** *Arch. Biochem. Biophys.*, 1956, **60**, 345–351. [Dept. Biochem. Nutrit., Univ. S. California, Los Angeles.]

The pigment obtained from 4000 sea urchins, *Strongylocentrotus purpuratus* and *S. franciscanus*, was purified by repeated column chromatography followed by crystallisation, to yield orange-red crystals of m.p. 179° to 181° C. Absorption maxima were at 458 mμ. in light petroleum, 490 to 496 mμ. in carbon disulphide and 472 to 478 mμ. in chloroform. The values agreed closely with those published for echinenone by Goodwin and Taha (Abst. 3326, Vol. 20), who obtained it from limpets, *Patella vulgata* and *P. degressa*. The oxime of echinenone had an absorption maximum at 455 mμ. in light petroleum. Reduction with aluminium *iso*propoxide and lithium aluminium hydride yielded the corresponding alcohol, *iso*-cryptoxanthin. An authentic sample of *iso*-cryptoxanthin was converted by the Oppenauer oxidation to echinenone; it had properties identical with those of the pigment isolated.

R. J. Ward.

2935

FISHER, L. R., KON, S. K. and THOMPSON, S. Y. **Vitamin A and carotenoids in certain invertebrates. 4. Mollusca: Loricata, Lamellibranchiata, and Gastropoda. 5. Cephalopoda.** *J. Marine Biol. Assoc. U.K.*, 1956, **35**, 41–61; 63–80. [Nat. Inst. Res. Dairying, Univ. Reading.]

For previous parts see Absts. 308, Vol. 24; 1660, Vol. 26.

4. Vitamin A, total carotenoids and β-carotene were estimated in 18 species of gastropods, 9 of lamellibranchs and 1 of loricates. Specimens were preserved by immersion in boiling sea-water for 2 min. and then in absolute alcohol. Later, in

the laboratory, they were saponified and extracts were purified chromatographically. Interference by xanthophylls, when vitamin A was estimated by the $SbCl_3$ reaction, was reduced by passing the extract in *n*-hexane through an alumina column treated with 8 per cent. ethanol in hexane before passing it through a column of untreated alumina. The vitamin A value in μg. per g. whole body was for *Mytilus edulis* 0·51, *Ostrea edulis* 0·26, *Gryphaea angulata* 0·16, *Cardium edule* 0·16, *Mya arenaria* 0·02, *Patella vulgata* 0·19, and *Aplysia depilans* 0·11. No vitamin A was found in *Chlamys septemradiatus*, *Pecten maximus*, *Scrobicularia plana*, *Buccinum undatum*, *Clione limacina*, *Astrea undosa*, *Helix aspersa*, *Littorina littoralis*, *L. littorea*, *L. rudis* or *Murex trunculus*. Ten specimens of a loricate, *Stenoplax conspicua*, gave average values in μg. per g. for vitamin A 0·044, carotenoids 5·1 and β-carotene 0·41.

Species containing vitamin A were further examined, and the vitamin was found mainly in the digestive glands or viscera. In *Patella vulgata* the concentration of vitamin A and carotenoids was higher in the testis, 0·67 and 112 μg. per g., respectively, than in the ovary, 0·11 and 19. In *Patella* evidence was obtained that vitamin A is produced by the conversion of carotenoid precursors in the algal diet. Possible functions of vitamin A in the different species are discussed.

5. Vitamin A, fat and carotenoids were estimated in 10 species of cephalopod including 4 squids, 5 cuttlefish and 1 octopus. Specimens were preserved in alcohol until analysis, when they were saponified and the extracts purified chromatographically. Most tissue extracts were rich in sterols which had to be removed. The extract in light petroleum was evaporated to dryness, dissolved in methanol and kept at — 20° C. for 1 hr., when most of the sterols were precipitated. Vitamin A was found in all the species examined; carotenoids also occurred, but generally only in small amounts. Cuttlefish and octopus were richer in carotenoids than squids. The eyes of *Alloteuthis media* had 0·61 μg. vitamin A per g. and the ovaries 0·71. Eyes of *Loligo forbesi* had from 0·06 to 0·43 μg. vitamin A per g. Livers from the same species had from 0·96 to 16 μg. vitamin A per g. Livers of *Ommastrephes pteropus* had per g. 6·6 and 15 μg. vitamin A and 13 and 42 μg. carotenoids. Other species found to contain vitamin A were *Todaropsis eblanae*, *Sepia officinalis*, *Parasepia elegans*, *Rossia macrosoma*, *Sepietta oweniana*, *Sepiola* sp. and *Eledone cirrosa*.

The form of the vitamin also was investigated in a number of instances. The vitamin was present mainly as the ester, especially in the liver. The reserves of females were depleted by development of eggs, which were found to be rich in vitamin A alcohol. In 2 species, *Loligo forbesi* and *Ommastrephes pteropus*, retinene was isolated from the eyes, which suggests a visual cycle resembling biochemically that of vertebrates.—I. M. Sharman.

2936

HIGH, E. G. **Further antioxidant studies concerned with the metabolism of carotene and vitamin A.** *Arch. Biochem. Biophys.*, 1956, **60**, 456–462. [Dept. Biochem., Meharry Med. Coll., Nashville, Tenn.]

Rats were given a basal diet deficient in vitamin A and daily supplements of 34 μg. carotene or 13 μg. vitamin A with or without one of certain anti-oxidants. The supplements were given for 21 days and faeces were collected for estimation of carotene, after which the rats were killed and vitamin A was estimated in the liver and kidneys. A daily supplement of 10 mg. 2 : 6-di*tert.*butyl-4-methylphenol significantly decreased the deposition of vitamin A from carotene in the liver from an average of 86 to 26 μg., but increased deposition in the kidneys from an average of 2·5 to 7·2 μg. There was no significant difference in growth rate. N, N′-diphenyl-*p*-phenylenediamine had little effect on carotene utilisation but *d*-α-tocopherol decreased deposition of vitamin A in the liver from 80 to 33 μg. and increased it in the kidneys from 4·7 to 7·0 μg. The Wistar strain of rats appeared to excrete less carotene than the Holtzman strain. None of the anti-oxidants had a significant effect on carotene excretion.—R. J. Ward.

2937

IRVING, J. T. and RICHARDS, M. B. **The protective action of vitamin A upon various tissues in the avitaminotic rat, and the sensitivity of these tissues to vitamin A deficiency.** *Brit. J. Nutrition*, 1956, **10**, 7–14. [Joint Dent. Res. Unit, Counc. Sci. Indust. Res., Johannesburg.]

Rats were restricted from a week before weaning to a diet deficient in vitamin A with or without small doses of the vitamin. After periods of up to 250 days they were killed and histological studies were made on the nasolachrymal duct, medulla oblongata, incisor teeth and maxillary fundic alveolar bone.

When no vitamin had been given, degenerative changes were found after 28 days in the medulla oblongata and in the epithelium of the nasolachrymal duct, but not in the two hard structures. When doses of from 0·33 to 3 I.U. daily were given for 50 days, the medulla oblongata, fundic bone and incisor teeth were protected by 1 I.U., but 3 I.U. were required to protect the nasolachrymal duct. In experiments lasting for up to 250 days 2 I.U. daily protected the medulla oblongata and fundic bone; 4 I.U. were needed to protect the nasolachrymal duct. The incisor teeth were not protected by 2 I.U., were partly protected by 4

I.U., but not completely even by 16 I.U. It appears that the requirement of vitamin A is not a function of bodyweight, but should be based on protection of the tissue which is most sensitive to deprivation of vitamin A. The relative sensitivity of the tissues to deficiency depends upon age.

T. Moore.

2938

LEUTZKIĬ, K. M. and LYUBOVICH, E. N. Narusheniya v obmene kholesterina pri nedostatochnosti vitamina A. [**Breakdown of cholesterol metabolism in vitamin A deficiency.**] *Dokl. Akad. Nauk SSSR*, 1955, **104,** 280–282. [Chernovitzk. Gosud. Univ.]

White rats initially weighing about 50 g. were given a synthetic diet without vitamin A for from 2½ to 3 months, or for 4 months to produce severe deficiency. Total cholesterol was estimated in the brain, liver, kidneys, adrenal glands, urine and faeces. The cholesterol content of the brain, adrenal glands and kidneys was appreciably less in deprived than in non-deprived animals. The latter excreted significantly less cholesterol in the faeces. More *p*-aminobenzoic acid was acetylated by deprived than by non-deprived rats.

D. W. Taylor.

2939

AVDEEV, I. M. and VOROB'EV, A. E. Zabolevanie glaz u telyat na pochve avitaminoza. [**Ophthalmia in calves due to vitamin deficiency.**] *Veterinariya*, 1955, **32,** No. 2, 73–74. [Bzyansk Intersovkhoz Vetbaklab.]

Ophthalmia in calves was found to be caused by deficiency of vitamin A. All the calves were given vitaminised fish oil and separated milk, and the sick ones were given whole milk as well. As a result all the sick calves recovered and ophthalmia disappeared.—H. Scherbatoff.

2940

O'DONOGHUE, J. G. **Vitamin A deficiency in beef cattle.** *Canad. J. Comp. Med.*, 1955, **19,** 367–372. [Vet. Serv. Branch, Alberta Dept. Agric.]

Vitamin A deficiency in cattle, as seen by the author in Alberta, appeared in 3 forms. The first was in young weak calves, which suffered from scouring and sometimes from secondary infections. The second appeared in older animals with damage to the peripheral nervous system which gave rise to inco-ordination. The third affected yearling beef animals which, without inco-ordination, suddenly became blind through injury to the optic nerve.

T. Moore.

2941

LUCAS, A., QUINCHON, C., FEUGEAS, C., HENRY, M., GOURDON, J. M., GOURDON, R. and TOUCAS, L. Kérato-conjonctivite, manifestation d'avitaminose A dans un troupeau de moutons. [**Kerato-conjunctivitis, a manifestation of vitamin A deficiency in a flock of sheep.**] *Rec. Méd. vét.*, 1955, **131,** 665–669. [Lab. Central Recherches Vét., Alfort.]

In a flock of 100 sheep, about 50 suddenly, within the space of 3 weeks, showed bilateral corneal opacity with other ocular signs of vitamin A deficiency. They appeared to be blind. The sheep had been kept in stall for about 10 weeks with a diet of beet, fine straw, legume meal of poor quality and a little grain. Specimens from the eyes showed no rickettsiae, and the condition was not infectious. The sheep were given good lucerne hay and, daily for 5 days, 2 ml. oil containing 3000 I.U. vitamin A per ml. The eyes quickly became clear and the sheep could see again. The previous dietary history was not known.

E. M. Hume.

2942

MCCLYMONT, G. L. **Vitamin A supplements for sheep. Their limited role.** *Agric. Gaz. N.S.W.*, 1955, **66,** 586–591. [Dept. Agric. Nutrit. Res. Lab., Vet. Res. Stat., Glenfield, N.S.W.]

2943

HARVEY, J. D., PARRISH, D. B. and SANFORD, P. E. **The application of deutectomy for reducing initial vitamin A reserves in newly hatched chicks, and some observations on the apparent consumption of these reserves.** *Poultry Sci.*, 1955, **34,** 1314–1321. [Dept. Chem., Kansas Agric. Exp. Stat., Manhattan.]

White Leghorn hens were given a diet low in carotenoids and adequate or inadequate in vitamin A. The progeny were maintained for 8 weeks on a basal diet lacking or supplemented with vitamin A. As judged by survival time, initial vitamin A stores in deutectomised chicks, *i.e.*, chicks from which the yolk sac had been removed, were about 3/4 of those in intact birds when the maternal diet had been adequate in vitamin A. Deutectomy therefore increased the sensitivity of chicks to subsequent treatment in experiments with vitamin A. The effect of removing the yolk sac was less marked when the maternal diet had been low in vitamin A. Variation between individuals in initial vitamin A reserves was reduced to a greater extent by the operation than by restriction of vitamin A intake by the parent hen. Transfer of vitamin A from the yolk to the body was rapid; only 10 per cent. of its initial value was present in the yolk 7 days after hatching. The liver reserves of vitamin A decreased considerably, particularly in deutectomised chicks, during the first 2 weeks after hatching, in spite of a dietary intake of from 1000 to 2000 I.U. vitamin A per lb. feed. On the same diet liver storage was resumed after 2 weeks, in both intact and treated birds.

E. M. Cruickshank.

2944

HARVEY, J. D., PARRISH, D. B., SANFORD, P. E. and HUGHES, J. S. **The utilization of carotene and vitamin A by chicks during the first week after hatching.** *Poultry Sci.*, 1955, **34**, 1348–1357. [Dept. Chem., Kansas Agric. Exp. Stat., Manhattan.]

When carotene was given in aqueous or oily medium, or as alfalfa, to newly hatched chicks from which the yolk sac had been removed, from 65 to 100 per cent. of it appeared to have been absorbed, though some destruction may have occurred in the alimentary tract. Aqueous preparations were better utilised for liver storage and for survival than oily preparations. Pre-formed vitamin A was more effective than carotene when given in similar preparations. Carotene or vitamin A given in oil or in aqueous dispersion or as alfalfa, during periods terminated 6 and 12 hr. after hatching, increased the liver reserves of vitamin A, estimated at 4 days of age, and prolonged the survival of chicks on a diet without vitamin A. Carotene and vitamin A injected into the residual yolks of newly hatched chicks disappeared rapidly; about 35 per cent. of it appeared in the liver. The survival of the chicks also was prolonged. It is tentatively suggested that conversion of carotene to vitamin A may have occurred in the yolk sac. The results showed that the chick converted carotene to vitamin A within 24 hr. after hatching, and that dietary vitamin A was used to support physiological functions involving vitamin A at least by the 5th day and probably earlier.

E. M. Cruickshank.

2945

LAUGHLAND, D. H. and PHILLIPS, W. E. J. **The utilization of vitamin A by normal and deuterectomized chicks.** *Poultry Sci.*, 1955, **34**, 1359–1362. [Chem. Div., Sci. Serv., Canada Dept. Agric., Ottawa.]

Day-old chicks were given a basal diet lacking vitamin A, alone or supplemented with vitamin A acetate or β-carotene. The vitamin A content of the liver was estimated at weekly intervals from 8 to 29 days of age. In chicks having the basal diet alone, the vitamin A content of the liver decreased from 74 I.U. after 8 days to 7·1 I.U. after 29 days. When the diet was supplemented with vitamin A acetate, the content, compared with that of the liver of birds given no supplement, was significantly greater, 232 I.U. after 8 days and 2130 I.U. after 29 days. In chicks given β-carotene, no significant storage occurred within 15 days, but after 29 days there was a rise to 398 I.U. Similar results were obtained with chicks from which the yolk sac had been removed, though storage was less. There was no significant difference between the weight gain of chicks having the basal ration alone and of those receiving supplements. It is concluded that absorption of vitamin A and conversion of β-carotene to vitamin A can occur in chicks less than 2 weeks old.—E. M. Cruickshank.

2946

BRÜGGEMANN, J. and TIEWS, J. Zur Prüfung des Resorptionsumfanges von Vitamin A aus stabilisierten Vitamin A-Konzentraten mit Hilfe des Vitamin A-Leberspeicherungstestes. **[Absorption of vitamin A from stabilised concentrates of vitamin A estimated by measuring storage of vitamin A in the liver.]** *Ztschr. Tierernährung Futtermittelk.*, 1956, **11**, 20–32. [Inst. Physiol. Ernährung Tiere, Univ. Munich.] English summary.

Rats deprived of vitamin A were given single oral doses of from 450 to 8000 I.U. of commercial preparations of vitamin A; they were killed 96 hr. later and the vitamin A stored in the liver was estimated. The amount stored divided by the quantity given, *Resorptionsindex*, was taken as the measure of utilisation for a preparation. Fourteen preparations were examined with alleged potencies ranging from 450 to 325,000 I.U. per g. Average values for the *Resorptionsindex*, based on estimations with three different intakes, usually 1000, 2000 and 3000 or 4000 I.U., ranged from 20·1 to 59·3. Powdered concentrates were superior to an oily standard preparation though none of them reached the value for the vitamin A emulsion A-Mulsin.—I. M. Sharman.

2947

KRISHNAMURTHY, S. and GANGULY, J. **Effect of blocking the reticulo-endothelial system on the storage of vitamin A ester and alcohol in the liver of the rat.** *Nature*, 1956, **177**, 575–576. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

Male rats, fed on a diet low in vitamin A, were divided into 3 groups each of 6 animals weighing between 75 and 100 g. One group remained on the diet alone, and another was given intraperitoneal injections of 1 ml. normal saline daily for 7 days and a single oral dose of 3000 μg. vitamin A in oil on the last day of the injections. The third group was treated like the second except that 1 ml. of a 20 per cent. suspension of Indian ink in normal saline was used instead of saline alone. The rats were fasted for 24 hr. after their last injection and then bled to death by puncture of the heart. The deprived rats were killed in the same way, and vitamin A alcohol and ester were estimated in the plasma and liver of all the animals.

Average values for total vitamin A ester and alcohol in the liver were 2238 and 56 μg. for those given vitamin A without Indian ink, and 1168

and 54 μg. for vitamin A with Indian ink. Corresponding values for the blood in μg. per ml. were 1·9 and 1·2 and 5·1 and 1·9. The low concentration of the ester in the liver and the high value in the blood of the rats treated with Indian ink compared with those given saline alone showed that blocking the Kupffer cells interfered with storage of the ester in the liver. Values for vitamin A alcohol in the liver were scarcely affected, which suggested that there are different mechanisms for storing the two forms of the vitamin.—I. M. Sharman.

2948

EAYRS, J. T. **The effect of vitamin A on the development of hypothyroid rats.** *J. Neuropathol. Exp. Neurol.*, 1956, **15**, 93–102. [Dept. Anat., Univ. Birmingham.]

Of 92 rats in 3 approximately equal groups, 2 groups were made hypothyroid by injection of methyl thiouracil daily from the day of birth, and one of them was given 100 I.U. vitamin A daily. The third group was kept as normal control. During the first 24 days mortality was high among the hypothyroid animals and vitamin A did not reduce it, but the bodyweight and size of the brain of survivors were greater in those given vitamin A than in those not given it. On the 24th day intracranial pressure in the surviving rats was measured; a steady mean pressure of 7·2 mm. Hg was recorded for the normal rats, 5·6 mm. for the untreated hypothyroid animals and 7·0 for the hypothyroid animals given vitamin A. The hypothyroid rats given vitamin A also had a greater axon network density than the untreated hypothyroid animals, and the mean length of the dendrites was 63·8 μ. for the animals given vitamin A, 47 for those without vitamin A and 77·1 for the normal animals. The age when the placing reflex appeared, which is usually retarded in hypothyroidism, was advanced by vitamin A, but not significantly.—I. M. Sharman.

2949

SERFATY, A. and OLIVEREAU, M. Avitaminose A, thyroïde, hypophyse et croissance pondérale chez le rat blanc male. [**Vitamin A deficiency, thyroid, anterior pituitary and growth in weight in the male white rat.**] *J. Physiol., Paris*, 1955, **47**, 829–834. [Lab. Physiol. Gén., Fac. Sci., Toulouse.]

Young male rats were kept on a diet deficient in vitamin A until depletion was indicated by loss of weight and xerophthalmia. They were then killed, and histological studies were made of their thyroid and pituitary glands. The beta cells of the pituitary were found to have degenerated, and the thyroid was atrophied.—T. Moore.

2950

FELL, H. B. **Recent research on vitamins. Effect of excess vitamin A on organized tissues cultivated in vitro.** *Brit. Med. Bull.*, 1956, **12**, 35–36; 37. [Strangeways Res. Lab., Cambridge.]

2951

HERBERTSON, M. A. **The reversibility of the effect of hypervitaminosis A on embryonic limb bones cultivated *in vitro*.** *J. Embryol. Exp. Morphol.*, 1955, **3**, 355–365. [Strangeways Res. Lab., Cambridge.]

Rudiments of limb bone from 6- to 7-day-old chick embryos were cultivated first in a medium which included fowl plasma containing added vitamin A, and subsequently in the same medium but with normal fowl plasma. The fortified plasma contained from 2000 to 4000 I.U. vitamin A per 100 ml., and the normal plasma from 200 to 300 I.U. The excess of vitamin A stopped growth of the explants, and caused the cartilage matrix to shrink and lose its basophilia and metachromasia; the extent of the damage depended on the length of exposure, the stage in development of the rudiment when explanted, and the particular rudiment treated. In the medium containing normal fowl plasma, the degree of recovery decreased with the severity of the injuries which had been sustained. In the shaft the abnormal changes were arrested, but lost matrix was not restored. The cells appeared healthy but resembled osteoblasts more than normal hypertrophic chondroblasts. The epiphyses also recovered partially and began to enlarge again, with a mitotic rate higher than in normal controls.

T. Moore.

2952

MCDOWELL, A. K. R. **Variations in the carotene and vitamin A contents of herd butterfats throughout lactation.** *J. Dairy Res.*, 1956, **23**, 111–119. [Dairy Res. Inst. (N.Z.), Palmerston North.]

Samples of butterfat were prepared by melting and decantation from butter made specially on the institute farm and from factory butter. Carotene and vitamin A were estimated in the butterfat so obtained, and the results were studied in relation to the feed of the cow and the period of lactation. The average carotene content of butterfat from 8 Friesian cows which had calved in the New Zealand autumn, April or May, rose from 7·7 μg. per g. in June to 11·2 in August, after which it fell fairly regularly to 7·1 in February. For 16 Jersey cows the corresponding values were 9·8 in June, 12·3 in August and 9·0 in January. Vitamin A values in the groups did not vary much, ranging from 10·3 to 12·4 for the Friesians and from 7·5 to 8·5 for the Jerseys. The carotene content of

butterfat from cows calving in spring followed a similar pattern in each of the seasons investigated, being generally at a maximum in spring and declining to low values in summer. Individual results, considered in relation to the carotene available in the diet, showed that the carotene content of the butterfat was influenced more by the diet than by the stage of lactation. Changes in vitamin A content were relatively small throughout lactation. In some instances a small increase attributed to season occurred in autumn. The content of carotene and vitamin A in butterfat made from milk during the first 12 days after parturition was generally higher than subsequently.—I. M. Sharman.

2953

SCOTT, W. G. and TAYLOR, R. J. **The vitamin-A and carotene potency of national (household) butter determined by a chromatographic-ultraviolet spectrophotometric method of assay.** *Analyst*, 1956, **81**, 117–121. [Govt. Lab., Clements Inn Passage, London, E.C.2.]

Carotene and vitamin A were estimated in 106 samples of imported butter and 10 samples of English butter by the chromatographic method of Boldingh and Drost (*J. Amer. Oil Chem. Soc.*, 1951, **28**, 480) for the analysis of margarine. A sample of 10 g. was saponified, the unsaponifiable matter was dissolved in light petroleum and the solution was chromatographed. The extinction of the carotene fraction, which was eluted before the vitamin A, was measured at wavelengths near 446 mμ. The vitamin A fraction was examined subsequently by measuring the extinction at wavelengths near 324 mμ. From the extinction values the biological potencies were calculated. The tests were made at two different laboratories and there was, in general, good agreement between their results. For the imported butter the vitamin A value ranged from 11·5 to 33·3 I.U. per g., mean 23·9, and the carotene value from 3·5 to 15·2 I.U. per g., mean 9·8. Corresponding values for English butter ranged from 17·7 to 23·4, mean 21·2, and from 4·0 to 9·4, mean 7·2.—I. M. Sharman.

2954

PRADHAN, S. K. and MAGAR, N. G. **Vitamin A_1, A_2 and neo-vitamin A in shark-liver oils.** *Indian J. Med. Res.*, 1956, **44**, 11–20. [Dept. Biochem., Inst. Sci., Bombay 1.]

Oil was extracted from the livers of 6 species of shark; vitamin A and iodine number were estimated. Extracts were purified by chromatography and their spectra were measured in pure *cyclo*hexane and ethanol with a Beckman spectrophotometer; measurements were made also in the product of the $SbCl_3$ reaction. Vitamin A_1 was estimated with the 3-point geometrical correction of Morton (see Absts. 4695, Vol. 21; 2824, Vol. 23). Values for vitamin A_2 were calculated from the observed spectrographic data at 693 mμ. in the product of the $SbCl_3$ reaction. Vitamin A values in I.U. per g., were for Waghbeer (*Galeocerdo tigrinus*) 2751, Win (*Pristis microdon*) 6242, Kanat (*Sphyrna blochii*) 8821, Khada (*Carcharinus malenopterus*) 12,147, Pisori (*Carcharinus limbatus*) 23,415, and Boot (*Sphyrna zygaena*) [not *Sphyrnazy gaena* as in Table 1] 82,667. Values for vitamin A_2 ranged from 250 I.U. per g. for a species of Kanat to 6500 for one of Boot, and the percentage of *neo*vitamin A from 19·9 for Win to 32·5 for Boot; iodine values ranged from 74·5 for Waghbeer to 139·0 for Kanat. The free fatty acid content of all the oils examined varied between 0·1 and 0·2 per cent.—I. M. Sharman.

2955

SCHARRER, K. and RÄKER, K. O. Der Carotingehalt von Futter- und Gemüsepflanzen sowie von natürlich und künstlich getrocknetem Pflanzenmaterial. **[Carotene content of fodder plants and vegetables and of naturally and artificially dried plant material.]** *Ztschr. Tierernährung Futtermittelk.*, 1956, **11**, 37–44. [Agrikulturchem. Inst., Justus-Liebig Hochsch., Univ. Giessen.] English summary.

Moisture and α- and β-carotene were estimated in 12 fresh fodder plants, 13 fresh vegetables, 4 types of silage, 5 types of hay, and several types of artificially dried forage. Certain of the dried materials were analysed also after 6 months' storage. The carotene values were highest in *Daucus carota*, *Medicago sativa*, *Brassica oleracea bullata*, *Helianthus annuus* and *Spinacea oleracea*, α-Carotene was present in all materials, and made up, on the average, about 4·5 per cent. of the total carotene. Carotene loss was high during haymaking and low in artificial drying.—V. H. Booth.

2956

SHMANENKOV, N. A. and GALICHNIKOVA, L. A. Znachenie dlya zhivotnykh i metodika opredeleniya vitamina A i karotina v kormakh. **[Significance for animals of, and method of estimating, vitamin A and carotene in the feed.]** *Veterinariya*, 1955, **32**, No. 9, 75–78. [Vses. Nauch.-Issled. Inst. Konevodstva.]

The loss of carotene from hay stacked for 9 months amounted to from 50 to 90 per cent.; fodder should be ensiled to reduce the loss. The average content in mg. per kg. of different types of fodder is shown and carotene requirements of domestic animals, pregnant and non-pregnant, are given.

To control the vitamin A intake of livestock it is recommended that carotene in fodder, especially hay, should be estimated by the method of Nasterovoi (Minist. Sovkhoz., 1951), by which a

representative sample of from 100 to 200 g. is finely divided, and 3 g. are powdered with sand or ground glass. The powdered hay is placed in a funnel blocked with cottonwool and covered with a 2-cm. layer of adsorbent such as aluminium oxide or calcium oxide. Carotene and chlorophyll are extracted with benzene, the carotene in solution passing through the adsorbent. The total amount of benzene used should be 60 ml. The carotene solution is matched against standard 10-ml. tubes, containing a mixture of alcohol with 1·01, 2·13, 3·19 or 4·25 ml. nitrobenzene. The respective colours are equivalent to carotene contents of 10, 20, 30 and 40 mg. per kg. hay. The standard tubes should be closed with rubber corks and kept in a dark room.—F. Billewicz.

2957

BOOTH, V. H. **The loss of carotene from dried green crop during storage. The gradient of loss through a stack.** *J. Sci. Food Agric.*, 1956, **7**, 114–119. [Dunn Nutrit. Lab., Milton Rd., Cambridge.]

Carotene was estimated in samples from 14 sacks from the middle, and 14 from the outside corners, of a stack of 10 tons of lucerne meal which contained 400 sacks. From the sacks in the centre 55 per cent. of carotene was lost against only 40·6 per cent. from the corner sacks. In a second experiment lucerne meal with a moisture content of 5 per cent. and a carotene content of 270 p.p.m. was put into 13 paper sacks and 9 polythene bags, which were sealed. Extra water was sprayed on to another portion to bring the water content to 10 per cent. and the moistened meal was filled into 2 paper sacks and 9 polythene bags. The 15 paper sacks and 18 polythene bags were distributed in the 2 middle courses of a large stack on a definite plan. The average difference in temperature between the inside and outside of the stack was 6·8° C. Moistened meal from the centre and outside, respectively, of the stack lost 13·2 and 7·5 per cent. of carotene; the corresponding dry meal lost 37·6 and 26·0 per cent. The differences between centre and outside for the same kind of sample gave a rough estimate of the effect of the difference of 6·8° C. in temperature. The protective effect of moisture was more important. In order to study further the effect of moisture, meal of 3 per cent. moisture content was filled into a tube 2·5 metres by 4 cm., closed at one end. After 28 weeks the tube was cut and moisture and carotene were estimated in the sections. In the first 8 cm. the moisture content had risen to an average of 10·5 per cent. and the carotene loss was 37·4 per cent. In the next 16 cm. the average moisture content was 4·9 per cent. and the carotene loss 42·8 per cent. The meal in the rest of the tube still had a moisture content of 3 per cent. and the average carotene loss was 54·2 per cent.

R. J. Ward.

See also Absts. 2832, 2972, 3101.

VITAMIN D

2958

RAOUL, Y., LE BOULCH, N., GUERILLOT-VINET, A., DULOU, R. and BARON, C. Structure stéroïde à noyau B ouvert et oxygéné du produit antirachitique obtenu par action d'une argile activée sur le cholestérol. [**Steroid structure, with B ring open and oxidised, of the antirachitic product obtained by the action of an activated clay on cholesterol.**] *C.R. Acad. Sci.*, 1955, **241**, 1882–1884.

A structural formula based on its chemical reactions is proposed for an antirachitic substance previously described (Absts. 346, 2948, Vol. 24; 1875, 3436, Vol. 25). The substance differs from other antirachitic substances in being an $\alpha\beta$-ethylenic ketone linked to a tertiary alcohol. It is biologically very active and is present in certain natural products.—E. M. Hume.

2959

LOUW, D. F., STRATING, J. and BACKER, H. J. **Δ^5-Steroids and provitamins D with branched side-chains. 4. The conversion of some Δ^5-steroids into provitamins D.** *Rec. Trav. chim. Pays-Bas*, 1955, **74**, 1540–1554. [Lab. Org. Chem., Univ. Groningen.]

The conversion of some new Δ^5-steroids into provitamins D is described. A provitamin D was prepared with a side-chain ending in a tertiary amine function. Four new provitamins D were prepared and samples of at least 90 per cent. purity were tested for antirachitic activity after irradiation with ultraviolet light. The purified esters were used for spectrophotometric investigation. The antirachitic activity was lessened when a methylene group was introduced into the aliphatic side-chain, and introduction of a second methylene group lessened it still further. There was an increase of antirachitic activity when a dimethylamide group was reduced to the physiologically active dimethylamine group.

E. M. Hume.

2960

YODER, L. and THOMAS, B. H. **Sulfonation and inactivation of vitamin D_2 by aqueous sulfite and aeration.** *Arch. Biochem. Biophys.*, 1956,

60, 392–397. [Chem. Labs., Iowa Agric. Exp. Stat., Ames.]

Small amounts of atmospheric oxygen were admitted to a flask filled with hydrogen, in which was a solution of crystalline vitamin D_2 in a mixture of pyridine and water, containing SO_2 with or without maize oil. The air was stirred continuously into the flask for $13\frac{1}{2}$ hr. The degree of sulphonation was measured. Samples were withdrawn after $1\frac{1}{2}$ and 6 hr. Presence of maize oil did not prevent sulphonation. Tested biologically, the sulphonated vitamin was without antirachitic potency.—E. M. Hume.

2961

CARLSSON, A. and LINDQUIST, B. **Comparison of intestinal and skeletal effects of vitamin D in relation to dosage.** *Acta physiol. scand.*, 1955, **35,** 53–55. [Dept. Pharmacol., Univ. Lund.]

Rats 25 days old were fed on a modification of Steenbock and Black's diet with a Ca content of only 0·04 per cent. After 21 days a single dose of 10 or 100 or 1000 I.U. vitamin D_2 was given orally, or none. Four days later 20 mg. Ca as the lactate, containing ^{45}Ca, was given, and after 18 hr. the rats were killed. The increase in absorption of ^{45}Ca caused by giving vitamin D was no greater with 100 or 1000 I.U. than with 10. The serum Ca value was progressively greater, the greater the dose of vitamin D. In the given conditions the serum Ca value is held to reflect the extent of bone resorption, which with large (pharmacological) doses of vitamin D is much greater than, but not in quality different from, that with small (physiological) doses. The process of bone accretion, representing the antirachitic effect of vitamin D, is present in both cases, but with large doses bone resorption far exceeds what is necessary for bone accretion, so that the blood and soft tissues become overloaded with bone minerals. Meanwhile intestinal absorption of Ca proceeds regardless of the large size of the dose of vitamin D, and the effect of absorption is far outweighed by the effect of resorption.—E. M. Hume.

2962

CARLSSON, A. and LINDQUIST, B. **A comparative study on the mode of action of dihydrotachysterol and vitamin D on the calcium metabolism.** *Acta paediat.*, 1955, **44,** 548–558. [Dept. Pharmacol., Univ. Lund.] French, German and Spanish summaries.

Small groups of rats 25 days old were given a diet containing, per cent., Ca 1·48 and P 0·25, or Ca 0·04 and P 0·48. After 21 days they were given vitamin D_2 or dihydrotachysterol; from 6 hr. to 6 days, but usually 4 days, later labelled Ca, 20 mg., as the lactate was given by mouth and the rats were killed 18 hr. afterwards. Radioactivity was estimated in certain tissues and Ca was estimated in the serum.

In the first experiment the rats received the high-Ca diet and were given 300 μg. dihydrotachysterol. Six rats received the labelled Ca immediately and 2 after 6, 12 and 24 hr., and 2, 4 and 6 days. Radio-activity in the femur increased progressively, the effect being fully developed after a few days. The effect was like that of vitamin D.

In the second experiment, groups of from 2 to 4 rats were given the diet high or low in Ca with dihydrotachysterol in doses, in μg., of 0·03, 0·3, 3, 30, 300 or 3000 or none. All those having 3000 μg. died. With doses above 3 μg. there was only a small increase in the rate of uptake of radioactivity in the femur, and the behaviour with doses of from 3 to 30 μg. corresponded with that with a dose of 10 I.U. vitamin D.

In the third experiment, groups of from 4 to 10 rats were given the low-Ca diet with doses of 30, 300 or 3000 μg. dihydrotachysterol or of 10, 100 or 1000 I.U. vitamin D or none. Again all the rats given 3000 μg. dihydrotachysterol died or were very sick. The effect of 10 I.U. vitamin D and of 30 μg. dihydrotachysterol was about the same on the serum Ca value, the percentage of radioactivity absorbed, and the ratio-activity in the femur and tibia as percentage of the dose.

In the fourth experiment intact rats fed on the low-Ca diet and parathyroidectomised rats fed on the high-Ca diet were given 30 μg. dihydrotachysterol or 100 I.U. vitamin D or no dose. There was no difference in the effect of the two substances in presence or absence of the parathyroid glands.

It is, therefore, concluded that the effects of the two substances are the same but that vitamin D_2 is more active and the therapeutic range of dihydrotachysterol is smaller, toxic effects being relatively more easily produced.—E. M. Hume.

2963

PILEGGI, V. J., DE LUCA, H. F., CRAMER, J. W. and STEENBOCK, H. **Citrate in the prevention of rickets in rats.**

CRAMER, J. W., PORRATA-DORIA, E. I. and STEENBOCK, H. **A rachitogenic and growth-promoting effect of citrate.** *Arch. Biochem. Biophys.*, 1956, **60,** 52–57; 58–63. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

(*a*) Young male rats weighing about 70 g. were given for 21 days a non-cereal basal diet low in Ca and P. Ca was added as $CaCO_3$ to make the Ca content 0·5 per cent., P as an equimolar mixture of KH_2PO_4 and K_2HPO_4, phytate P as Ca phytate,

and citric acid as a mixture of 0·02 mole citric acid with 0·02 mole Na citrate per 100 g. diet. When vitamin D was given it was as 75 I.U. vitamin D_2 every 3 days.

Addition to the basal diet of vitamin D or citrate or both promoted weight gain, increased bone ash and plasma inorganic P and decreased the width of the uncalcified layer of cartilage between the epiphysis and diaphysis. Citrate was more effective than vitamin D alone; both together were more effective than either alone. Citrate increased the proportion of dietary phytate hydrolysed much more than vitamin D did, and addition of vitamin D to citrate increased it only slightly. Unlike vitamin D, citrate decreased the activity of faecal and intestinal phytase and alkaline phosphatase. It is concluded that the effect of citrate lay in its Ca-complexing effect. With phytate-free diets, citrate had no antirachitic effect when the percentage of P was 0·015 and of Ca was 0·5, or when the percentage of P was 1·2 and of Ca 0·02, but when the percentage of P was 0·2 and of Ca 1·0, citrate had about the same degree of antirachitic effect as vitamin D.

(*b*) To the same non-cereal diet with 0·02 per cent. P, $CaCO_3$ was added to make the Ca content 0·5 per cent. Vitamin D was given and citrate incorporated in the diet as just described. Food intake of some rats was restricted to 20 g. to last 3 days, and others had food to appetite. The rats weighed from 76 to 80 g. Urine and faeces were collected every 3 days for 9 days from groups of from 5 to 7 rats. Calculi occurred when citrate was given; Ca content was added to that of the urine.

When citrate was given the faecal excretion of Ca was greatly increased; the effect was relatively less when the absorption of Ca was greater under the influence of vitamin D. The Ca balance was negative whether vitamin D was given or not, but it was less so when vitamin D was given. The P balance was negative and citrate had no effect on it unless vitamin D was given, when citrate increased the loss of P. It is concluded that in the circumstances described citrate had a rachitogenic effect.

The effect of citrate in reducing the power of vitamin D to depress the growth of rats given a diet adequate in Ca and low in P is attributed to its action in promoting withdrawal of Ca and P from the skeleton and thereby making more P available for growth.—E. M. Hume.

2964

LARON, Z., CANLAS, B. D. (Jr.) and CRAWFORD, J. D. **The action of cortisone on the teeth of rachitic rats.** *Arch. Pathol.*, 1956, **61**, 177–180. [Dept. Paediat., Harvard Med. Sch., Boston, Mass.]

Thirty rats weighing from 45 to 50 g. were given a rachitogenic diet low in Ca without vitamin D. After 17 days groups were given daily for 3 days 100 " units " vitamin D, or 80 mg. Ca as Ca lactate, or 2 or 5 mg. cortisone acetate, or combinations of 2 or 3 of the supplements, or no addition. At the end of 3 days blood was taken for analysis and the rats were killed. A portion of the upper maxilla with the two median incisors was taken for histological examination.

The value for serum inorganic P did not vary and the mean for all groups was 13·6 mg. per 100 ml. Serum alkaline phosphatase was lower when cortisone was given. The mean for all rats not given cortisone was 84 Bodansky units per 100 ml., and for rats given cortisone it was 73; the difference was barely significant. Serum Ca values were little increased by vitamin D or Ca, being between 4 and 5 mg. per 100 ml. whether either of them was given or not, but when both were given the mean value was 8·8. The mean values were always higher with cortisone, being with vitamin D 6·0, with Ca 6·8 and with both 9·2. In the incisor teeth, rats having the rachitogenic diet alone showed marked widening of the predentine, and other irregularities. When vitamin D or Ca was given, the predentine was narrower, and cortisone added to either of them had no further effect. When both were given, the predentine was reduced to a thin layer, which was not so thin when cortisone was given as well.

E. M. Hume.

2965

STEENBOCK, H. and HERTING, D. C. **Vitamin D and growth.** *J. Nutrition*, 1955, **57**, 449–468. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Rats weighing from 70 to 80 g., usually male, were given a basal diet of, per cent., glucose 67, steamed egg white 18, cottonseed oil 10, roughage 3, salt mixture without Ca or P 2, and a mixture of water-soluble vitamins. Vitamins A, E and K were given in oil 3 times a week. Ca was added as $CaCO_3$ and P as a neutral equimolar mixture of KH_2PO_4 and K_2HPO_4. When very large amounts of Ca were required P was added as $Ca_3(PO_4)_2$. Before the experiment 9 representative normally fed rats of mean weight 73 g. were analysed to obtain mean values for serum Ca and inorganic P and for certain characteristics of the femur. When vitamin D was given it was as 75 I.U. vitamin D_2 on the first and every third day. The experiments usually lasted 21 days.

With a diet containing only 0·018 per cent. Ca and P ranging from 0·016 to 1·168 per cent. the rats lived for many weeks, but growth was more strongly inhibited the greater the content of P. Addition of vitamin D overcame the inhibition and

growth continued for a further 7 weeks at all levels of P intake. Without vitamin D half the rats died within 9 weeks; the value for serum P was excessively high and for serum Ca excessively low; vitamin D corrected both.

With a diet containing 0·3 per cent. P and from 0·21 to 2·63 per cent. Ca, the addition of Ca increased growth to some extent but not as much as addition of vitamin D. With vitamin D addition of Ca had only a small effect, and the largest amounts of Ca inhibited growth. Addition of Ca was less beneficial to bone than addition of vitamin D. The width of metaphyseal cartilage was normal except in rats given much Ca and no vitamin D, in which there was a rachitic widening. Whether the salt supplying Ca was highly basic or not made no difference.

With a diet containing adequate Ca, 0·45 per cent., and increasing amounts of P, the effect of vitamin D was not as great as when the Ca content was low. The difference seemed to be due to the higher value for serum Ca maintained by the higher intake.

Further experiments were made in which rats were started on diets with and without vitamin D. When the weight of those with vitamin D exceeded that of those without by about 10 g., the amount of Ca or P or both was raised or lowered. No change was as effective in increasing growth as administration of vitamin D. Consumption on alternate days of the diet containing either added Ca or added P again failed to give a growth performance as good as that with vitamin D.

From the fact that, with diets low in Ca and high in P, addition of Ca was less effective in promoting growth than addition of vitamin D, it was concluded that the action of vitamin D is not limited to the absorption and deposition of bone salts, but that the vitamin has a more widespread effect on organic tissue metabolism, of which increased growth is one manifestation.

E. M. Hume.

2966

Herting, D. C. and Steenbock, H. **Vitamin D and gastric secretion.** *J. Nutrition*, 1955, **57**, 469–482. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Rats weighing from 70 to 95 g. were given a stock diet or a rachitogenic diet low in P with maize and wheat gluten, or a semi-synthetic rachitogenic diet (see preceding Abst.) to which NH_4Cl, $NaHCO_3$ and Ca and P and vitamin D were added as described above. The experiments lasted 21 days. After from 16 to 24 hours' starvation, or less if there was a risk of tetany from low-Ca diets, the pyloric sphincter was tied and gastric secretion was collected 6 hr. later, no water having been given.

The addition of vitamin D increased the volume of gastric secretion and reduced the *p*H, but the values were never beyond those obtained with a stock diet. The effect of vitamin D was to restore the normal state. The difference in *p*H with and without vitamin D was greatest with diets low in P or in available P. With diets high in P or normal diets there was no effect. The Ca content of the diet had no influence except on the availability of P. The changes in the volume of secretion usually reflected those in *p*H, being increased by vitamin D, but not invariably, so that the mechanisms governing the two functions might not be the same. The effect of vitamin D was not modified by altering the acid base balance in the diet or by injecting histamine. Serum P increased when vitamin D exercised its effect on gastric *p*H, but it might increase without that effect being present.

No obvious correlation was found between water content of the body, volume of urine and gastric secretion. Ulcers in the stomach tended to be produced with diets high in Ca, and the tendency was greater when vitamin D was added.

E. M. Hume.

See also Absts. 3101, 3354.

VITAMIN E

2967

Navazio, F. Cromatografia su carta dell'alfa-tocoferolo-fostato (alfa-tph). [**Paper chromatography of α-tocopheryl phosphate.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 550–551. [Ist. Chim. Biol., Univ. Rome.]

The mixture of solvents used was pyridine, *iso*butanol, distilled water and concentrated acetic acid, in the proportions 20 : 30 : 50 : 5, at *p*H 6. The spots were developed by spraying the paper with 1 per cent. $FeCl_3 . 6H_2O$ in 80 per cent. alcohol. The spot for α-tocopheryl phosphate was light yellow on a dark orange ground. The method distinguished it from adenosine triphosphate, cocarboxylase and glucose-1- and glucose-6-phosphate. The amount of α-tocopheryl phosphate in the spot could be estimated by measuring the amount of P.—E. M. Hume.

2968

Green, J. and Marcinkiewicz, S. **η-Tocopherol (7-methyltocol): a new tocopherol in rice.** *Nature*, 1956, **177**, 86–87. [Walton Oaks Exp. Stat., Res. Labs., Vitamins, Ltd., Dorking Rd., Tadworth, Surrey.]

The lipoid fraction of whole Japanese rice was

saponified with alkali and the vitamin E complex was purified by treatment with Floridin earth. Two-dimensional chromatography as previously described by the authors (Abst. 4814, Vol. 25) showed that at least 3 tocopherols were present which moved to the positions of α-, ζ- and ε-tocopherol; γ- and δ-tocopherols were absent. The spot in the ε-position gave a strong positive reaction with diazotised *O*-dianisidine which is given only by tocopherols with the 5-position free. By methods not described ε-tocopherol was proved to be absent. The new spot was considered to be 7-monomethyltocol and was named η-tocopherol. Rice contained α-, ζ- and η-tocopherols in the proportion 47 : 26 : 27. η-Tocopherol had an absorption maximum at 293 mμ.; $E\ ^{1\ per\ cent.}_{1\ cm.} = 78$. It gave a yellow nitroso derivative with nitrous acid, and on oxidation with nitric acid gave a red *O*-quinone with absorption maximum at 477 mμ., and $E\ ^{1\ per\ cent.}_{1\ cm.} = 56$.—R. J. Ward.

2969

HALDEN, W. Vitamin E im Lichte neuester Erkenntnisse. [**Vitamin E in the light of recent discoveries.**] *Lebensmittel u. Ernährung*, 1955, **8,** No. 12, 10–13. [Univ. Graz.]

Green's table of the tocopherol content of plant oils (Abst. 4814, Vol. 25) is quoted; the relative values of known tocopherols in terms of α-tocopherol = 100, and the values of germ oils in α-tocopherol equivalents are shown in tables. The role of vitamin E in biochemistry *in vivo* and *in vitro* is then discussed extensively with reference to its anti-oxidative action and the importance of that action, as, for instance, in preventing the deposition of peroxides of fatty acids with protein and cholesterol in the aorta, in balancing highly unsaturated fatty acids and in protecting vitamin A, enzymes and other essential components of diet and body tissues from oxidative destruction. Requirements are discussed in relation to physiological state, and diets and foods in relation to requirements.—R. J. Ward.

2970

MOORE, T. **Recent research on vitamins. Vitamin E.** *Brit. Med. Bull.*, 1956, **12,** 44–48. [Dunn Nutrit. Lab., Univ. Cambridge.]

2971

BECKMANN, R. **Vitamin E.** *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1955, **7,** 153–222; 281–376. [Kinderklin., Westfäl. Wilhelms Univ., Münster.]

A review.

2972

NAVAZIO, F. and FIORETTI, P. Effetto dell'alfa-tocoferolo-fosfato sul tasso plasmatico dei caroteni. [**Effect of α-tocopheryl phosphate on the plasma value for carotenes.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 552–554. [Ist. Chim. Biol., Univ. Rome.]

Vitamin A and carotene were estimated by the Carr Price method in the blood plasma of normally fed male dogs weighing about 12 kg. before and 8 hr. after administration by mouth or by intramuscular injection of 100, 150 or 200 mg. α-tocopheryl phosphate. In 9 experiments the vitamin A value was not changed but the carotene value was always increased. When an ethereal extract of the plasma was treated with methanol and passed through a column of $Ca(OH)_2$ to free it from xanthophylls, the amount of the residual α-, β- and *neo*-β-carotenes still remained greater after administration of tocopheryl phosphate than before it.—E. M. Hume.

2973

CHRISTENSEN, F., DAM, H., GORTNER, R. A. (Jr.) and SØNDERGAARD, E. **"In vitro" hemolysis of erythrocytes from vitamin E deficient rats and chicks.** *Acta physiol. scand.*, 1956, **35,** 215–224. [Dept. Biochem. Nutrit., Polytec. Inst., Copenhagen.]

White female rats were given a basal diet without fat or tocopherol for 62 days followed by the same diet or one containing 2 or 20 per cent. lard. Some of the animals were given 0·02 per cent. α-tocopheryl acetate or 0·126 per cent. methylene blue. Tests for haemolysis were made on the erythrocytes by a slight modification of the method of György and Rose with dialuric acid. Of 72 rats given the fat-free diet for 62 days, 45 showed complete haemolysis in 4 hr. Vitamin E gave complete and methylene blue partial protection. The inclusion of lard in the diet did not affect haemolysis. When physiological saline was substituted for the dialuric acid and buffer solutions in the test, haemolysis occurred in the erythrocytes from deficient rats, the preparations being kept at 37° C. for 2 or 4 hr. Haemolysis was complete in 1 hr. when the temperature was 47° C. Dietary methylene blue gave partial, and dietary vitamin E complete, protection against the occurrence of such haemolysis. Spontaneous haemolysis did not occur when purified nitrogen was bubbled through the suspension of erythrocytes.

The erythrocytes of deficient chicks were more resistant to haemolysis than those of rats and only faint haemolysis occurred within 4 hr., even when dialuric acid was added.—R. J. Ward.

2974

MORGULIS, S., KAREL, J. L. and WILDER, V. M. Dystrophie musculaire nutritionnelle et "le quotient de créatine". [**Nutritional muscular**

dystrophy and the creatine quotient.] *Bull. Soc. Chim. biol.*, 1955, **37**, 851–856. [Dept. Biochem., Coll. Med., Univ. Nebraska, Omaha.]

Young rabbits weighing from 400 to 500 g. were fed as described earlier (Abst. 2903, Vol. 11), with or without α-tocopherol. The tocopherol-free diet produced dystrophy. In both groups the creatine quotient, QC,

$$\frac{\text{total creatinine} - \text{pre-formed creatinine}}{\text{total creatinine}} \times 100$$

in urine was estimated.

In 32 urine samples from normal rabbits the value of the QC was from 9·7 to 23·7, mean 15·4 ± 3·7, and individual variations during 2 or 3 weeks were slight. In the deprived rabbits the value began to rise before signs of dystrophy appeared; it continued to rise and the animals usually died with clinically severe dystrophy when it exceeded 80. Individual variations from day to day were very large. In rabbits with advanced dystrophy and QC between 70 and 80, treatment with α-tocopherol was followed by very rapid fall of the QC to normal in from 2 to 4 days. Recovery of normal muscular structure and function followed more slowly.—D. Duncan.

2975

DINNING, J. S. **The influence of vitamin E deficiency on the incorporation of various radioactive precursors into urinary creatinine by the rabbit.** *Arch. Biochem. Biophys.*, 1956, **60**, 501–502. [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

White male New Zealand rabbits were given a diet without vitamin E, with or without supplements of 10 mg. α-tocopheryl acetate twice a week. When the deprived animals showed signs of muscular dystrophy, both groups were given intraperitoneal injections of 10 μC. per 100 g. bodyweight of sodium formate-^{14}C, glycine-1-^{14}C or glycine-2-^{14}C. The animals were killed 4 hr. after injection and the specific activity of urinary creatinine was estimated. When sodium formate was injected the specific activity for the normal animals was 56 counts per min. per μ*M* and for the deficient animals 855. With glycine-1-^{14}C the corresponding values were 46 and 664, and with glycine-2-^{14}C 59 and 266.—R. J. Ward.

2976

RUMERY, R. E., MAUER, S. I. and MASON, K. E. **Muscle protein fractions in late-lactation paralysis of vitamin E deficient rats.** *J. Exp. Zool.*, 1955, **129**, 495–503. [Dept. Anat., Sch. Med. Dent., Univ. Rochester, N.Y.]

Gastrocnemius muscle was taken from rats at ages from 5 to 30 days for estimation of insoluble protein, actomysin and soluble protein. Some of the young rats had been reared by mothers which had received a stock diet, but the mothers of others had been transferred to a diet deficient in vitamin E immediately before mating. Young from the mothers deprived of vitamin E became paretic between the ages of 18 and 25 days, and in that period there was a rapid fall of actomysin and a sharp rise in the insoluble protein in muscle. Spontaneous recovery, which occurred before the 30th day in those animals which did not die, was accompanied by a compensatory rise of actomysin. In the animals on stock diet actomysin increased steadily and insoluble protein decreased throughout the period between the 18th and 30th days.

T. Moore.

2977

TARJÁN, R. and KRAMER, M. (with SZÁNTÓ, M. and TÓTH, A.). Veränderungen im Vitamin-E-Gehalt der Organe und Gewebe junger Ratten bei Verabreichung von Diäten mit verschiedenem Vitamin-E-Gehalt. [**Changes in the vitamin E content of organs and tissues in young rats given diets with different contents of vitamin E.**] *Internat. Ztschr. Vitaminforsch.*, 1955, **26**, 220–225. [Inst. Ernährungswiss., Budapest.] English and French summaries.

Young rats were given for 10 weeks a diet deficient in vitamin E with 0·9, 4·6 or 9·5 mg. vitamin E per 100 g. diet, after which they were killed and the vitamin E content of some organs was estimated. The vitamin E content of the liver did not significantly increase with increasing intake; the values were 6·6, 7·0 and 7·3 mg. per 100 g. Vitamin E in the serum rose from about 0·1 mg. per 100 ml. with the lowest intake to 0·4, and to 0·9 with the highest. The greatest increase was in the adrenal glands with values of 3·4, 6·3 and 22·5 mg. per 100 g. for the respective intakes.

R. J. Ward.

2978

CHERNICK, S. S., MOE, J. G., RODNAN, G. P. and SCHWARZ, K. **A metabolic lesion in dietary necrotic liver degeneration.**

ROSECAN, M., RODNAN, G. P., CHERNICK, S. S. and SCHWARZ, K. **Acetate-2-C^{14} utilization in dietary necrotic liver degeneration.** *J. Biol. Chem.*, 1955, **217**, 829–843; 967–976. [Nat. Inst. Arthritis Metabol. Dis., Nat. Insts. Health, Bethesda, Md.]

(*a*) Rats 18 to 20 days old were given a basal diet containing, per cent., torula yeast 30, sucrose 59, vitamin-E-free lard 5, salts 5 and vitamin mixture in lactose 1. Mean survival of rats on this diet is 45 days and all develop liver necrosis. After 18 to 22 days some of the rats received supplements of vitamin E, 0·5 or 1 per cent. L-cystine, 1 per cent. L-cysteine, 1·23 per cent. DL-methionine or a source of factor 3 (Abst. 1037,

Vol. 22); the rest continued on the basal diet. After from 21 to 200 days from weaning rats were killed; oxygen consumption was studied with slices of liver and other tissues and liver homogenates.

Liver slices showing gross necrosis consumed oxygen very slowly. Histologically normal slices from rats on the basal diet showed normal oxygen consumption for 30 min. and then a rapid decline. This was prevented by the supplement of vitamin E and did not occur in slices from rats on stock diet. Slices of kidney or diaphragm from rats on the basal diet had normal oxygen consumption, even when the liver showed gross necrotic change. The value of amino acids and factor 3 preparations in preventing respiratory decline was proportional to their value in preventing necrosis.

Liver homogenates from rats on the basal diet, with additions of $MgSO_4$, cytochrome *c*, adenosine triphosphate, diphosphopyridine nucleotide, nicotinamide, fructose diphosphate and pyruvate in different combinations, showed no metabolic difference from normal liver homogenates.

Liver damage produced by a high-fat, low-protein diet, 5 per cent. cystine or 0·5 per cent. ethionine did not reproduce the same metabolic defect.

(*b*) Liver tissue from rats fed as described above and free from evidence of disease was incubated in Warburg vessels at *p*H 7·4 and 37·2° C. in Krebs's phosphate buffer with sodium acetate-2-^{14}C. Recoveries of ^{14}C were measured in acetoacetic acid, lipids and CO_2 for up to 2 hr. Metabolism of acetate was found to decline rapidly in tissue from rats on the basal diet, but continued for the whole experiment in tissue from rats fed on stock diet or given vitamin E.

In rats on basal diet the fasting blood ketone value was lower than that of rats given vitamin E.

Metabolic activity in liver slices was restored 1 hr. after intraperitoneal injection of vitamin E emulsion into fasting rats previously fed on the basal diet.—D. Duncan.

2979

PROSPERI, P. and BORSELLI, L. Studio istologico sulla ipervitaminosi E nella cavia. [**Histological study of vitamin E excess in the guinea-pig.**] *Riv. Clin. pediat.*, 1955, **56,** 378–391. [Ist. Clin. Pediat., Univ. Florence.] English and French summaries.

Of 18 guineapigs [total number stated to be 30 but no account given of 12], weighing from 250 to 300 g., all having the same [presumably complete] diet, 6 were given 100 mg. vitamin E daily for 10 days, 6 had 300 mg. daily for 10 days, 2 had a single dose of 600 mg., 2 of 900 mg. and 2 of 1200 mg. The last 6 were all killed 4 days later. The vitamin was given by intramuscular injection. All the animals appeared perfectly well except those given 1200 mg., which seemed dull with a staring coat. Those in the two first groups gained weight; the weight of the other 6 remained unchanged. Histological examination of tissues and organs showed no change in the group given 100 mg. In the other groups there were changes, of severity increasing gradually with increasing dose, though only very marked with the largest dose. There were degenerative changes in the liver, and oedema in the myocardium and brain. In the endocrine glands there were signs of overstimulation in the pancreas, pituitary gland, testes and ovaries.

The results suggested that on a bodyweight basis there was no reason for apprehension about the size of the doses of vitamin E commonly given to human beings.—E. M. Hume.

2980

TAYLOR, D. W. **The effects of vitamin E and of methylene blue on the manifestations of oxygen poisoning in the rat.** *J. Physiol.*, 1956, **131,** 200–206. [Dept. Physiol., Univ. Aberdeen.]

Weanling hooded rats given a diet with supplements of other vitamins but without vitamin E were divided into 4 groups each of 4 males and 4 females. Group E received a supplement of 5 mg. α-tocopheryl acetate twice weekly; group M received 0·15 per cent. methylene blue in the diet, and group ME received both. Group O had no supplement. When aged from 180 to 200 days all the animals were exposed to oxygen at a pressure raised from 1 to 5 atmospheres at the rate of 10 lb. per sq. in. per min. Signs of oxygen poisoning appeared successively as twitching and jerking of the ears, head and limbs, then violent shivering and convulsions which were quickly followed by prostration and death. The time from the initial rise of oxygen pressure to the appearance of convulsions and prostration was measured in each group. Blood samples for the dialuric acid haemolysis test were taken immediately after decompression.

Methylene blue prevented pigmentation of the uterus and loss of weight by the testes. The total testicular tissue for group O was on the average 1·21 g. per rat, and for groups E, M and ME it was 2·76, 2·45 and 2·54 g. The mean time to onset of oxygen poisoning was 33 min. in group O, 36 in group ME, 44 in group M and 56 in group E. Tocopherol and methylene blue given separately provided a significant ($P < 0·01$) degree of protection but given together did not alter appreciably the time to onset of poisoning. The difference between groups M and E suggests a failure of methylene blue to replace vitamin E fully. When blood from the test rats without vitamin E was centrifuged for the haemolysis test the supernatant liquid was already so deeply coloured by

haemolysis, whether the animals received methylene blue or not, that it was impossible to make the test.—I. M. Sharman.

2981

SACCO, T. Sull' azione masteoplastica della vitamina E. [**Effect of vitamin E on the mammary glands.**] *Riv. Zootec.*, 1955, **28,** 347–349. [Ist. Fisiol. Animali Domest., Bologna.]

See Absts. 1534, 4108, Vol. 23, in which it was shown by Piana that vitamin E promoted mammary development in female guineapigs.

Three groups of 10 male guineapigs received a mixed diet with fresh green food and 15 mg. ascorbic acid daily. One group consisted of 5 entire males and 5 castrates. In the second group of 10 entire males, and the third of 10 castrates, each animal received daily by mouth 20 mg. α-tocopherol in oil; treatment began 3 weeks after castration and continued for just over 3 months.

The guineapigs given α-tocopherol developed slightly greasy coats. When they were killed their mammary glands were slightly larger than those of the group not given tocopherol, but there was no histological difference except for the presence of more fat and a greater development of sebaceous glands. It is considered possible that the oil in which the α-tocopherol was dissolved was responsible for the difference.

It is concluded that the effect of α-tocopherol is not comparable with that of folliculin, at least for the male guineapig.—D. Duncan.

2982

LUDOVICY, R. Influence de l'α-tocophérol sur la sensibilisation au potassium. [**The effect of α-tocopherol on potassium sensitivity.**] *Arch. internat. Pharmacodyn.*, 1955–56, **104,** 196–203. [Lab. Physiol., Inst. Léon Frédéricq, Univ. Liège.]

The injection of *dl*-α-tocopheryl disodium phosphate into the lymphatic sacs of frogs from 5 to 24 hr. before dissection decreased by 50 per cent. the sensitivity to potassium, induced by sodium thiocyanate, of the isolated rectus abdominis muscle. Tocopherol also decreased by 40 per cent. the sensitivity to K induced by caffeine, but that induced by veratrin was not affected.—T. Moore.

2983

DARLINGTON, F. G. and CHASSELS, J. B. **A study on the breeding and racing of thoroughbred horses given large doses of alpha tocopherol. 1. Breeding experiments. 2. Racing experiment.** *The Summary*, 1956, **8,** 1–10; 10–20. [Nat. Stud Farm, Oshawa, Canada.]

1. The 34 brood mares studied included 17 barren and maiden mares and 4 most difficult to get in foal; 7 had an average age of 17 years. All were given from 600 to 1000 I.U. α-tocopheryl succinate daily from April 1955. Apart from the maiden mares, the proportion of the mares which had had foals in the 5 preceding years was 15 out of 17, 15 out of 24, 15 out of 24, 17 out of 26 and 17 out of 28; in 1956, 30 were in foal and only 4 barren. Of the 4 barren mares 1 had cystic ovaries, 2 gave haemolytic streptococci in cervical swabs and 1 had been barren 4 times in 6 years. Of 27 other mares not given α-tocopherol, 19 were in foal in 1956.

A decline in fertility of maiden mares is attributed to "the indiscriminate use of hormone products during their racing career". Of 6 such treated with tocopherol, all conceived.

The 5 stallions studied had an average age of 11 years and in the 5 years before experiment had a record of 178 foals from 270 mares; in 1955 they received α-tocopherol and 76 out of 86 mares served were found to be in foal. Two younger stallions also improved in performance. In an old gelding teaser given testosterone for 12 years the implanted testosterone had a more lasting effect when α-tocopherol was given.

2. A group of 15 racehorses received α-tocopherol in the 1955 season, usually 2000 I.U. daily. The horses appeared less nervous, ate better, and were more successful in racing performance than in the previous season.—D. Duncan.

2984

MERK, W. B. Über die Beziehungen der Mineralstoffe und Vitamine zur unspezifischen Sterilität des Rindes. [**Relation of minerals and vitamins to non-specific sterility in cattle.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag. Prof. Crasemann, 79–84. [Inst. Haustierernährung, Eidg. Tech. Hochsch., Zürich.]

The part played by lack of calcium, phosphorus, potassium, sodium, manganese, copper or cobalt or excess of fluorine in causing sterility in cattle is discussed with reference to the literature. A brief note is included on the probable importance of deficiency of vitamins A, D and E in non-specific sterility.—A. M. Copping.

2985

LAMBERT, N. H. **Alpha tocopherol in small animal therapy. (Further observations with increased dosage.)** *The Summary*, 1955, **7,** 1–6. [Dublin.]

The condition of 9 old dogs suffering from cardiovascular disorders and other abnormalities was improved by large doses of natural α-tocopheryl succinate. The same treatment cured cystic mammitis in an old cat, and improved the racing performance of 2 young greyhounds. To prevent relapse the treatment had to be continued.

T. Moore.

2986

SWINGLE, K. F., SAFFORD, J. W. and MCROBERTS, D. E. **Tocopherol levels of the early milks of semirange cattle.** *Amer. J. Vet. Res.*, 1956, **17**, 28–35. [Montana Vet. Res. Lab., Bozeman.]

Samples of colostrum were taken on the first 4 days after parturition and of milk (7 samples in all) every 4 days, commencing at the eighth day, from 53 semi-range Hereford cows originating from 5 different herds, 3 of which, comprising 46 cows, had a previous history of white muscle disease, and from the cows of one dairy herd. The average tocopherol content in μg. per 100 ml. in the colostrum of individual beef cows ranged from 18 to 1357. The average for each herd ranged from 59 to 696. The average for the colostrum from the dairy herd was 283. Similarly, the average tocopherol values for the milk samples ranged from 16 to 501 μg. per 100 ml., with the averages for the herds ranging from 40 to 275. The average value for the milk from the dairy herd was 79. The lowest values were obtained from a herd which had previously suffered losses from white muscle disease, but the disease could not be definitely attributed to lack of tocopherol in the diet.

R. J. Ward.

2987

KRUISHEER, C. I. **The total tocopherol (vitamin E) content of Dutch butter. (With reference to the carotene and vitamin A contents.)** *Nederlands Melk Zuiveltijdschr.*, 1955, **9**, 275–290. [Govt. Dairy Stat., Leyden.] Dutch summary.

Samples of butter from 18 creameries in different parts of the country were examined every month. Half of each sample was stored at — 20° C. for from 8 to 12 months (Abst. 1525, Vol. 26). Vitamin E was estimated by the $\alpha\alpha^1$-dipyridyl method after vitamin A and carotene had been removed by adsorption with Floridin XS. Vitamin A and carotene were estimated as previously described (Kruisheer and Den Herder, Absts. 275, 4151, Vol. 23). The butters were tested for flavour, particularly off-flavour of a fatty, fishy or fish-oil nature. The individual results are tabulated.

The mean tocopherol content in μg. per g. butter was for the whole year 20 with range 8 to 34, for the pasture period June to September 24 with range 20 to 34, and for the period in stall from December to April 15 with range 8 to 21. The corresponding values in μg. per 100 g. for whole milk as delivered to the factories were 88, 105 and 67, and for " drinking " milk standardised to 2·5 per cent. fat content the values were about two-thirds of those. For vitamin A and carotene the values were like those previously found (Absts. 275, 4151, Vol. 23).

Statistical examination of the results for the different months showed a significant correlation between carotene content and vitamin A content except in May and June. Between tocopherol content and carotene content there was no correlation from May to August, but for the other months there was a positive correlation with fair significance. Between tocopherol content and vitamin A content there was a positive correlation of varying significance. The findings gave some confirmation to the hypothesis that tocopherol promotes the assimilation and formation or stability of vitamin A and the stability of carotene. There was little or no correlation between tocopherol content and liability to develop off-flavour on storage, which seemed to be greater in the pasture period, and it was concluded that tocopherol in butter has no anti-oxidant activity of any importance. Tocopherol sometimes remained stable during storage and sometimes decreased, but the results were irregular and could not be correlated with such other variables as Cu content or intensity of oxidation defect.—E. M. Hume.

VITAMIN K

2988

SATHE, V., DAVE, J. B. and RAMAKRISHNAN, C. V. **Spectrophotometric method for the estimation of vitamin K_3.** *Nature*, 1956, **177**, 276. [Dept. Biochem., Fac. Sci., M.S. Univ. Baroda.]

When a solution of vitamin K_3 was shaken with ethanol, and 2 : 4-dinitrophenylhydrazine in 2*N* HCl and then Na_2CO_3 was added, a stable green colour developed, which could be removed through its solubility in amyl alcohol and used for spectrophotometric measurement of vitamin K_3. The method was suitable for micro-estimation of from 2 to 30 μg. vitamin K_3.—A. M. Copping.

2989

REBER, E. F., MORRILL, C. C., NORTON, H. W. and RHOADES, H. E. **Studies of the effects of chlortetracycline, vitamin E and vitamin K in the nutrition of the rat. 1. Growth.** *J. Nutrition*, 1956, **58**, 19–28. [Dept. Vet. Physiol., Coll. Vet. Med., Univ. Illinois, Urbana.]

Rats were given a basal diet without vitamins E and K, alone or with addition of vitamins E and K and aureomycin hydrochloride (chlortetracycline) in amounts of 0·02 or 0·03 per cent. singly or in their possible combinations. The experiment

was based on a factorial design. The addition of vitamin E or aureomycin increased growth significantly. Degeneration of the testes occurred in the rats fed on the basal diet alone, but not in those receiving any of the supplements. Vitamin E or aureomycin but not vitamin K increased the concentration of vitamin A in the liver from an average of 260 I.U. per g. to 1039 and 942 I.U. per g., respectively. In the colon, aureomycin reduced the number of coliform and lactic acid bacteria, and vitamin K reduced the number of coliform bacteria. Aureomycin or vitamin K increased the growth of yeasts in the colon.

R. J. Ward.

2990

MASONI, S., ZULIANI, F. and NEPPI LEVI, P. Potere antifungino e antibatterico delle associazioni vitamina K_5 (2-metil-4-amino-1-naftolo-cloridrato)-antibiotici. 1. Antagonismo e sinergismo nei riguardi dello *Staphylococcus pyogenes aureus*, del *B. coli*, del *B. pyocianeum* e della *Candida albicans*. [**Antifungal and antibacterial activity of associations of vitamin K_5 (2-methyl-4-amino-1-naphthol hydrochloride) and antibiotics. 1. Antagonism and synergism with regard to *Staphylococcus pyogenes*. *Bact. coli*, *B. pyocyaneum* and *Candida albicans*.**] 2. Antagonismo e sinergismo nei riguardi delle infezioni miste schizomiceti-fungo: *Staphylococcus pyogenes aureus*, *B. coli*, *B. pyocianeum* e *Candida albicans*. [**2. Antagonism and synergism with regard to mixed infections by schizomycetes and fungi: *Staphylococcus pyogenes aureus*, *Bact. coli*, *B. pyocyaneum* and *Candida albicans*.** *Arch. Sci. biol.*, *Bologna*, 1956, **40**, 38–46; 47–57. [Ist. Igiene, Univ. Modena.]

1. The antibacterial effect of penicillin, streptomycin, oxytetracycline, chlorotetracycline, chloramphenicol, subtilin and polymyxin, alone and combined with vitamin K_5, was investigated *in vitro* with several micro-organisms. The effect of the antibiotic substances on *Staphylococcus pyogenes aureus* was enhanced *in vitro* by vitamin K_5. With *Bact. coli* and *B. pyocyaneum* the effect of oxytetracycline and streptomycin was increased but there seemed to be antagonism between other antibiotics and vitamin K_5. Antagonism between vitamin K_5 and penicillin, oxytetracycline and polymyxin was shown with *Candida albicans*, but vitamin K_5 had no effect on the action of streptomycin and it increased the effect of other antibiotics.

2. Further studies were made with the same antibiotics and vitamin K_5 on mixed cultures of bacteria and the mould *Candida albicans*. The presence of vitamin K_5 did not appear to alter the effect of antibiotics on the mould in mixed cultures and the antibacterial effects were generally enhanced, with the exception of mixed cultures containing *B. pyocyaneum*, where greater doses of antibiotic were required to obtain a minimum effect.—A. M. Copping.

2991

ZULIANI, F. and MASONI, S. Su un eventuale potenziamento nell'attività antibatterica e antifungina dell'associazione di alcuni chemioterapici con la vitamina K_5 (2-metil-4-amino-1-naftolo-cloridrato). [**Potentiation of antibacterial and antifungal activity of some drugs by association with vitamin K_5 (2-methyl-4-amino-1-naphthol hydrochloride).**] *Arch. Sci. biol.*, *Bologna*, 1956, **40**, 58–65. [Ist. Igiene, Univ. Modena.]

The effect of combining vitamin K_5 with 8-hydroxyquinoline, *furazina* [? Furacin], chloramine, undecylenic acid or tyrothricin was investigated with *Staphylococcus pyogenes aureus*, *Bacterium coli* and *Candida albicans*, separately and in mixed cultures. The results suggested a synergic effect between vitamin and chemotherapeutic agent, especially in reactions against *Candida*. The possible use of vitamin K_5 as an aid to chemotherapy in clinical practice is suggested.

A. M. Copping.

2992

GREEN, J. P., SØNDERGAARD, E. and DAM, H. **Intracellular distribution of vitamin K in beef liver.** *Biochim. biophys. Acta*, 1956, **19**, 182–183. [Dept. Biochem. Nutrit., Polytech. Inst., Copenhagen.]

Beef liver was homogenised and centrifuged to yield 3 fractions representing the nuclei, mitochondria and supernatant fluid. The fractions were tested biologically on chicks for vitamin K, and their activity appeared to be associated chiefly with the mitochondria.—A. M. Copping.

VITAMIN B COMPLEX: GENERAL

2993

LOY, H. W. (Jr.), PARRISH, W. P. and SCHIAFFINO, S. S. **The use of turbidity measurements in microbiological methods for vitamins.** *J. Assoc. Off. Agric. Chem.*, 1956, **39**, 172–179. [Food Drug Admin., Dept. Health, Educat. Welfare, Washington 25, D.C.]

The use of turbidity as criterion was investigated in microbiological methods for estimating folic acid, nicotinic acid, pantothenic acid, riboflavin

and vitamin B_{12}. With proper precautions measurement of turbidity gave results equal in validity to those of titrimetric methods. Certain changes are recommended in preparing the inoculum and concentrating the standard.—A. M. Copping.

2994

SCHIAFFINO, S. S., LOY, H. W. (Jr.), KLINE, O. L. and HARROW, L. S. **Application of the variable reference technique for the spectrophotometric determination of vitamins.** *J. Assoc. Off. Agric. Chem.*, 1956, **39**, 180–185. [Food Drug Admin., Dept. Health, Educat. Welfare, Washington 25, D.C.]

The use of a recording double-beam spectrophotometer for measuring concentrations of several components in a mixture containing vitamins of the B complex is reported. The method depended on the selection of suitable wavelengths characteristic of each component and on the absence of interfering substances. For concentrates in tablets and capsules and other pharmaceutical preparations the results showed accuracy similar to that obtained with other methods, and much time was saved.

A. M. Copping.

2995

DALGLIESH, C. E. **Recent research on vitamins. Interrelationships of tryptophan, nicotinic acid and other B vitamins.** *Brit. Med. Bull.*, 1956, **12**, 49–51. [Postgrad. Med. Sch., London.]

2996

RERAT, A., LE BARS, H. and JACQUOT, R. Essai de localisation du lieu d'absorption des vitamines B dans le tube digestif du mouton. [**Attempt to locate the site of absorption of B vitamins in the digestive tract of the sheep.**] *C.R. Acad. Sci.*, 1956, **242**, 679–681.

The absorption of B vitamins was studied in 3 sheep by an indirect method in which chromic oxide as tracer was given with the diet of oats and lucerne hay, and the concentration of the insoluble tracer and of vitamins of the B complex was estimated in the rumen, reticulum, omasum, abomasum, small intestine, caecum, colon and rectum. From the results it seemed that absorption of the vitamins was at a maximum in the omasum and the small intestine. The observation was confirmed by direct measurement of vitamin B_1, riboflavin, nicotinic acid, pantothenic acid and vitamin B_{12} in venous blood obtained from the different sections of the gut and by comparison of the amounts with the amount of B vitamins in blood from the jugular vein.—A. M. Copping.

2997

BALAKRISHNAN, S., RAJAGOPALAN, R. and GIRI, K. V. **The present state of knowledge regarding biosynthesis of B-complex vitamins.** *Indian Med. Gaz.*, 1955, **90**, 7–19. [Dept. Biochem., Indian Inst. Sci., Bangalore.]

2998

MANNINO, N. and PIPITONE, V. Il problema della vitaminosintesi batterica nel quadro della resistenza agli antibiotici: ricerche con E. coli. [**Bacterial synthesis of vitamins and resistance to antibiotics. Researches on *E. coli*.**] *Bol. Ist. sieroterap. milan.*, 1955, **34**, 374–381. [Ist. Clin. Med., Univ. Bari.] English summary.

A strain of *Bacterium coli* was subcultured repeatedly in a synthetic medium without water-soluble vitamins, in presence of penicillin, aureomycin, terramycin, chloramphenicol or streptomycin. Growth was measured turbidimetrically. Vitamin B_{12}, folic acid, vitamin B_6 and nicotinamide were estimated microbiologically after 8 and 24 hr. in cultures of the strains rendered resistant to the different antibiotics and of the original, non-resistant strain, and in the medium itself. Synthesis of any of the vitamins was much less by strains resistant to any of the antibiotics.

E. M. Hume.

2999

MONDOLFO, H. and MONDOLFO HOUNIE, E. Sull'antagonismo esistente tra l'aureomicina e alcuni fattori metabolici (vitamine del gruppo B, guanina, adenina, ecc.). [**Antagonism between aureomycin and some metabolic factors (vitamins of the B complex, guanine, adenine, etc.)**] *Boll. Ist. sieroterap. milan.*, 1955, **34**, 536–540. [Buenos Aires.] English summary.

Strains of *Staphylococcus aureus*, *Bacterium coli* and *Lactobacillus arabinosus* were grown in a broth medium. The maximum concentration of vitamin B_1, riboflavin, pyridoxine, nicotinamide, Ca pantothenate, adenine, guanine, uracil and biotin which would not adversely affect the growth of the organisms was estimated. With that concentration of each of the substances singly, the growth of the organism was tested in the presence of graded concentrations of aureomycin. Nicotinamide and guanine had some power to counteract the effect of aureomycin for all 3 organisms, and for *Staph. aureus* Ca pantothenate and adenine also had some effect. Leucine and valine increased the toxicity of aureomycin. The other substances had little or no bacteriostatic effect.

With a synthetic medium also, nicotinamide and guanine partly counteracted the effect of aureomycin on *Bact. coli* and *Staph. aureus*. Combinations of substances were more effective than single ones, but the effect was not equal to the sum of the separate effects. There was no tendency for aureomycin-resistant mutants to appear.

Experiments with acromycin duplicated those with aureomycin.—E. M. Hume.

3000

PELLETT, P. L. and PLATT, B. S. **A dietary defect in maize developed during treatment with lime.** *Nature*, 1956, **177**, 422–424. [Human Nutrit. Res. Unit, Med. Res. Counc. Labs., Hampstead, London, N.W.3.]

When rats were given diets consisting mainly of maize cooked in lime water without supplements of vitamins of the B complex, their growth rate was significantly less than that of rats given untreated maize. Growth was improved by a supplement of aureomycin or of a mixture of B vitamins but not of nicotinic acid or tryptophan. Riboflavin produced a much greater growth improvement than vitamin B_1 and acted as well as the vitamin B complex. Analysis of the treated maize by chemical and microbiological methods showed a great decrease in content of vitamin B_1, riboflavin and total nicotinic acid. The remaining nicotinic acid might be available to a greater extent than in raw maize but the loss of vitamin B_1 and riboflavin in the process was considered to be a great disadvantage.—A. M. Copping.

3001

FARRER, K. T. H. **The nutritive value of yeast extract.** *Med. J. Austral.*, 1954, i, 67–71. [Res. Labs., Kraft Foods, Ltd., Melbourne.]

The nutritive value of yeast is reviewed. Tables are given setting out the composition, including the content of 5 B vitamins, the percentage distribution of the N between insoluble, proteose, peptone, sub-peptone and amino acid N, and the content of essential amino acids in comparison with that of meat, casein and white flour. Yeast extract provides a balanced mixture of the B vitamins and contributes especially lysine to supplement the low concentration of lysine in bread.

E. M. Hume.

3002

MONZINI, A. and CRISTALLO, G. Contenuto in vitamina B_1 e B_2 dei formaggi italiani e sue variazioni durante il processo di maturazione. [**Content of vitamins B_1 and B_2 in Italian cheeses and their variations during ripening.**] *Ann. Sper. agrar.*, 1956, **10**, 253–267. [Staz. Sper. Freddo, Milan.] English summary.

The vitamin B_1 and riboflavin contents of 11 types of Italian cheese are tabulated. Gorgonzola was the richest in both vitamins, with 68 and 432 μg. per 100 g. fresh cheese, respectively. Mascarpone, rich in fat and coagulated with acid, was a poor source of both. Bel Paese and Robiolina made with fresh milk contained about twice as much of each vitamin as when the milk was pasteurised. The vitamin contents fell slightly and then rose during the process of ripening in the last 2 cheeses, but different types of cheese varied in the behaviour of their vitamin content. Lactic acid bacteria and *Penicillium weidemannii* were shown to produce both vitamins.—D. Duncan.

3003

ALMON, L., GIEGER, M. and ANDERSON, W. S. **Effect of varied soil nitrogen on B vitamins in collards.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 1235–1237. [Mississippi Agric. Exp. Stat., State College.]

Collards were grown in plots which received applications of 20, 120 or 200 lb. N per acre. Mean values are tabulated from 5 replications for yield, moisture, N, vitamin B_1, riboflavin and nicotinic acid content at the 3 levels of N application. Yield and moisture content did not significantly differ. Percentage N and vitamin content, on a dry basis, were significantly higher in collards from plots which received the medium and high applications of N compared with collards from plots which received the low application of N.—F. C. Aitken.

See also Absts. 2859, 2882.

VITAMIN B_1 (ANEURIN, THIAMINE)

3004

DOHERTY, J. J., CANE, N. and WOKES, F. **The estimation of vitamin B_1 in pharmaceutical products.** *J. Pharm.*, 1955, **7**, 1053–1062. [Ovaltine Res. Labs., King's Langley, Herts.]

In the spectroscopic study of vitamin B_1 with changing *p*H, an isosbestic point at which there was no change in the spectral absorption over the *p*H range from 1 to 9 was found at about 273 mμ. The existence of such an isosbestic point could be used to check the production or destruction of irrelevant absorption when the *p*H was reduced from 7 to 1. Reduction of the *p*H produced a rise in the E value at 245 mμ. which for anhydrous vitamin B_1 was about 0·1 for 5 μg. per ml. Details of a method of estimation based on the finding are given.—K. H. Coward.

3005

KLOTZSCHE, C. Mikrobiologische Untersuchungen mit Aneurin-1-5-naphthalindisulfonat. [**Microbiological studies with aneurin-1-5-naphthalenedisulphonate.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **102**, 429–432. [Bundesgesundheitsamt, Berlin-Dahlem.]

The 1 : 5-naphthalenedisulphonate of vitamin

B_1 is used as a stable source of the vitamin for fortifying food products. In a series of standard tests with *Phycomyces blakesleeanus*, stimulation of growth was variable in comparison with that caused by vitamin B_1 hydrochloride. Satisfactory response to the naphthalenedisulphonate was obtained only with a highly purified and washed preparation. It was suggested that some impurity might be inhibiting growth of *Phycomyces* and that the naphthalenedisulphonate should be highly purified in order to obtain its full effect as a source of vitamin B_1. Tests with lactobacilli gave irregular responses which could not be used as a measure of potency of the disulphonate.

A. M. Copping.

3006

IWATSU, T. **Studies on vitamin B_1 and related compounds. 70. Synthesis and reactions of dihydrothiamine.** *J. Pharm. Soc. Japan.*, 1955, **75,** 677–681. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.] English summary.

3007

NAVAZIO, F., SILIPRANDI, N. and ROSSI-FANELLI, A. **Pure crystalline oxythiamine phosphoric esters. Preparation and some chemical and biological properties.** *Biochim. biophys. Acta*, 1956, **19,** 274–279. [Inst. Biochem., Univ. Rome.] French and German summaries.

3008

KOEDAM, J. C., STEYN-PARVÉ, E. P. and VAN RHEENEN, D. L. **Thiamine deficiency after feeding pyrithiamine.** *Biochim. biophys. Acta*, 1956, **19,** 181–182. [Lab. Physiol. Chem., Univ. Utrecht.]

In pigeons given vitamin B_1, alone or with pyrithiamine, the inhibitor produced a highly significant decrease of vitamin B_1 pyrophosphate in the brain, liver, muscle and kidneys, and of pyruvic decarboxylase in the breast muscle. The effect of the inhibitor was biochemically like simple vitamin B_1 deficiency.—A. M. Copping.

3009

MAMEESH, M. S., SCHENDEL, H. E., NORTON, H. W. and JOHNSON, B. C. **The effect of penicillin on the thiamine requirement of the rat.** *Brit. J. Nutrition*, 1956, **10,** 23–27. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Groups of rats were given a basal diet lacking vitamin B_1, alone or with graded doses of 0·5 to 5·0 μg. vitamin B_1 per g. diet, with and without 50 mg. crystalline sodium penicillin G per kg. diet. With low intakes of vitamin B_1 growth was improved by penicillin but with larger amounts penicillin had no effect. It was calculated that for maximum growth without penicillin the rat required $1{\cdot}00 \pm 0{\cdot}03$ μg. vitamin B_1 per g. diet, and with penicillin $0{\cdot}98 \pm 0{\cdot}14$. The findings are briefly discussed with reference to theories about the effect of antibiotics on the requirements of vitamins of the B complex.—A. M. Copping.

3010

GHELARDI PRIMAVORI, G. Contributo allo studio farmacologico dell'acido glicerofosforico. 2. Differenza di azione biologica fra i due isomeri alfa e beta associati alla tiamina od alla cocarbossilasi. [**Pharmacological study of glycerophosphoric acid. 2. Difference in biological action between the two isomers, α- and β-, associated with vitamin B_1 or cocarboxylase.**] *Arch. internat. Pharmacodyn.*, 1955–56, **104,** 228–243. [Ist. Farmacol., Univ. Pisa.]

In 8 groups of adult rabbits the excretion of phosphorus in the urine and faeces was measured after oral or parenteral administration of vitamin B_1 or cocarboxylase, and Na α- or β-glycerophosphate. When α-glycerophosphate was given with vitamin B_1 or cocarboxylase there was always a tendency to increased loss of P by excretion ; with β-glycerophosphate there was increased retention of P. When the glycerophosphates were given alone, their behaviour was reversed.

A. M. Copping.

3011

CARDOSO, M. R. Action de l'aneurine et de l'acétylcholine sur le coeur de la tortue. [**Action of vitamin B_1 and acetylcholine on the heart of the tortoise.**] *Exp. Med. Surg.*, 1955, **13,** 270–278. [Inst. Rocha Cabral, Lisbon.]

In the isolated heart of the tortoise *Clemmys leprosa*, perfused with Ringer solution, addition of a small amount of acetylcholine to the perfusion fluid caused a diminution in the frequency and amplitude of the contractions. After washing of the heart repetition of the experiment had the same effect. If, however, just before the addition of acetylcholine, vitamin B_1 was added, the effect of acetylcholine was much weaker, and further addition of acetylcholine had no effect. Such perfusion fluid tested on another heart inhibited its response to acetylcholine. Even when the first heart was washed several times after exposure to acetylcholine and vitamin B_1, perfusion fluid from it still had power to protect the second heart against acetylcholine. To produce the effect on the first heart it was necessary that vitamin B_1 and acetylcholine should act together and not in sequence, and that the temperature should be maintained at about 35° C., but it was not necessary for the second heart to be kept warm. It is concluded that a tortoise heart, made insensitive to acetylcholine by the action of vitamin B_1 and acetylcholine, liberates a substance capable of rendering a second heart insensitive.—E. M. Hume.

3012

GIACALONE, O. Azione della aneurina sui limiti di resistenza all'ipoalimentazione e sulla perdita percentuale giornaliera di peso corporeo. [**Action of vitamin B_1 on the limits of resistance to undernutrition and on the daily percentage loss of bodyweight.**] *Arch. Fisiol.*, 1955, **55**, 68–72. [Ist. Fisiol., Univ. Palermo.]

In the same way as was done with vitamin B_{12} (Abst. 3076, Vol. 26), 2 groups of 5 adult rats were maintained on a complete diet inadequate in quantity, 0·215 Cal. per g. bodyweight being given daily. One group received 5 mg. vitamin B_1 by subcutaneous injection every other day. The rats given vitamin B_1 died after an average of 50·2 days with an average loss of 49·1 per cent. of bodyweight; the corresponding values for those not given vitamin B_1 were 54·4 and 47·4. The differences were significant.—E. M. Hume.

3013

PANDOLFO, L. and SERIO, S. Azione del blocco dei gruppi NH_2 con chetene sull' attività della tiaminasi estratta dalla *Venerupis decussata*. [**Effect of blocking the NH_2 groups with ketenes on the activity of thiaminase extracted from *Venerupis decussata*.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 541–543. [Ist. Chim. Biol., Univ. Palermo.]

Thiaminase prepared from *Venerupis decussata* was treated with ketenes prepared by heating acetone vapour. The amount of amino N in the thiaminase extract was sometimes increased and sometimes decreased by the treatment, but the thiaminase activity was in no way affected.

E. M. Hume.

3014

HARRIS, D. L. **Interaction of thiamine and pyridoxine in *Neurospora*. 2. Competition between pyridoxine and the pyrimidine precursor of thiamine.** *Arch. Biochem. Biophys.*, 1956, **60**, 35–43. [Dept. Physiol., Univ. Chicago, Ill.]

In extension of previous studies (Abst. 2926, Vol. 23) it was found that pyridoxine inhibited the synthesis of thiamine by thiamine-less mutants of *Neurospora*. The inhibition was not readily overcome by addition of thiazole but was prevented by an increase in concentration of pyrimidine. No inhibition occurred if thiamine was present. Utilisation of pyrimidine could be inhibited by 4-deoxypyridoxine. It is suggested that pyridoxine may inhibit synthesis of thiamine by acting as a competitive substrate for the enzyme which couples pyrimidine to thiazole.—A. M. Copping.

3015

FARRER, K. T. H. **The thermal destruction of vitamin B_1 in foods.** *Advances in Food Res.*, 1955, **6**, 257–311. [Res. Labs., Kraft Foods, Ltd., Melbourne.]

See also Absts. 2812, 2864.

RIBOFLAVIN

3016

FORKER, B. R. and MORGAN, A. F. **Cause of pituitary-adrenal failure in the riboflavin-deficient rat.** *J. Biol. Chem.*, 1955, **217**, 659–667. [Dept. Home Econ., Univ. California, Berkeley.]

Groups of about 8 weanling rats, given a complete diet with or without riboflavin or the complete diet restricted to give the same bodyweight as the deprived group, were exposed for $2\frac{1}{2}$ hr. to an oxygen tension equivalent to an altitude of 20,000 ft. at different ages after from 1 to 11 weeks on the diet (see Abst. 430, Vol. 25).

The ascorbic acid content of the adrenal glands generally increased progressively with lapse of time, particularly in the deprived rats; in the rats on the restricted diet it increased greatly at first but not progressively later. Rats exposed to anoxia had less ascorbic acid than corresponding unexposed rats whatever the rest of the treatment. In deprived rats the difference decreased and disappeared after 11 weeks, but it increased with time in the rats fed on the restricted diet.

The adrenal glands of normal and deprived rats were enucleated after 7 weeks on the experimental diets. The cortex was soon regenerated, as was proved by the maintenance of blood glucose values during a fast of from 4 to 7 days.

Male rats were hypophysectomised at weaning and then given riboflavin-deficient or normal diets. When signs of deficiency appeared adrenocorticotropic hormone was given and the animals were killed after some hours' fast. The fall in the eosinophil count of the blood and the rise in the glycogen content of the liver in response to the hormone were similar in deprived and normal rats but administration of adrenaline caused no eosinopenia in the deficient animals. It appeared probable that the adrenal cortex of rats deprived of riboflavin had not lost the ability to respond normally to adrenocorticotropic hormone, but that the defect might lie in failure of the process by which the pituitary is stimulated to release adrenocorticotropic hormone.—A. M. Copping.

3017

KOTAKE, Y. and MORI, T. **Research on xanthurenic acid. 12. On the excretion of**

xanthurenic acid and the diabetic symptoms appeared in albino rats caused by vitamin B_2 deficiency. *Proc. Japan Acad.*, 1955, **31**, 247–251. [Dept. Biochem., Wakayama Med. Coll.]

For previous parts see Absts. 4903, 5617, Vol. 25.

12. Groups of 5 male rats weighing about 150 g. were given a complete purified diet or one deficient in riboflavin or in vitamin B_6. When signs of deficiency appeared, xanthurenic acid was estimated in the urine after a single oral dose of 0·1 g. tryptophan. The mean total excretion, in μg., was for non-deprived rats 1358, for those deprived of vitamin B_6 10,900, and for those deprived of riboflavin 4893. The rats deprived of riboflavin were given 10 mg. tryptophan every other day for a month. The blood sugar value rose steadily, though less steeply than with deprivation of vitamin B_6. There was some degree of degeneration in the beta cells of the pancreas, but it too was less than in rats deprived of vitamin B_6. When the deprived rats were given a single oral dose of 0·1 g. tryptophan, the blood sugar value fluctuated widely and reached a high level after 72 hr. If 1 mg. 5-hydroxyanthranilic acid was injected when the oral dose of tryptophan was given, the maximum value attained by the blood sugar was much lower.—E. M. Hume.

3018

NELSON, M. M., BAIRD, C. D. C., WRIGHT, H. V. and EVANS, H. M. **Multiple congenital abnormalities in the rat resulting from riboflavin deficiency induced by the antimetabolite galactoflavin.** *J. Nutrition*, 1956, **58**, 125–134. [Inst. Exp. Biol., Univ. California, Berkeley.]

Simple deprivation of riboflavin during gestation did not affect foetal development in rats. When galactoflavin was added to a diet lacking riboflavin the incidence of foetal death and abnormalities was high. The effect of the antimetabolite was present with amounts per kg. diet of from 5 to 25 mg. and was severe with 50 mg. or more. Inclusion of 200 mg. in the diet for from 4 to 6 days between the seventh and thirteenth days of gestation produced abnormalities in the skeleton and cardiovascular system of the young. When galactoflavin was given throughout gestation, severe abnormalities of the skeletal and soft tissue occurred. Inclusion of 20 mg. riboflavin per kg. diet completely controlled the effect of the antimetabolite.—A. M. Copping.

3019

MASLENIKOVA, E. M. Uchastie vitamina B_2 (riboflavina) v obmene veshchestv. [**Metabolic fate of vitamin B_2 (riboflavin).**] *Vop. Pitan.*, 1956, **15**, No. 1, 3–9. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

A review.

3020

EPSHTEĬN, I. B. and CHAGOVETZ, R. V. Izmeneniya soderzhaniya i raspredeleniya riboflavina v myshtzakh krolika pri rabote i narkoze. [**Changes in the total content and distribution of riboflavin in rabbit muscle during work and narcosis.**] *Dokl. Akad. Nauk SSSR*, 1955, **105**, 319–322. [Inst. Biokhim., Akad. Nauk SSSR.]

Total riboflavin and labile and tightly-bound fractions were estimated in rabbit thigh muscle fatigued with an electric stimulator for 1 hr., and, in addition, in animals narcotised with barbiturate, after stimulation until an equivalent degree of fatigue had been reached. Throughout the experiments, values for total riboflavin and for the fractions estimated were higher in fatigued than in comparable unexercised muscle. There was no difference between values in narcotised and normal animals not exercised, but values for fatigued muscle were somewhat less in narcotised than in normal muscle.—D. W. Taylor.

3021

WORDEN, A. N., WATERHOUSE, C. E. and PULMAN, R. N. **The response of the dog to test doses of riboflavin.** *Vet. Rec.*, 1956, **68**, 147–152. [Nutrit. Res. Unit, Huntingdon.]

The effect of large doses of riboflavin was studied on two dogs and a bitch that were already receiving a diet with adequate amounts of the vitamin; they were kept in metabolism cages for from 8 to 14 days. In the dogs urinary excretion of riboflavin was increased for as long as 4 days after a dose of 15 mg. The bitch was pregnant and showed very little increase. Such tests with riboflavin are considered unlikely to be of value in veterinary practice with dogs.—A. M. Copping.

3022

APOSHIAN, H. V. and LAMBOOY, J. P. **The *in vivo* synthesis of diethylriboflavin phosphate.** *J. Amer. Chem. Soc.*, 1955, **77**, 6368. [Dept. Physiol., Univ. Rochester, N.Y.]

Chromatographic studies of extracts from the liver of rats receiving diethylriboflavin showed the presence of 2 spots with R_F values identical with those obtained from synthetic diethylriboflavin and diethylriboflavin 5′-phosphate. The results, therefore, showed that the diethylriboflavin, which was strongly antagonistic to riboflavin, could be converted into its phosphorylated form *in vivo*.

A. M. Copping.

3023

ENARI, T. M. **Effect of cobalt and iron on riboflavin production by *Candida guilliermondia*.** *Acta chem. scand.*, 1955, **9**, 1726–1727. [Lab. Biochem., Univ. Helsinki.]

Addition of cobalt in a concentration of 10^{-4} *M* to the medium in which *Candida guilliermondia* was grown increased its production of riboflavin. When Co was present addition of iron in concentrations of up to 10^{-5} *M* increased riboflavin production. Without Co the same concentration of Fe inhibited riboflavin production. Zinc was the only other cation of those tested which appeared to stimulate production of riboflavin by *Candida*.

A. M. Copping.

See also Absts. 2812, 2832.

NICOTINIC ACID (NIACIN)

3024

SASSI, L. Dosage chimique de l'acide nicotinique dans le sang. [**Chemical estimation of nicotinic acid in blood.**] *Arch. Inst. Pasteur Tunis*, 1956, **33**, 127–136. [Inst. Pasteur, Tunis.]

Nicotinic acid was estimated in blood by adaptation to paper chromatography of the cyanogen bromide method and the picryl chloride method. Calculation of the results was simple and values found in normal and jaundiced serum were similar to those reported by other observers.

A. M. Copping.

3025

SCHOU, S. A. Kobberindholdet i galenica. 3. Kobberafgift fra apparatur. [**The copper content of galenicals. 3. The release of copper from apparatus.**] *Dansk. Tidsskr. Farm.*, 1955, **29**, 243–258. [Rigshosp. Apotek, Copenhagen.] English summary.

Solutions of nicotinic acid, nicotinamide, niketh-amide and theophyllamine prepared for injection were found to attack the copper and brass of apparatus for filling ampoules and syringes to an extent which could affect the stability of the preparations and could even exceed the amount known to give unpleasant effects on injection. (From summary.)—K. H. Coward.

3026

KODICEK, E., BRAUDE, R., KON, S. K. and MITCHELL, K. G. **The effect of alkaline hydrolysis of maize on the availability of its nicotinic acid to the pig.** *Brit. J. Nutrition*, 1956, **10**, 51–67. [Dunn Nutrit. Lab., Univ. Cambridge.]

Nicotinic acid, tryptophan, riboflavin, vitamin B_1 and pantothenic acid were estimated by microbiological, chemical and chromatographic methods in diets and dietary constituents given to weanling pigs. The greater part of the nicotinic acid in maize was in the milling fractions termed hominy meal and bran, where it was almost entirely in the bound form. Hydrolysis of the milling fractions with 0·5 *N* NaOH liberated nicotinic acid from its bound form, as was shown by the behaviour on a paper chromatogram. When signs of nicotinic acid deprivation appeared in pigs receiving a diet based on whole maize, recovery was induced by replacing the whole maize with maize reconstituted from milling fractions, including hominy meal and bran treated by alkaline hydrolysis. Reconstituted maize with hominy meal and bran untreated by alkali did not promote recovery. Treatment with nicotinic acid cured the lesions. Alkaline hydrolysis of maizemeal and bran is recommended as a useful method of making the vitamin available to pigs.—A. M. Copping.

3027

GERSHBEIN, L. L. **Effect of nicotinic acid and derivatives on rat liver regeneration.** *Amer. J. Physiol.*, 1956, **184**, 47–51. [Biochem. Res. Lab., Dept. Biol., Illinois Inst. Technol., Chicago.]

In rats with part of the liver removed, regeneration of liver tissue was less if the diets included 0·25 or 0·35 per cent. nicotinic acid or nicotinamide. Similar amounts of *iso*nicotinic acid hydrazide or kynurenic acid had no apparent effect, and coramine increased the rate of new tissue formation. When the nicotinic acid or amide was given in a single large daily dose by mouth or injection the rate of liver regeneration was not affected. Inclusion of 0·35 per cent. choline in the diet with 0·35 per cent. nicotinamide prevented the inhibition of liver regeneration by the nicotinamide.—A. M. Copping.

3028

SEN, S. C. and SEN, S. **Niacin and coagulability of blood.** *Indian J. Med. Res.*, 1956, **44**, 67–70. [Dept. Physiol., Presidency Coll., Calcutta.]

In 12 rabbits, after the intramuscular injection of 100 mg. nicotinic acid per kg. bodyweight, which had previously been shown to produce a big rise in blood sugar, there was an increase in the coagulability of the blood during the first 60 min. followed by a return to normal in 120 min. The ionisable calcium rose and fell correspondingly. There was no significant change in the prothrombin or fibrinogen value, but there was an increase in platelet count.—L. Wills.

3029

QUAGLIARIELLO, E. and DELLA PIETRA, G. **The metabolism of 3-hydroxyanthranilic and quinolinic acids in the chick embryo.** *Biochem. J.*, 1956, **62,** 168–171. [Inst. Chem., Fac. Med. Surg., Univ. Naples.]

See Absts. 1957, Vol. 25 ; 403, Vol. 26.

3030

DAUM, M. G. La niacina en el café y su importancia nutricional en Venezuela. [**Nicotinic acid in coffee and its nutritional importance in Venezuela.**] *Arch. venezol. Nutricion*, 1955, **6,** 61–70. [Inst. Nac. Nutrición.] English and German summaries.

Nicotinic acid was estimated microbiologically with *Lactobacillus arabinosus* in fresh and roasted coffee beans and in infusions and extracts of coffee. The nicotinic acid content increased during roasting and an average of 33·9 mg. per 100 g. roasted, ground coffee was obtained from 15 samples. More than 80 per cent. of the nicotinic acid was present in extracts and infusions and less than 20 per cent. was retained in the grounds. From the results of the study and from the known high consumption of coffee in Venezuela it was calculated that coffee supplied an average daily intake of 1·58 mg. nicotinic acid.

A. M. Copping.

VITAMIN B_6 (PYRIDOXINE, ADERMIN)

3031

PARRISH, W. P., LOY, H. W. (Jr.) and KLINE, O. L. **Further studies on the yeast method for vitamin B_6.** *J. Assoc. Off. Agric. Chem.*, 1956, **39,** 157–166. [Div. Nutrit., Food Drug Admin., Dept. Health, Educat. Welfare, Washington 25, D.C.]

The use of *Saccharomyces carlsbergensis* to estimate pyridoxine, pyridoxal and pyridoxamine was investigated in relation to the *p*H and amino acid and L-cystine content of the medium. The critical *p*H for optimum growth was in the range from 3·5 to 4·5 with inorganic nitrogen supplied by 10 mg. $(NH_4)_2HPO_4$ per tube or as $(NH_4)_2SO_4$. Of 18 amino acids in a casein hydrolysate, 10 increased yeast growth and of these 5, *iso*leucine, histidine, methionine, tryptophan and valine, were essential. A high concentration of cystine tended to depress growth response to pyridoxamine. In order to obtain uniformity of response it is suggested that pyridoxamine should be converted to pyridoxine by treatment with nitrous acid.

A. M. Copping.

3032

SAKURAGI, T. and KUMMEROW, F. A. **The synthesis of long chain fatty acid derivatives of the vitamin B_6 group.** *J. Amer. Chem. Soc.*, 1956, **78,** 839–842. [Dept. Food Technol., Univ. Illinois, Urbana.]

The synthesis is described of the tripalmitate, trilinoleate, trioctanoate and tridecanoate of pyridoxine, pyridoxal dipalmitate, pyridoxamine tripalmitate and other palmitate derivatives of pyridoxine and deoxypyridoxine. All the long-chain fatty acid derivatives in ether as solvent had their maximum ultraviolet absorption in the region of 265 to 270 mμ.—A. M. Copping.

3033

SAKURAGI, T. and KUMMEROW, F. A. **Solubility and heat stability of fat-soluble derivatives of vitamin B_6.** *J. Amer. Oil Chem. Soc.*, 1956, **33,** 116–118. [Dept. Food Technol., Univ. Illinois, Urbana.]

Pyridoxine trilinoleate and tripalmitate were soluble in olive oil at 3° C. Solubility was increased by mixed esterification with palmityl and acetyl groups. Esters with C_6, C_8 or C_{10} fatty acids also were fat-soluble. The esters were stable to heat in oily solution when a palmitoyl group was present or when pyridoxine was fully esterified with a saturated fatty acid of chain length C_{10} or longer.—A. M. Copping.

3034

TULPULE, P. G. and WILLIAMS, J. N. (Jr.) **Relationship of dietary protein and food intake to pyridoxine nutrition in the rat.** *J. Nutrition*, 1955, **57,** 529–539. [Dept. Biochem., Univ. Wisconsin, Madison.]

Changes in bodyweight, vitamin B_6 activity and concentration of riboflavin in the liver, kidneys and intestines were studied in rats receiving a purified diet containing 20 per cent. casein with or without pyridoxine or diets without pyridoxine and containing 60 per cent. casein or no casein. Without pyridoxine, the high protein diet permitted slightly better weight gain than the 20 per cent. casein diet, but the loss of vitamin B_6 and riboflavin from the tissues was similar on the two diets. Restriction of food intake on the diet with 20 per cent. casein and devoid of pyridoxine caused loss of vitamin B_6 from the tissues similar to that on the unrestricted diet. When the diet contained no protein the loss of vitamin B_6 was less and that of riboflavin greater than with diets containing 20

or 60 per cent. casein. After 4 weeks some animals in the groups deprived of pyridoxine were given the complete purified diet and the vitamin B_6 activity of their tissues rose to normal within 2 weeks.—A. M. Copping.

3035

AGNEW, L. R. C. **Cardiac, renal and hepatic hypertrophy in pyridoxine-deficient rats.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 452–453. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

The heart and kidneys from rats receiving for 55 days a purified diet lacking pyridoxine had significantly greater weights, both wet and dry, than those from rats having the same diet supplemented with pyridoxine, whether the food intake was unrestricted or restricted to give bodyweights equal to those of the deprived rats. The livers of the deprived rats were significantly heavier than those of the non-deprived with restricted intake, but were not significantly different from those of the non-deprived with unrestricted intake. The increase in weight of the heart, liver and kidneys was therefore considered to be a true hypertrophy. A. M. Copping.

3036

MEISTER, A. and DOWNEY, P. F. **Evidence for participation of vit. B_6 in glutamine-α-keto acid transamination-deamidation reaction.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 49–52. [Lab. Biochem., Nat. Cancer Inst., Nat. Insts. Health, Bethesda, Md.]

Large doses of *iso*nicotinic acid hydrazide given by stomach tube or in drinking water for from 10 to 20 days reduced the glutamine-pyruvate transaminase and deamidase activity *in vitro* of liver tissue preparations from rats on a normal stock diet or a purified diet lacking vitamin B_6. Addition to the liver preparations of pyridoxal phosphate or pyridoxamine phosphate increased the activity of preparations from rats receiving *iso*nicotinic hydrazide but not of preparations from untreated rats. The results supported the theory that vitamin B_6 is involved in the mechanism of transamination between glutamine and α-keto acids.—A. M. Copping.

3037

KOTAKE, Y. and NAGAYAMA, I. **Research on xanthurenic acid. 13. The effects of xanthurenic acid on phosphorus metabolism.** *Proc. Japan Acad.*, 1955, **31,** 311–316. [Dept. Biochem., Wakayama Med. Coll.]

For part 12 see Abst. 3017, Vol. 26.

Of rats weighing about 200 g., fed on a diet of, per cent., casein 22, starch 52, yeast 2, agar 3, McCollum salt mixture 6, sugar 5 and butter 10, some were injected intraperitoneally with 300 mg. xanthurenic acid per kg. bodyweight. The values for blood sugar and for inorganic P in the blood and liver all rose but began to fall again within 5 hr. Phosphocreatine in the blood and liver fell but began to rise again within 3 hr. None of the values had been restored to the initial level within 14 days. The amount of creatinine in the urine in 24 hr. increased. When groups of rats were given a casein diet and a small amount of tryptophan, with 35 per cent. butter or deficient in vitamin B_6, the same changes were induced. When glucose was given to the experimental groups just described, blood sugar increased but the value for inorganic P in the blood remained almost unchanged, although in untreated rats it fell steeply.

In diabetic patients after injection of glucose, the rise in blood sugar was not accompanied by the fall in inorganic P shown by healthy subjects.

Rats were injected simultaneously with 0·2 unit insulin, and 300 mg. xanthurenic acid per kg. bodyweight. They were killed after 2 or 3 hr. The fall in the values for phosphocreatine in the blood and liver which occurs with xanthurenic acid was prevented by insulin.

It is concluded that xanthurenic acid acts to produce diabetes by blocking the phosphorylation of carbonate.—E. M. Hume.

3038

GEROCARNI, B. and CALDARERA, C. Dati preliminari sopra un'esperienza di sinergismo fra cortisone e vitamina B_6. [**Preliminary results on a test for synergism between cortisone and vitamin B_6.**] *Acta vitaminol.*, 1955, **9,** 261–263. [Fac. Méd., Paris.] French, English, German and Spanish summaries.

Formalin arthritis was induced in male rats weighing about 150 g. by injection into the plantar aponeurosis of the foot of 0·1 ml. of 2 per cent. formalin twice on alternate days, and, after 5 days, of 4 per cent. formalin once. Four groups of 5 rats thus prepared were given by intramuscular injection daily for 30 days 2·5 mg. cortisone acetate, or the same with 6 mg. daily of pyridoxine diphosphate, or physiological saline, or were untreated. Cortisone considerably modified the development of the lesions, and its beneficial effect was enhanced when pyridoxine diphosphate was given as well.—E. M. Hume.

See also Abst. 3377.

PANTOTHENIC ACID

3039

SAKURAGI, T. and KUMMEROW, F. A. **The synthesis of long chain fatty acid derivatives of pantothenic acid.** *J. Amer. Chem. Soc.*, 1956, **78,** 838–839. [Dept. Food Technol., Univ. Illinois, Urbana.]

3040

CUMMINS, J. T., CHELDELIN, V. H. and KING, T. E. **Occurrence of pantothenyl cysteine in natural materials.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 658–659. [Dept. Chem., Oregon State Coll., Corvallis.]

With a bio-autographic technique, a synthetic medium described by King and Cheldelin (*J. Bacteriol.*, 1950, **59,** 229) and *Acetobacter suboxydans* as test organism, conjugates of pantothenic acid were identified in extracts of natural materials. As little as 0·2 μg. pantothenyl cysteine or coenzyme A could be detected. By this method pantothenyl cysteine was found in beef liver.

A. M. Copping.

3041

BOXER, G. E., SHONK, C. E., STOERK, H. C., BIELINSKI, T. C. and BUDZILOVICH, T. V. **Pantoylaminoethanethiol, an antagonist of pantothenic acid and pantetheine active *in vitro* and in the rat.** *J. Biol. Chem.*, 1955, **217,** 541–550. [Res. Labs., Chem. Div., Merck and Co., Inc., Rahway, N.J.]

The acetylation of sulphanilamide by a crude pigeon liver extract in the presence of coenzyme A or pantotheine, the precursor of coenzyme A, was inhibited by pantoylaminoethanethiol added to the system. The direct effect of the antagonist on coenzyme A, shown by an inhibition of phosphotransacetylase, was less than on the system synthesising coenzyme A.

In rats deprived of pantothenic acid, addition of the antagonist to the diet caused failure of growth and death within 3 weeks. The effect was reversed by pantothenic acid. The coenzyme A content of liver and brain decreased in rats receiving the antagonist. Less than 10 mg. of antagonist daily had little effect on rats; reversal of inhibition was obtained with 90 μg. pantothenic acid daily, and less gave incomplete protection.

A. M. Copping.

3042

BARBORIAK, J. J. **Pantothenic acid and reproduction.** *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag Prof. Crasemann, 54–56. [Lab. Nutrit., Dept. Biochem., Sch. Med., Yale Univ., New Haven, Conn.]

A very brief review is given of abnormalities occurring in the young of animals deprived of pantothenic acid. Possible metabolic disturbances related to lack of coenzyme A are discussed.

A. M. Copping.

3043

ULLREY, D. E., BECKER, D. E., TERRILL, S. W. and NOTZOLD, R. A. **Dietary levels of pantothenic acid and reproductive performance of female swine.** *J. Nutrition*, 1955, **57,** 401–414. [Illinois Agric. Exp. Stat., Urbana.]

Reproductive performance was investigated in 16 Duroc and 16 Hampshire gilts receiving a basal diet containing soya bean protein with vitamin supplements including 1·5, 5·9, 12·5 or 19·1 mg. pantothenic acid per kg. diet. The groups having the 2 lower doses of pantothenic acid showed signs of deficiency; fatty livers, enlarged adrenal glands, intramuscular haemorrhage, dilatation of the heart, atrophy of the ovaries and failure of uterine development were recorded at autopsy. Those on the lowest dose failed to conceive. Those having 5·9 mg. pantothenic acid per kg. diet carried their litters to term but the young showed abnormalities, including locomotor incoordination, and more than half died within 14 days. With 12·5 or 19·1 mg. pantothenic acid per kg. diet, gestation and lactation appeared to be normal and there was no difference between the 2 groups. Gilts receiving 5·9 mg. vitamin per kg. diet had significantly less free pantothenic acid in the milk collected during the third and fourth weeks of lactation than those having higher intakes. There was no significant difference in the amount of total pantothenic acid in the milk whatever the level of feeding.

A. M. Copping.

BIOTIN

3044

JANSEN, B. C. P. Biotine. [**Biotin.**] *Voeding*, 1956, **17,** 3–9.

A chapter for a new textbook of nutrition (see also Absts. 3588, Vol. 24; 296, 342, 395, Vol. 26).

FOLIC ACID (PTEROYLGLUTAMIC ACID)

3045

TIKHOMIROVA, A. N. and PENAR, O. I. Materialy k izucheniyu obmena folievoi kisloty u belykh krys pri razvitii u nikh nedostatochnosti etoi kisloty. [**Folic acid metabolism in the rat during the development of folic acid deficiency.**] *Vop. Pitan.*, 1956, **15,** No. 1, 37–40. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

Twenty weanling rats weighing from 50 to 60 g. received a synthetic diet with little or no folic acid and containing 1 per cent. sulphonamide. Half the rats received 200 μg. folic acid daily. At intervals for from 5 to 6 weeks folic acid was estimated in 24-hr. samples of urine, and the blood picture was studied. The quantities of sulphonamide and of folic acid given were then doubled and the rats were killed 2 or 3 weeks later for estimation of folic acid in the liver.

The rats not given folic acid gained little weight after the 20th day. The mean daily folic acid output in the urine fell in the deprived group from 102 to 61 μg. by the fifth week and rose in the non-deprived from 92 to 139 μg. Hb value and reticulocyte and white cell counts fell steadily in the deprived rats. The total folic acid content of the liver at the end of the experiment was 20 μg. in the deprived and 122 μg. in the non-deprived rats.

D. Duncan.

3046

McDONALD, M. W. **Effect of supplementary choline and methionine on the response of chickens to folic acid.** *Nature*, 1956, **177,** 343. [Poultry Exp. Stat., Seven Hills, N.S.W.]

Chicks were given for 6 weeks a basal diet of crushed wheat, meatmeal and whey powder with or without folic acid or *dl*-methionine or both. In a second experiment the diet was supplemented with choline or folic acid or choline, folic acid and methionine. In the first experiment growth was increased by methionine and still more by methionine and folic acid, but folic acid alone gave no increase, showing that the chick's requirement for folic acid was increased by methionine. In the second experiment growth was depressed by choline, but the response was reversed when folic acid was given also. The results showed that the basal diet was deficient in methionine and that the response to its addition was independent of its role as methyl donor. It is suggested that the interaction between methionine and folic acid in the first experiment was due to the labile methyl group in the molecule. The results showed that folic acid is required for the catabolism of excess methyl groups as well as for transmethylation.

E. M. Cruickshank.

3047

SLUNGAARD, R. K. and HIGGINS, G. M. **Experimental megaloblastic anemia in young guinea pigs.** *Blood, J. Haematol.*, 1956, **11,** 123–142. [Mayo Clin., Rochester, Minn.]

Guineapigs fed on a purified complete diet were maintained in good health and their blood picture was normal. When vitamin C, folic acid or vitamin B_{12} or a combination of them was removed from the diet, certain animals developed megaloblastosis in each group except that from which vitamin C alone was removed. The vitamin-C-deficient animals developed hypochromic, microcytic anaemia associated with internal haemorrhages. Megaloblasts and giant metamyelocytes in the bone marrow were found most frequently in animals deprived of both vitamin C and folic acid, and only infrequently in animals deprived of vitamin B_{12} alone or with vitamin C. Most, but not all, of the animals with megaloblastosis were anaemic ; the anaemia was frequently dimorphic. The clinical condition of the animal was not a reliable guide to the presence of megaloblastosis, but diarrhoea was associated with megaloblastosis in animals deficient in folic acid, alone or combined with vitamin C. The bacterial flora of the stools was examined but gave inconclusive results, though there was some evidence that the presence of *Bacterium coli*, not normally found in the stools of guineapigs, was associated with the development of megaloblastosis. Spontaneous remissions occurred. In 2 animals deprived of both vitamin C and folic acid treatment with vitamin C had no effect on the megaloblastosis or the anaemia, but folic acid produced a return to normal. Each group of animals and often individual animals are described in detail.

L. Wills.

3048

GUGGENHEIM, K., HALEVY, S., NEUMANN, H. and USIELI, V. **The metabolism of pteroylglutamic acid by the rat.** *Biochem. J.*, 1956, **62,** 281–286. [Lab. Nutrit., Dept. Biochem., Hebrew Univ.-Hadassah Med. Sch., Jerusalem.]

Excretion of folic acid and citrovorum factor in the urine and storage in the liver in response to injection of pteroylglutamic acid with or without ascorbic acid were studied in young rats on an adequate synthetic diet and on diets high in fat, low in protein and fat, low in protein and high in fat, or protein-free. Urinary excretion of folic acid and citrovorum factor was increased by giving pteroylglutamic acid and much increased by the addition of ascorbic acid. Citrovorum factor accounted for only 0·5 to 3 per cent. of

the total folic acid activity. The livers of rats receiving pteroylglutamic acid showed considerable storage of citrovorum factor and folic acid. The amount of citrovorum factor appeared to be limited; that of folic acid increased with increased dosage of pteroylglutamic acid and ascorbic acid. Rats receiving phenobarbital showed increased excretion of citrovorum factor and of ascorbic acid. Addition of ascorbic acid to urine *in vitro* did not increase the content of citrovorum factor. Low protein intake decreased the amount of citrovorum factor in the liver, and with no protein the ability to store folic acid also was impaired. High fat intake or accumulation of fat in the liver did not appear to affect ability to form and store citrovorum factor.

A. M. Copping.

3049

FERRARI, V. La conversione dell'acido folico a "Citrovorum Factor" nelle epatopatie sperimentali e cliniche. 1. Ricerche sperimentali in vivo. [**Conversion of folic acid to citrovorum factor in experimental and clinical liver disorders. 1. Experiments *in vivo*.**] *Acta vitaminol.*, 1955, **9**, 241–245. [Ist. Patol. Med., Univ. Pavia.] French, English, German and Spanish summaries.

Six adult male rats weighing from 300 to 350 g. were selected from a group treated for 4 months with CCl_4 and were matched with 6 normal rats of similar age, strain and weight. For a week before the experiment they received a basal diet containing, per cent., washed casein 18, rice starch 68, olive oil 10 and salt mixture 4, with vitamin B_1, riboflavin, vitamin B_6, nicotinamide, calcium pantothenate, *p*-aminobenzoic acid, biotin, inositol, choline, menadione, calciferol and 0·2 mg. folic acid per kg. diet. Vitamin A was given weekly. Urine was collected for 24 hr. before and after intraperitoneal injection of 1 mg. folic acid, and total folic acid and citrovorum factor were estimated microbiologically.

There was no significant difference in basal excretion of citrovorum factor between rats treated with CCl_4 and untreated rats, but after administration of folic acid the untreated rats excreted significantly more citrovorum factor than the treated. The total folic acid activity of the urine, measured after the test dose in 2 rats of each group, showed no significant difference between the groups. It is suggested that the difference in output of citrovorum factor was due to impairment of the conversion of folic acid by the damaged liver.—D. Duncan.

3050

GOLDIN, A., VENDITTI, J. M., HUMPHREYS, S. R., DENNIS, D. and MANTEL, N. **Studies on the management of mouse leukemia (L1210) with antagonists of folic acid.** *Cancer Res.*, 1955, **15**, 742–747. [Lab. Chem. Pharmacol., Nat. Cancer Inst., Bethesda, Md.]

In an experiment with 17 groups of 20 mice inoculated with leucaemia L1210 the effects of varying amounts of aminopterin or A-methopterin with and without delayed addition of citrovorum factor were studied. The survival time of the mice was considerably extended by the folic acid antagonists in suitable amounts. When citrovorum factor was given after the antagonists the dose could be very large without lethal effect. In a second experiment, survival time was much prolonged with carefully chosen doses of A-methopterin and citrovorum factor. Leucaemic cells from mice which survived long periods of treatment did not appear to develop resistance to the folic acid antagonist. The effect of treatment seemed to depend on some relation between tumour, host and drug which is not yet fully defined.

A. M. Copping.

3051

FOLEY, G. E. and HALEY, E. C. **Chemical and biological studies on 1, 2-dihydro-*s*-triazines. 7. Activity in pteroylglutamic acid-*Lactobacillus casei* 7469 systems. 8. Activity in nicotinic acid, riboflavin and thiamine systems. 9. Inhibition of synthesis of citrovorum factor in *Leuconostoc citrovorum* 8081 systems.**

FOLEY, G. E., MODEST, E. J., FARBER, S. and HALEY, E. C. **10. Mechanism of action in microbiological systems.** *Antonie van Leeuwenhoek J. Microbiol. Serol.*, 1955, **21**, 385–396; 397–404; 405–416; 417–432. [Dept. Pathol., Harvard Med. Sch., Boston, Mass.]

7. The 1 : 2-dihydro-*s*-triazines are inhibitors of *Lactobacillus casei* 7469 in systems for estimating pteroylglutamic acid. The behaviour of a number of derivatives was studied.

8. In the same way the action of derivatives was studied for inhibiting *Lactobacillus arabinosus* 8014, *L. casei* 7469 and *L. fermenti* 9338 in nicotinic acid, riboflavin and vitamin B_1 systems.

9. Low concentrations of pteroylglutamic acid which induced only a small amount of growth in *Leuconostoc citrovorum* 8081 promoted maximum growth when high concentrations of ascorbic acid were added; synthesis of citrovorum factor was affected in the same way. Other reducing agents such as glutathione or *l*-cysteine, and vitamin B_{12} and thymidine could replace ascorbic acid. Reduced (dihydro) pteroylglutamic acid acted like pteroylglutamic acid and a reducing agent. The synthesis of citrovorum factor was inhibited by 1 : 2-dihydro-*s*-triazines.

10. The evidence is marshalled in favour of the suggestion that the principal point of activity of the phenyldihydrotriazines in microbiological

systems is at the reductive sequence in the biosynthesis of citrovorum factor from pteroylglutamic acid.—E. M. Hume.

3052

NURMIKKO, V. **The dialysis technique in the study of the vitamins and amino acids affecting associations of micro-organisms.** *Acta chem. scand.*, 1955, **9**, 1317–1322. [Biochem. Inst., Helsinki.]

An apparatus was devised containing several compartments separated by dialysis membranes in which interdependence of micro-organisms for certain nutrients could be demonstrated. *Streptococcus faecalis* R, *Lactobacillus arabinosus* 17–5 and *Leuconostoc mesenteroides* P–60 could not grow in separate test tubes in a medium without phenylalanine, proline and folic acid, but could grow when they were inoculated into separate compartments of a cross-dialysis apparatus containing the same deficient medium. Experiments with up to 7 different organisms were used to demonstrate that the substances concerned in such symbiosis were phenylalanine, proline, folic acid and folinic acid.

A. M. Copping.

See also Absts. 3294, 3377, 3934.

VITAMIN B_{12}

3053

ANALYTICAL METHODS COMMITTEE, VITAMIN-B_{12} PANEL. **The estimation of vitamin B_{12}.** *Analyst*, 1956, **81**, 132–136.

The microbiological method of estimating vitamin B_{12} with *Ochromonas malhamensis* was investigated in 8 laboratories with solutions of vitamin B_{12}, 2 liver powders, fish solubles, chick mash and dried cow manure. The response of *Ochromonas* was considered to be highly specific for vitamin B_{12}, and satisfactory agreement was obtained between the different laboratories. In an appendix to the report details are given of methods for preparing test extracts and basal medium and for setting up and interpreting the tests.

A. M. Copping.

3054

SHRIMPTON, D. H. **The estimation of vitamin-B_{12} activity in feeding stuffs with *Lactobacillus leichmannii* and *Ochromonas malhamensis*.** *Analyst*, 1956, **81**, 94–99. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Vitamin B_{12} activity was estimated in herring-meal, whalemeat meal, meat-and-bone meal, dried skimmed milk and white-fish meal with *Lactobacillus leichmannii* and *Ochromonas malhamensis*. The values obtained with *Ochromonas* were like or less than those with *L. leichmannii*. No technical advantage was found in using *Ochromonas* instead of *L. leichmannii*.—A. M. Copping.

3055

HEINRICH, H. C., RÄDEL, G. and SOMMER, L. Die mikrobiologische Bestimmung der B_{12}-Vitamine mit dem Phytoflagellaten "Euglena gracilis isol. T". [**Microbiological estimation of vitamin B_{12} with the phytoflagellate *Euglena gracilis isol.* T.**] *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1955, **7**, 124–127. [Physiol. Chem. Inst., Univ. Hamburg.]

A recently identified strain of *Euglena gracilis* (*E. gracilis* var. *saccharophila isol.* T) proved more satisfactory than *E. gracilis* var. *bacillaris* (Egvb.), commonly used. The newly isolated strain gave results more rapidly than the old, and the curve of response to vitamin B_{12} extended over a wider range of doses.—E. M. Hume.

3056

MCLAUGHLAN, J. M., ROGERS, C. G. and CAMPBELL, J. A. **The influence of thiamine on the microbiological assay of vitamin B_{12} with *Escherichia coli* 113-3.** *J. Amer. Pharm. Assoc.*, 1955, **44**, 594–598. [Food and Drug Lab., Dept. Nat. Health Welfare, Ottawa.]

The low results of tube tests for vitamin B_{12} in multivitamin preparations with *Bacterium coli* 113–3 and the medium of Davis and Mingioli (*J. Bacteriol.*, 1950, **60**, 17) in comparison with those of the U.S.P. method were found to be caused by the presence of vitamin B_1. When samples were extracted with sodium metabisulphite to destroy vitamin B_1, the results of the two methods agreed well.—K. H. Coward.

3057

WEISS, W., EDELSON, H. and LOY, H. W. **The nature of the dose-response curve and its effect upon the error of the assay of vitamin B_{12}.** *J. Assoc. Off. Agric. Chem.*, 1956, **39**, 167–172. [Food Drug Admin., Dept. Health, Educat. Welfare, Washington 25, D.C.]

Results of duplicate estimations on 16 samples of vitamin B_{12} made according to the U.S. Pharmacopeia XV method were analysed and discussed with reference to the shape of the curve relating dose and response and to the limits of accuracy of the method.—A. M. Copping.

3058

PAWEŁKIEWICZ, J. and NOWAKOWSKA, K. Prekursory biosyntezy nukleotydocyjanokobalamin. [**Precursors in the biosynthesis of cyanocobalamin nucleotides.**] 2. Synteza

nowych pochodnych witaminu B_{12}. [**2. Synthesis of new vitamin B_{12} derivatives.**]

PAWEŁKIEWICZ, J. 3. Wpływ działania aureomycyny na syntezę witaminów grupy B_{12} przez bakterie kwasu propionowego. [**3. Effect of aureomycin on the synthesis of B_{12} vitamins by propionic acid bacteria.**] *Acta biochim. polon.*, 1955, **2**, 259–278; 321–327. [Zakł. Biochemii Żywności WSR, Poznan.] English and Russian summaries.

For previous work see Abst. 4950, Vol. 25.

2. Six further new substances synthesised by *Propionibacterium shermani* were isolated. Instead of the 5 : 6-dimethylbenzimidazole of vitamin B_{12}, they contained, as nucleotide bases, benzimidazole, 5-nitrobenzimidazole, 5(6)-nitro-6(5)-methylbenzimidazole, 5 : 6-di-nitrobenzimidazole, 5-ethoxybenzimidazole and 5 : 6-imidazobenzimidazole. All were obtained in crystalline form. The propionic acid bacteria condensed benzotriazole and 2-mercaptobenzomidazole with the cobalamin molecule. The 6 substances were active for *Bacterium coli* mutant and for *Euglena gracilis*. The synthesis of cyanocobalamin followed the synthesis of cyanocobalamin desnucleotide (vitamin B_{12p}); it took place in the course of 24 hr. in the final stage of fermentation, in the presence of 5 : 6-dimethylbenzimidazole.

3. Addition of aureomycin to the culture of *Propionibacterium* changed the proportions of the different cobalamins synthesised. The concentration of vitamin B_{12} and of an unidentified cobalamin X increased and that of vitamin B_{12p} decreased. (From summaries.)—E. M. Hume.

3059

JANICKI, J. and PAWEŁKIEWICZ, J. Witamin B_{12p}. [**Vitamin B_{12p}.**] *Acta biochim. polon.*, 1955, **2**, 329–341. [Zakł. Biochemii Żyności WSR, Poznan.] Russian and English summaries.

The cobalamin previously isolated and called vitamin B_{12p} (Abst. 4950, Vol. 25) has been identified as cyanocobalamin desnucleotide and is considered to be identical with Ford's Factor B (Abst. 1839, Vol. 24). A chromatographic method with aluminium oxide was developed for separating vitamin B_{12p} from other cobalamins in 85 per cent. acetone solution. In the crude concentrate of cobalamins from the propionic acid bacterial fermentation, vitamin B_{12p} constituted from 10 to 15 per cent. (From summary.)—E. M. Hume.

3060

OSTROWSKI, W. Połączenia witaminu B_{12} z białkami. 3. Badania nad kompleksem cyjanokobalamina-białko (erytroglobulin) w surowicy krwi. [**Protein-vitamin B_{12} complexes. 3. Studies of the cyanocobalamin-protein complex (erythroglobulin) in blood serum.**] *Acta biochim. polon.*, 1955, **2**, 297–313. [Zakł. Chemii Fizjol. AM, Cracow.] English and Russian summaries.

For previous work see Abst. 444, Vol. 26.

3. The cyanocobalamin-protein complex was precipitated from fraction III of human serum by Cohn's ethanol method (*J. Amer. Chem. Soc.*, 1950, **72**, 465). In fraction IV the amount was only about one-third of that in fraction III. Cyanocobalamin was estimated with *Euglena gracilis*. In precipitation of bovine serum proteins insoluble in water, the complex was with the α-euglobulin fraction soluble in 0·01 *M* NaCl. The complex separated from serum fractionated by Derrien's method (Abst. 1515, Vol. 22) in ammonium sulphate solvent from 1·46 *M* to 1·96 *M*, so that its solubility resembled that of the α-globulin group. It was adsorbed on pulverised silica gel and to a less extent on Bentonite and kaolin. It was not adsorbed on Celite. The complex was stable in 0·04 *M* Britton-Robinson buffer with *p*H range from 6·5 to 8·7. Outside that range the vitamin was split off.

A chromatographic method is described, suitable for investigating free and bound vitamin B_{12} in different biological materials. (From summary.)

E. M. Hume.

3061

RÁBEK, V. T., KAŠÍK, D., ŠÍCHOVÁ, O. and ŠTĚDRÁ, H. **New members of the vitamin B_{12} group isolated from sewage sludge.** *Biochim. biophys. Acta*, 1956, **19**, 191–192. [Pharmaceut. Biochem. Inst., Prague.]

Vitamin B_{12} compounds in extracts of sewage sludge were identified by chromatography and electrophoresis on paper. Three new components, K, J and L, were shown in the chromatograms, with the possibility of a fourth, M. All were without effect on growth of *Bacterium coli* mutant.

A. M. Copping.

3062

PETERSON, B. H., HALL, B. and BIRD, O. D. **Microbiological activities of compounds related to vitamin B_{12}.** *J. Bacteriol.*, 1956, **71**, 91–93. [Res. Labs., Parke, Davis and Co., Detroit, Mich.]

The relative activities of 9 analogues of vitamin B_{12} were estimated with 3 lactobacilli, *Bacterium coli* and *Ochromonas malhamensis*. A linear response to all the analogues was obtained with *Lactobacillus leichmannii*; none of the compounds were active for *Ochromonas*. All the analogues except Factor B contained a purine base, and the microbiological activities for different organisms proved useful in separating compounds with closely similar chemical and physical properties.

A. M. Copping.

3063

JOHNSON, R. R., BENTLEY, O. G. and MOXON, A. L. **Synthesis *in vitro* and *in vivo* of Co^{60} containing vitamin B^{12}-active substances by rumen microorganisms.** *J. Biol. Chem.*, 1956, **218**, 379–390. [Dept. Animal Sci., Ohio Agric. Exp. Stat., Wooster.]

Rumen micro-organisms were grown *in vitro* in a semipurified medium with cobalt chloride containing ^{60}Co, and studies were made with a wether lamb in a metabolism crate, to which injections of ^{60}Co were given directly into the rumen through a long hypodermic needle. Substances with vitamin B_{12} activity were detected with *Lactobacillus leichmannii* and *Bacterium coli*, in fractions separated by paper electrophoresis from extracts of rumen contents or cultures ; 7 were obtained which contained ^{60}Co. Vitamin B_{12} and vitamin B_{12b} were identified, but it was calculated that up to 65 per cent. of the total radio-activity of the rumen extracts came from other forms of vitamin B_{12}.

Liver and kidney samples from the lamb showed the presence of 4 substances with vitamin B_{12} activity.—A. M. Copping.

3064

JOHNSON, A. W. and TODD, A. **Vitamin B_{12}.** *Endeavour*, 1956, **15**, 29–33.

3065

GRÜN, F. and HAAS, R. **Paramagnetism of a reduction product of vitamin B_{12}.** *Nature*, 1956, **177**, 378–379. [Inst. Phys. Chem., Univ. Basle.]

The valency of the cobalt atom in a reduction product of vitamin B_{12} was investigated by magnetic methods. In the product, which was prepared by the method of Schindler (Abst. 3494, Vol. 21), the cobalt atom appeared to be bivalent. A. M. Copping.

3066

BEAVEN, G. H. and JOHNSON, E. A. **The reduction of vitamin B_{12}.** *Nature*, 1955, **176**, 1264–1265. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

The structure of reduction products of vitamin B_{12} was investigated by spectrophotometry. Those reported by Diehl and Murie (*Iowa State Coll. J. Sci.*, 1952, **26**, 555) and by Boos *et al.* (Abst. 4343, Vol. 23) were prepared. Both were readily re-oxidised to vitamin B_{12a}, but their spectra were widely different. Chemical behaviour suggested that the organic part of the molecule was not significantly affected and that the changes concerned the state of oxidation of the cobalt, but the spectra suggested that some rearrangement of double bonds might occur. The observations are discussed with reference to the structure of vitamin B_{12}.—A. M. Copping.

3067

FELLER, B. A. and MACEK, T. J. **Effect of thiamine hydrochloride on the stability of solutions of crystalline vitamin B_{12}.** *J. Amer. Pharm. Assoc.*, 1955, **44**, 662–665. [Res. Labs., Chem. Div., Merck and Co., Inc., Rahway, N.J.]

Crystalline vitamin B_{12} was found to be stable at room temperature in aqueous solution at *p*H 4 containing 10 mg. vitamin B_1 hydrochloride per ml. alone or together with 10 mg. nicotinamide per ml. At higher temperatures the thiazole moiety of the vitamin B_1 molecule caused decomposition.—K. H. Coward.

3068

SMITH, E. L. **Recent research on vitamins. Vitamin B_{12}.** *Brit. Med. Bull.*, 1956, **12**, 52–56. [Glaxo Laboratories, Ltd., Greenford, Middlesex.]

3069

RUBBO, S. D. **Vitamin B_{12}: a short summary.** *Med. J. Austral.*, 1953, i, 324–326. [Univ. Melbourne.]

The main facts, scientific and clinical, about vitamin B_{12} are briefly reviewed.—E. M. Hume.

3070

ROBSCHEIT-ROBBINS, F. S. and WHIPPLE, G. H. **Red cell stroma in dogs. Stroma protein and stroma lipides vary in different types of anemia.**

TISHKOFF, G. H., YUILE, C. L., ROBSCHEIT-ROBBINS, F. S. and WHIPPLE, G. H. **Red cell stroma and hemoglobin metabolism in anemic dogs. Regeneration of red cell proteins labeled with C^{14} lysine.**

WHIPPLE, G. H., ROBSCHEIT-ROBBINS, F. S. and BALE, W. F. **Red cell stroma protein rich in vitamin B_{12} during active regeneration. Anemia studies using radio-active cobalt B_{12} in dogs.** *J. Exp. Med.*, 1955, **102**, 705–711 ; 713–723 ; 725–731. [Dept. Pathol., Sch. Med. Dent., Univ. Rochester, N.Y.]

(*a*) Stroma is defined as the " posthemolytic residue " from washed red cells got by " agglutination " with acetate buffer solution, separation and repeated washing. For the technique see Tishkoff *et al.* (*Blood, J. Hematol.*, 1953, **8**, 459). Dogs were fed on the standard diet of salmon-bread, dried skimmed milk and tinned salmon. The stroma from blood of dogs made anaemic by bleeding contained more protein and more lipid than the residue from normal blood cells. Protein deficiency induced after bleeding did not affect the result, but dogs made anaemic while on a low-protein diet produced stroma with less protein. In phenylhydrazine anaemia, stroma protein was greatly increased.

(*b*) Dogs made anaemic as described above were given a regenerating diet which included cooked pig liver with the low-protein diet or with the salmon-bread diet alone or with Lextron and iron. In the animals rendered anaemic by bleeding the peak of incorporation of ^{14}C-lysine into the stroma preceded and exceeded the peak for Hb when liver alone was added to the diets, but followed and was lower than the peak for Hb when iron and Lextron, substances favouring the formation of Hb, also were added. In phenylhydrazine anaemia, in which Hb-forming materials are readily available to the body, the peak of incorporation in Hb preceded and exceeded that of stroma. After the peaks of incorporation had been reached the proteins of stroma and red cell Hb showed some degree of independence as far as incorporation of ^{14}C-lysine was concerned until maturation of the red cell was complete, that is to say until the end of the reticulocyte stage, when the rate of decline in the ^{14}C-lysine activity of the proteins was about the same. It is suggested that the findings show that after maturation of the red cells their proteins are metabolically inert.

(*c*) Two dogs, anaemic and given a regenerating diet, received 2 injections of vitamin B_{12} labelled with ^{60}Co at the start of treatment. The stroma protein showed a high concentration of vitamin B_{12} during the early stages of regeneration only; the Hb contained negligible amounts at all times although the content of radio-active Co in the organs lasted for many weeks after vitamin B_{12} had disappeared from the stroma.—L. Wills.

3071

O'Dell, B. L., Gordon, J. S., Bruemmer, J. H. and Hogan, A. G. **Effect of a vitamin B_{12} deficiency and of fasting on oxidative enzymes in the rat.** *J. Biol. Chem.*, 1955, **217**, 625–630. [Dept. Agric. Chem., Univ. Missouri, Columbia.]

Endogenous respiration, choline oxidase, succinoxidase and cytochrome oxidase were measured in the liver of newborn rats from mothers deprived of vitamin B_{12}. There was a lower content of cytochrome oxidase but not of other oxidative enzyme systems, compared with those in the liver of young born to mothers having vitamin B_{12}. There was no difference in the cytochrome oxidase of the brain, kidney and skeletal muscle between newborn rats from deprived and normal mothers. The effect on newborn rats of fasting for 24 hr. was investigated, but the decrease in cytochrome oxidase was less than in rats deprived of vitamin B_{12}. In young growing rats deprivation of vitamin B_{12} caused a decrease in the cytochrome oxidase of the liver to much the same extent as in newborn animals.—A. M. Copping.

3072

Wong, W. T. and Schweigert, B. S. **Role of vitamin B_{12} in nucleic acid metabolism. 2. Liver coenzyme A levels in the rat.** *Arch. Biochem. Biophys.*, 1956, **60**, 126–129. [Div. Biochem. Nutrit., Amer. Meat Inst. Found., Chicago, Ill.]

Weanling rats from mothers deprived of vitamin B_{12} were given a diet of maize and soya bean oilmeal with or without a supplement of vitamin B_{12}. After 6 weeks the animals were killed by bleeding and the coenzyme A activity of the liver was measured by the sulphanilamide method (Abst. 1921, Vol. 18). The amount in the livers of deprived rats was from 2 to 3 times as great as in the livers of rats having vitamin B_{12}.

For part 1 see *J. Nutrition*, 1956, **58**, 231.

A. M. Copping.

3073

Henry, K. M. and Kon, S. K. **Vitamin B_{12} and protein metabolism.** *Brit. J. Nutrition*, 1956, **10**, 39–50. [Nat. Inst. Res. Dairying, Univ. Reading.]

The biological value and true digestibility of proteins were measured in a series of 8 experiments with rats depleted of vitamin B_{12} and 6 experiments with normal rats. The proteins studied were purified casein and the proteins of 100 per cent. wheat flour. Additions of DL-methionine, homocysteine or lysine were made in some experiments. For rats deprived of vitamin B_{12} methionine alone or homocysteine and vitamin B_{12} increased the biological value of casein to the same extent, indicating that the vitamin was concerned in the synthesis of methyl groups. Choline with homocysteine had the same effect as vitamin B_{12}. In 2 out of 3 experiments vitamin B_{12} alone did not improve the biological value of casein. The vitamin did not increase the biological value of the proteins of whole wheat flour. When supplements of lysine or lysine and methionine were given, the protein efficiency ratio of flour was increased by vitamin B_{12}, but this result was considered of doubtful value since it depended on the composition of the weight gain in relation to protein intake.

With normal rats addition of vitamin B_{12} did not increase the biological value of soya protein or of casein at a level of 16 per cent. protein in the diet. Vitamin B_{12} had no effect on the protein efficiency ratio of whole wheat flour for normal rats.

From these results and an extensive survey of other investigations it was concluded that vitamin B_{12} is concerned in the synthesis of methyl groups but that it does not function in transmethylation or in protein utilisation.

A. M. Copping.

3074

ARNSTEIN, H. R. V. and STANKOVIĆ, V. **The effect of certain vitamin deficiencies on glycine biosynthesis.** *Biochem. J.*, 1956, **62**, 190–198. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

Amino acid metabolism was studied in rats having purified diets with or without pteroylglutamic acid or vitamin B_{12} and in guineapigs on normal or scorbutogenic diets. Known amounts of glycine labelled with ^{15}N or ^{14}C were present in the diet and the extent of synthesis of glycine was calculated from the dilution of radio-active glycine in the viscera after from 13 to 21 days. Glycine was synthesised at a normal rate by rats deprived of vitamin B_{12} and guineapigs deprived of vitamin C. Lack of vitamin C had no effect on synthesis of hippuric acid and formate from serine. In rats deprived of pteroylglutamic acid there was a decrease in synthesis of glycine and in conversion of glycine to serine, alanine, aspartic acid and glutamic acid.—A. M. Copping.

3075

SURE, B. **Effect of amino acid and vitamin B_{12} supplements on the biologic value of proteins in rice and wheat.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 1232–1234. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

The biological value of protein in milled rice and enriched wheat flour was calculated in terms of gain in bodyweight per g. protein intake by young growing rats. Rice protein was greatly improved by the addition of L-lysine and DL-threonine together but not by lysine or vitamin B_{12} alone, which were of little effect or were inhibitory. It was further improved by vitamin B_{12} or DL-methionine in addition to L-lysine and DL-methionine. The best results, with increases of protein efficiency of 91 and 102 per cent. for polished and processed milled rice, respectively, were obtained with lysine, threonine and methionine. The percentage increase of protein efficiency in wheat flour was with lysine alone 147, lysine and threonine 206, lysine, threonine and DL-valine 222. With vitamin B_{12} the two last values increased to 241 and 252. A. M. Copping.

3076

GIACALONE, O. Azione della vitamina B_{12} sui limiti di resistenza all'ipoalimentazione e sulla perdita percentuale giornaliera di peso corporeo. [**Action of vitamin B_{12} on the limits of resistance to undernutrition and on the daily percentage loss of bodyweight.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 545–548. [Ist. Fisiol., Univ. Palermo.]

Two groups of 5 rats were given 0·215 Cal. per g. bodyweight daily of a diet of wheat starch 75, casein 10, butter 10 and salt mixture 5, with adequate vitamins. On alternate days one group received 8 μg. vitamin B_{12} subcutaneously. The rats given vitamin B_{12} survived on the average for 52·0 days, and those not given it for 54·4 days, and the respective mean loss of weight was 91 and 89 g., differences found to be significant. (See also Abst. 4844, Vol. 25.)—E. M. Hume.

3077

TOMODA, I. **Influence of vitamin B_{12a} on the activity of perfused toad heart poisoned by cyanide.** *Kumamoto Med. J.*, 1955, **8**, 23–25. [Inst. Physiol., Coll. Med., Kumamoto Univ.]

KCN added to the perfusion fluid readily inhibited pulsation of the toad's heart. Vitamin B_{12} or vitamin B_{12a}, added to the perfusion fluid, counteracted the inhibitory effect of cyanide and pulsation was restored.—A. M. Copping.

3078

BRIGNON, J. J. and WOLFF, R. Sur les corrélations entre la saponine et la vitamine B_{12} au cours de la croissance chez le poussin. [**Relations between saponin and vitamin B_{12} during growth of the chicken.**] *C.R. Soc. Biol.*, 1955, **149**, 1451–1452. [Lab. Chim. Biol., Fac. Méd., Nancy.]

The effect of saponin obtained from *Quillaja saponaria* was studied on chicks receiving vitamin B_{12} by mouth or by injection. The inhibition of growth by the saponin was apparent whether vitamin B_{12} was given or not, and irrespective of the way in which the vitamin was given. The observations of other workers on the growth-inhibiting effects of saponins from alfalfa meal are briefly discussed (*cf.* Title 3793, Abst. 5149, Vol. 18; 2942, 2943, Vol. 20).—A. M. Copping.

3079

RICHARDSON, L. R. and BROCK, R. **Studies of reproduction in rats using large doses of vitamin B_{12} and highly purified soybean proteins.** *J. Nutrition*, 1956, **58**, 135–145. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., College Station.]

Inclusion of vitamin B_{12} in a purified diet containing soya bean protein or casein improved the weaning weight and survival of young. No evidence was obtained to suggest that large amounts of vitamin B_{12} in the maternal diet were toxic to the young. Exhaustive extraction of soya bean protein with boiling water and with *iso*propanol did not affect reproduction or lactation in rats receiving it as sole protein in the diet. Five generations of females receiving diets with the highly purified proteins weaned more than 90 per cent. of their young. The problem whether unrecognised vitamins necessary for reproduction exist is discussed, and it is concluded that if such

substances were present they must have been very closely held by protein concentrates.

A. M. Copping.

3080

HALBROOK, E. R., BEECKLER, A. F. and SMITH, E. P. **Chicken feeding research. 1. The effect of various grain combinations in the diet on growth, egg production, feed efficiency, mortality, and market quality of chickens. 2. The effect of condensed fish solubles and vitamin B_{12}-antibiotic and vitamin B-complex supplements in the diet on growth, egg production, feed efficiency, mortality, hatchability of eggs, and market quality.** *Montana Agric. Exp. Stat. Bull.* No. 502, September 1954, pp. 17.

1. The studies reported extended over 7 years. A combination of wheat and oats was more satisfactory than a combination of wheat and barley, as source of carbohydrate in a basal diet, for growth and efficiency of feed utilisation up to 12 weeks of age. A mixture of wheat and barley was better for economical egg production and for efficiency of feed utilisation up to 24 weeks, and for the health of laying birds. It produced as high a grade of broilers as wheat and oats. A diet containing wheat and barley was superior to a mixture of maize, wheat, oats, bran and shorts as judged by liveweight and efficiency of feed utilisation up to 24 weeks of age. The wheat and barley diet was inferior to the more complex mixture for egg production and market quality of broilers.

2. When the diet contained 10 per cent. meat scraps, condensed fish solubles slightly increased growth and efficiency of feed utilisation. White Leghorn fowls seemed to respond better than New Hampshires to the addition of fish solubles. An antibiotic supplement containing vitamin B_{12} increased growth and efficiency of feed utilisation for egg production and reduced the mortality of young chicks. Supplements containing the vitamin B complex were of little value in the conditions of the experiment.—E. M. Cruickshank.

3081

HALBROOK, E. R., BEECKLER, A. F. and SMITH, E. P. **Turkey feeding research. 1. The effect of various grain combinations in the diet on growth, feed efficiency, mortality, and market quality of turkeys. 2. The effect of condensed fish solubles and vitamin B_{12}-antibiotic and vitamin B-complex supplements in the diet on growth, feed efficiency, mortality and market grade in Broad Breasted Bronze turkeys.** *Montana Agric. Exp. Stat. Bull.* No. 501, September 1954, pp. 14.

1. In experiments made over 3 years, barley was superior to oats as an addition to wheat in mash mixtures for turkeys, giving faster growth, more efficient utilisation of feed, lower mortality and better market quality of the carcase. A combination of wheat and oats or of wheat and barley was superior to a mixture of maize, wheat, oats, bran and shorts, in every comparison save that of market quality, which was slightly higher with the more complex mixture. It is concluded that barley can be used in place of oats and that complex grain mixtures are not necessary.

2. When condensed fish solubles or an antibiotic supplement containing vitamin B_{12} was added to diets containing 10 per cent. meat scraps, growth was faster, but efficiency of utilisation of feed and market quality of the carcase were not improved. No benefit was obtained by using a vitamin B complex supplement.

E. M. Cruickshank.

3082

MEADE, R. J. **The influence of protein content of the diet and of chlortetracycline and/or vitamin B_{12} supplementation upon performance of growing-fattening pigs.** *J. Animal Sci.*, 1956, **15,** 297–306. [Nebraska Agric. Exp. Stat., Lincoln.]

Sixty weanling pigs were divided at random into 12 groups of 5 and assigned to diets with 3 different amounts of protein and with 0, 2, 4 or 8 mg. chlortetracycline (aureomycin hydrochloride) per lb. diet. In a second test with 60 pigs the same amounts of protein were used with 5 mg. aureomycin, 5 μg. vitamin B_{12} or both. With protein percentages at successive stages of about 18–16–14, 16–14–12, and 14–12–10, there was no significant difference between the final weights after 96 days. Slight differences in growth of the pigs on the lowest intake of protein in the second experiment were possibly related to a change in the diet which gave a lower intake of tryptophan, methionine and lysine while the total amount of protein was unaltered. None of the supplements of aureomycin alone or with vitamin B_{12} affected growth with the amounts of protein used.

A. M. Copping.

3083

JUCKER, H., WERREN, F. and SCHÜRCH, A. Versuche zur Feststellung der Wirkung von Vitamin-B_{12}-Gaben allein und mit Terramycin auf die Mastleistung verschiedenaltriger Mastschweine. [**Effect of giving vitamin B_{12} alone and with terramycin on the fattening of pigs at different ages.**] *Schweiz. Landwirtsch. Monatsh.*, 1955, **33,** No. 6, pp. 11. [Inst. Haustierernährung, Eidg. Tech. Hochsch., Zürich.]

Supplements of 25 mg. vitamin B_{12} alone or with 1·5 g. terramycin per ton feed were given to pigs of 22 or 38 kg. initial weight; other animals received the diet unsupplemented. With younger

animals both supplements increased gains in weight and improved feed utilisation and carcase condition; the combination of vitamin B_{12} and terramycin was more effective than vitamin B_{12} alone. With older animals there was no significant benefit.—A. M. Copping.

3084

CLIFFORD, R. J., HENDERSON, G. N. and WILKINS, J. H. **The effect of feeding penicillin and vitamin B_{12} to mature debilitated horses.** *Vet. Rec.*, 1956, **68**, 48–51.

Twelve horses in poor physical condition were divided into 2 groups comparable in general appearance, and were fed on a normal diet. One group was given a supplement equivalent to 1 g. procaine benzyl penicillin daily for 9 weeks without any appreciable change in condition. All the horses were then given a supplement equivalent to 15 μg. vitamin B_{12} daily for 8 weeks with a ration of increased energy value. There was considerable improvement whether penicillin had been given previously or not.—A. M. Copping.

3085

CABASSO, V. J., STEBBINS, M. R. and JOHNSON, D. W. **Effect of cortisone, ACTH, and vitamin B_{12} on distemper in ferrets.** *Vet. Med.*, 1956, **51**, 119–120; 122. [Viral and Rickettsial Sect., Res. Div., Amer. Cyanamid Company, Pearl River, N.Y.]

Intensive treatment with cortisone, adrenocorticotropic hormone and vitamin B_{12} did not prevent the death from distemper of infected ferrets. Combined treatment with cortisone and adrenocorticotropic hormone improved appetite and prolonged survival, but did not prevent the fatal effects of the infection.—A. M. Copping.

3086

BROWN, F. and CUTHBERTSON, W. F. J. **Vitamin B_{12} activity of *Chlorea vulgaris* Beij and *Anabaena cylindrica* Lemm.** *Nature*, 1956, **177**, 188. [Glaxo Laboratories, Ltd., Greenford, Middlesex.]

The vitamin B_{12} activity of two algae was investigated by the plate method with the *Bacterium coli* mutant, followed by chromatography, ionophoresis and bio-autography. Vitamin B_{12}, cyanocobalamin, represented 65 to 70 per cent. of the activity in *Anabaena cylindrica*, with pseudovitamin B_{12} and traces of factors A and B making up the remainder. The total activity was 0·63 μg. per g. dry weight. The cobalamin content of *Chlorella*, 6·3 μg. per 100 g. dryweight, was of the same order as that reported by Combs (Abst. 2502, Vol. 23). Both algae would contribute considerable amounts of cobalamin to the diet of man or animals.—A. M. Copping.

See also Abst. 3127.

OTHER B VITAMINS

3087

RABBI, A., VIVIANI, R. and MARCHETTI, M. Influenza della vitamina B_{12} sulla carenza dei fattori proteici animali (F.P.A.) della caseina nel ratto. [**Effect of vitamin B_{12} on the lack of the animal-protein factors (A.P.F.) of casein, in the rat.**] *Internat. Ztschr. Vitaminforsch.*, 1955, **26**, 185–191. [Ist. Biochim., Univ. Bologna.] German, English and French summaries.

Rats were reared on a normal diet of mixed grains, vegetables and 5 per cent. crude casein, and on 2 diets with highly purified casein lacking animal-protein factor, with and without a supplement of vitamin B_{12}. Those given vitamin B_{12} showed normal fertility and reared their young, but the second generation failed to rear their young. Those with no vitamin B_{12} supplement were infertile in the first generation. The results suggest that the animal-protein factor in casein may not be identical with vitamin B_{12}.

A. M. Copping.

VITAMIN C (ASCORBIC ACID)

3088

LAMPITT, L. H., BAKER, L. C. and WITTENBERG, E. **The photochemical oxidation of ascorbic acid in solutions containing oxalic acid. 2. Mechanism of the reaction.** *J. Sci. Food Agric.*, 1956, **7**, 120–124. [Lyons Labs., Cadby Hall, Kensington, London, W.14.]

For part 1 see Abst. 1798, Vol. 26.

When a solution at *p*H 1·7 containing oxalic acid, ascorbic acid and ferric ammonium sulphate was exposed to ultraviolet light in the absence of air it developed reducing power as measured by a dye solution. Ferric salts oxidise ascorbic acid in H_2SO_4 but not in oxalic acid solution. It is suggested that the oxidation of ascorbic acid depends upon OH and HO_2 radicals which are produced on

auto-oxidation of Fe^{2+} derived from the photochemical reduction of ferri-oxalate. The re-oxidation by air to Fe^{3+} of Fe^{2+} produced by irradiation of a solution of oxalic acid and ferric ammonium sulphate in an atmosphere of nitrogen depended on the ratio of iron to oxalate; when this exceeded 1/50, Fe^{2+} were produced in an atmosphere of air.—A. Hepburn.

3089

HARRIS, L. J. **Recent research in vitamins. Vitamin C.** *Brit. Med. Bull.*, 1956, **12**, 57–60. [Dunn Nutrit. Lab., Univ. Cambridge.]

3090

BURNS, J. J., DAYTON, P. G. and SCHULENBERG, S. **Further observations on the metabolism of L-ascorbic acid in guinea pigs.** *J. Biol. Chem.*, 1956, **218**, 15–21. [Res. Serv., Third (New York Univ.) Med. Div., Goldwater Mem. Hosp., New York.]

For previous work see Abst. 3543, Vol. 21.

From 3 guineapigs, 24 hr. after intraperitoneal injection of ascorbic acid labelled in the carboxyl atom or uniformly with ^{14}C, about 25 per cent. of the radio-activity was recovered as $^{14}CO_2$ and 9 per cent. in the urine, which showed that the entire carbon chain was extensively oxidised. The percentage of radio-activity recovered as ascorbic, diketogulonic and oxalic acids in the urine after 48 hr. was 34, 15 and 21·5 for L-ascorbic acid-1-^{14}C and 28, 20 and 9·7 for L-ascorbic acid-$^{14}C_6$; dehydroascorbic acid contributed less than 1 per cent. The half-life of ascorbic acid was calculated to be about 4 days in guineapigs; it is about 18 days in man (Title 5651, Vol. 25).—A. Hepburn.

3091

BHATTACHARYA, S. K., ROBSON, J. S. and STEWART, C. P. **The glutathione content of blood and tissues following alloxan and dehydroascorbic acid injections.** *Biochem. J.*, 1956, **62**, 12–21. [Dept. Clin. Chem., Univ. Edinburgh.]

Glutathione and total glutathione including oxidised glutathione were greatly decreased in blood of rabbits and rats after intravenous injection of amounts of alloxan sufficient to produce diabetes. In rats, glutathione decreased rapidly in the liver without the production of oxidised glutathione, but the amount was unchanged in the pancreas.

In rabbits, in contrast with rats, the blood sugar was not abnormally high after intravenous injection of dehydroascorbic acid, and the concentrations of glutathione, oxidised glutathione and total glutathione in the blood did not alter significantly. The concentrations of all three in the liver, pancreas and blood of the rat did not change except immediately after intravenous injection of dehydroascorbic acid when, in the liver, glutathione and total glutathione decreased sharply without the appearance of oxidised glutathione.

The results showed that the decrease of glutathione in the blood and tissues after administration of diabetogenic substances was not entirely, or even largely, due to oxidation of reduced to oxidised glutathione.—A. Hepburn.

3092

NATH, M. C., SAHU, V. K. and BEHKI, R. M. **Prevention of dehydroascorbic acid diabetes by the sodium salt of the condensation product of glucose and acetoacetate.** *Metabolism*, 1956, **5**, 18–21. [Dept. Biochem., Univ. Nagpur.]

The production of diabetes in rats by intravenous injection of dehydroascorbic acid was prevented by injection, 2 min. before the dehydroascorbic acid, of the sodium salt of the condensation product of glucose and ethyl acetoacetate, 2-tetrahydroxybutyl-5-methyl-4-carbethoxyfuran. It was without effect when injected 10 min. after the dehydroascorbic acid. (See also Abst. 3252.)

A. Hepburn.

3093

UYAMA, Y. and OGINO, S. **Studies on the metabolism of crystalline lens.** *Med. J. Osaka Univ.*, 1955, **6**, 529–559. [Dept. Ophthalmol., Med. Sch., Osaka Univ.]

Results of work on lens metabolism, most of it already published in Japanese, are presented in 9 sections dealing with growth and senescence, carbohydrate metabolism, vitamin C metabolism, glutathione metabolism, genesis of experimental cataract, genesis of senile cataract, role of vitamin C and glutathione in the lens, protein metabolism, and permeability of the lens capsule. [Only the first 3 are given here and the bibliography is presumably at the end of the report, which is to be continued.]—A. Hepburn.

3094

UYAMA, Y. and OGINO, S. **Study on the metabolism of vitamin C in the crystalline lens. 3. On the conversion of 2, 3-diketogulonic acid to ascorbic acid in the crystalline lens.** *Med. J. Osaka Univ.*, 1955, **6**, 515–518. [Dept. Ophthalmol., Med. Sch., Osaka Univ.]

For parts 1 and 2 see Abst. 469, Vol. 26.

Dehydroascorbic acid and diketogulonic acid were converted to ascorbic acid on incubation with an extract of the crystalline lens of rabbits.

A. Hepburn.

3095

UYAMA, Y., OGINO, S. and YAMADA, Y. **Biochemical studies on cataract. 2. Relationship between abnormal metabolism of tyrosine and cataract formation.** *Med. J. Osaka Univ.*,

1955, **6,** 519–528. [Dept. Ophthalmol., Med. Sch., Osaka Univ.]

Scorbutic guineapigs receiving tyrosine and sodium butyrate developed cataract and excreted benzoquinone acetic acid, the oxidised form of homogentisic acid, in the urine. When butyrate was omitted cataract did not develop and little benzoquinone acetic acid was excreted. Excretion of homogentisic acid and of *p*-hydroxyphenylpyruvic acid was similar in the 2 groups. The injection of benzoquinone acetic acid produced cataract in scorbutic guineapigs, which could be prevented by giving ascorbic acid or anthranilic acid, but not glutathione.—A. Hepburn.

3096

MOURIQUAND, C. and EDEL, V. Évolution du fer intraérythroblastique non hémoglobinique au cours du scorbut aigu expérimental. [**Changes in the non-haemoglobin iron in the red cells during acute experimental scurvy.**] *C.R. Soc. Biol.*, 1955, **149,** 1576–1579. [Lab. Histol., Fac. Méd., Lyons.]

Of 21 guineapigs, 7 were fed on a stock diet and 14 on a scorbutogenic diet not lacking Fe. Smears of bone marrow were examined from time to time for sideroblasts (red cells containing cytoplasmic Fe granules) and Hb was estimated.

The non-deprived animals maintained the value for circulating Hb within the usual limits except for 2 low values. All but 3 of the deprived showed a considerable fall in Hb. In the non-deprived the percentage of sideroblasts was normal, from 40 to 90, but most of the deprived animals showed a sharp fall after the 19th day, and one animal after the 14th. The size of the Fe granules diminished so that they became difficult to find. Three animals with clinical scurvy showed no decrease in sideroblasts. There was no close relation between the behaviour of the Hb and of the sideroblasts.

After from 21 to 25 days, 4 of the scorbutic guineapigs received a single injection of ascorbic acid; the rest died. In the treated guineapigs the sideroblast counts were normal or almost normal after from 2 to 14 days.—D. Duncan.

3097

MÜLLER, W. and NOVER, A. Kernveränderung in den Ganglienzellen der Netzhaut bei experimentellen Vitamin-C-Mangel. [**Alterations of the nuclei in the ganglion cells of the retina during experimental vitamin C deficiency.**] *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1955, **7,** 277–280. [Max-Planck-Inst. Hirnforsch., Abt. Tumorforsch. Exp. Pathol., Univ. Cologne.] English and French summaries.

Sections of retinal tissue from pairs of guineapigs of the same weight, one normal and one scorbutic, were stained with haematoxylin and eosin and the size of the nuclei was measured in two dimensions. No difference in size of nuclei or in staining could be detected in ganglion cells from the retina of scorbutic and normal animals.—A. M. Copping.

3098

SRIRAMACHARI, S., PIRANI, C. L. and HAYMAKER, W. **The effect of traumatic injury on the brain of vitamin-C-deficient guinea-pigs.** *Amer. J. Pathol.*, 1956, **32,** 131–139. [Armed Forces Inst. Pathol., Washington 25, D.C.]

Of 22 guineapigs weighing about 250 g. and fed on a scorbutogenic diet, 9 received in addition 0·2 mg. vitamin C daily, and 13 had 2 mg. Animals were killed after 3, 6, 8, 12 and 16 weeks, and the brain was examined. There were no petechiae visible, and no changes in the parenchyma of the brain.

In a second experiment with 2 groups of 8 or 10 guineapigs fed on the same diet with one of the same 2 supplements, a punctured wound was made in the brain 10 days after the diets were started. Animals were killed 3, 8, 10, 15 or 22 days later, and the site of injury was examined histologically. In the scorbutic animals there was lack of healing, particularly at the mouth of the wound in the region of the meninges. The failure to heal was not in essence different from that in other organs of the body of scorbutic animals, where lack of differentiation of mesenchymal elements is characteristic. In the reaction of the mesoglia, scorbutic animals showed no abnormality.

E. M. Hume.

3099

KUROKAWA, T. **The influence of vitamin C deficiency on the heteroplastic bone formation induced by transplantation of urinary bladder epithelium.** *Keio J. Med.*, 1955, **4,** 47–59. [Dept. Pathol., Sch. Med., Keio Univ.]

In 60 guineapigs weighing from 200 to 300 g. small pieces of mucosa from the bladder wall were implanted under the fascia of the abdominal muscle. After the operation the animals were given a scorbutogenic diet, and half of them had some green food or about 10 mg. vitamin C daily. They were all killed after 21 days, when signs of scurvy were apparent in the deprived animals. The implants had formed nodular indurations which were excised and examined histologically. Healing of the wound was much delayed in the deprived group. Bone formation in the cysts formed was frequent in the non-deprived animals, but very rare in the deprived. In the deprived there was a type of hyalinised lesion with proliferation of elastic fibres that did not occur in the non-deprived. No inhibition of collagen formation was observed in the deprived animals.

E. M. Hume.

3100

BOLKER, H. I., FISHMAN, S., HEARD, R. D. H., O'DONNELL, V. J., WEBB, J. L. and WILLIS, G. C. **The incorporation of acetate-1-C^{14} into cholesterol and fatty acids by surviving tissues of normal and scorbutic guinea pigs.** *J. Exp. Med.*, 1956, **103**, 199–205. [Dept. Biochem., McGill Univ., Montreal.]

Incorporation of ^{14}C into cholesterol and fatty acids, when acetate-1-^{14}C was incubated for 3 hr. with tissue from the liver, adrenal glands or aorta of guineapigs fed on a scorbutogenic diet, was not different from that when the diet contained ascorbic acid. Much more was incorporated into the liver than into the adrenal glands or aorta. Cholesterol and hexosamine were above normal in the serum of scorbutic guineapigs.

A. Hepburn.

3101

DESMARAIS, A. and MCGRAW, J. Y. Influence des vitamines A et D sur la croissance et la résistance capillaire du cobaye carencé ou non en acide ascorbique. [**Effect of vitamins A and D on growth and capillary resistance of guineapigs deprived or not deprived of ascorbic acid.**] *C.R. Soc. Biol.*, 1955, **149**, 1718–1722. [Dept. Exp. Physiol., Laval Univ., Quebec.]

Male albino guineapigs weighing about 500 g. were given a scorbutogenic diet to appetite, and were divided into 4 groups of 15 animals each. Group 1 had no supplement; groups 2 and 4 had daily supplements of 5 mg. ascorbic acid; groups 3 and 4 had daily supplements of 0·075 mg. calciferol during the first 16 days of the experiment and then of 0·075 mg. β-carotene instead. All the supplements were given by mouth. Bodyweight was recorded throughout the experiment and, at intervals, capillary resistance was measured by a negative-pressure method.

After 56 days the animals in group 2 weighed on the average 80 g. more than those in group 1. The weight gain of both groups given calciferol was retarded initially; when carotene was substituted they grew more rapidly and by the 56th day their weights were intermediate between those of the other two groups.

The capillary resistance of the guineapigs in group 1 fell progressively to a very low level on the 46th day, and the same value was maintained during the remainder of the experiment. The capillary resistance of the animals in group 2 rose at first but fell again to normal by about the 26th day and continued to fall during the following 20 days. The resistance of both groups given calciferol fell during the first 16 days. When carotene was substituted resistance was stabilised in group 3 and restored to normal in group 4.

I. M. Sharman.

3102

PORTER, J. C. and JONES, J. C. **Effect of plasma from hypophyseal-portal vessel blood on adrenal ascorbic acid.** *Endocrinology*, 1956, **58**, 62–67. [Dept. Physiol., Southwestern Med. Sch. Univ. Texas, Dallas.]

Blood was taken from the hypothalamico-hypophyseal portal vessel and from the common carotid artery of 12 dogs. The effect of the 2 lots of plasma on the content of ascorbic acid in the adrenal glands was tested on adult rats which had had the pituitary gland removed, and on intact rats which had received intraperitoneal injections of hydrocortisone acetate to inhibit the release of adrenocorticotropic hormone from the pituitary gland. That effect of hydrocortisone was experimentally confirmed. After the preparatory treatment and before injection of the test plasma, the left adrenal gland was removed; 90 min. after injection of the test plasma the right adrenal gland was removed, and ascorbic acid was estimated in both of them. The ascorbic acid content was significantly less after injection with blood plasma from the hypophyseal portal vessel than with plasma from the carotid artery in the rats injected with hydrocortisone, but not in those from which the pituitary gland had been removed.

It is suggested that blood from the hypophyseal portal vessel contains one or more substances which accelerate the release of adrenocorticotropic hormone from the anterior lobe of the pituitary gland.—E. M. Hume.

3103

HOLZBAUER, M. and WALTER, K. **Inactivation of the adrenal ascorbic acid-depleting activity of pituitary extracts by ascorbic acid.** *Nature*, 1956, **177**, 379–380. [Dept. Pharmacol., Univ. Edinburgh.]

On injection into hypophysectomised rats, a Ringer solution which contained ascorbic acid and adrenocorticotropic hormone (ACTH) and had been kept at room temperature for from 18 to 24 hr. had only 1·9 per cent. of the power to deplete adrenal ascorbic acid possessed by a similar solution without ascorbic acid. Simultaneous injections of ascorbic acid kept in Ringer solution only for the same time and of ACTH did not give the effect. Previous work showed that in the same way ascorbic acid inhibited the ability of ACTH to expand the chromatophores in isolated frog skin.—A. Hepburn.

3104

DESMARAIS, A. and GAGNON, P. M. Influence de l'exposition au froid sur l'activité thyroïdienne et sur le poids et la teneur en acide ascorbique des surrénales chez le cobaye carencé ou non en acide ascorbique. [**Effect of exposure to**

cold on the thyroid activity and on the weight and ascorbic acid content of the adrenal glands in the guineapig deprived or not deprived of ascorbic acid.] *C.R. Soc. Biol.*, 1955, **149,** 1714–1718. [Dept. Exp. Physiol., Laval Univ., Quebec.]

Male guineapigs were fed on a diet deficient in ascorbic acid for 21 days, by which time signs of deficiency were clearly evident. Two other groups of guineapigs received 5 or 150 mg. ascorbic acid daily. From the 3 groups, 9, 8 and 6 animals were kept at room temperature and 14, 6 and 6 were kept at 10° ± 1° C. for 6 days before being killed.

The guineapigs receiving both doses of ascorbic acid grew normally, though their weight fell temporarily on exposure to cold. The growth of the guineapigs not receiving ascorbic acid decreased from the 18th day and was little affected by cold. The weight of the adrenal glands increased only in the scorbutic guineapigs exposed to cold; the hypertrophy was prevented by ascorbic acid (see Abst. 2125, Vol. 19). The amount of ascorbic acid in the adrenal glands depended directly on the amount given and was greatest in the animals exposed to cold. Among the latter the degree of retention was highest in the scorbutic guineapigs. Thyroid activity, as measured by the height of the vesicle epithelium, was increased only in the scorbutic guineapigs exposed to cold.

A. Hepburn.

3105

Berzin, V. K. Vliyanie nedostatka askorbinovoi kisloty na reaktivnost' organizma v opytakh proverki toksigennosti difteriinykh kul'tur. [**Effect of ascorbic acid deficiency on the capacity of the system to react in tests of the toxicity of diphtheria cultures.**] Gipovitaminoz C kak faktor, snizhayushchii priobretennyi immunitet k difterii ili prepyatstvuyushchii ego razvitiyu. [**Vitamin C deficiency as a factor in lowering acquired diphtheria immunity or inhibiting its development.**] *Zh. Mikrobiol. Epidemiol. Immunobiol.*, 1955, No. 7, 71–74; No. 9, 18–22.

(*a*) Experiments on guineapigs showed that partial deprivation of ascorbic acid inhibited the development of immunity to diphtheria after a course of active immunisation. The inhibition was affected by the size of the infecting dose and the duration of the state of partial deficiency. It is suggested that ascorbic acid might form a useful adjunct in the active immunisation of children against diphtheria.

(*b*) As a result of observations showing a fall in resistance to infection during the winter and early spring, correlated with a low ascorbic acid content of the diet, experiments were performed to test the resistance to injection with strains of *Corynebacterium diphtheriae* of 3 groups of guineapigs, normal animals, animals on a low intake of ascorbic acid and frankly scorbutic animals.

Resistance was reduced in proportion to the degree of deficiency. All frankly scorbutic animals died within 2 or 3 days and showed little sign of inflammatory reaction, and from many of them bacteria were recovered. The ascorbic acid content of the adrenal glands was greatly decreased. About 25 per cent. of the partly deprived animals died in from 5 to 10 days. They exhibited necrosis at the site of injection and inflammatory exudates in the body cavities.—D. W. Taylor.

3106

Perez y Perez, F. Contribución al estudio de los factores enzimáticos de la esterilidad. Hialuronidasa y vitamina C. [**Enzymes in relation to sterility. Hyaluronidase and vitamin C.**] *An. Inst. Invest. Vet., Madrid*, 1954, **6,** 145–161. [Cat. Cirug. Obstet., Fac. Vet., León.] English and German summaries.

Bull semen diluted with egg yolk and citrate buffer showed more abnormal sperms and a shorter time of survival when hyaluronidase was added. Addition of vitamin C did not prolong survival, but reduced the number of abnormal forms. When both substances were added, vitamin C prevented the adverse effect of hyaluronidase. High concentrations of vitamin C were harmful.—D. Duncan.

3107

Koser, S. A. and Thomas, J. L. **Effect of ascorbic acid on cysteine requirement of lactobacilli.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 454–458. [Walter G. Zoller Mem. Dent. Clin., Univ. Chicago, Ill.]

Six of 36 strains of oral lactobacilli tested could grow without cysteine. Ascorbic acid and other reducing substances could replace cysteine for 5 other strains which needed cysteine, of which one was *L. casei* and the others were strains of the heterofermentative species *L. fermenti*. Ascorbic acid usually accelerated the growth of lactobacilli which required cysteine but did not affect the final amount of growth.—A. Hepburn.

3108

Anagama, Y. Studien über Vitamin C in Milch und Milchprodukten. [**Vitamin C in milk and milk products.**] *J. Fac. Fish. Animal Husb. Hiroshima Univ.*, 1955, **1,** 49–94. [Fukuyama, Japan.]

After an extensive review (137 references) of the literature, except that for the war years, from which values for the vitamin C content of milk are quoted, the results of experiments begun in 1938 and pursued at different times between then and

1952 are reported in tables. Vitamin C was estimated throughout by the 2 : 6-dichlorophenol-indophenol method of Radeff (Abst. 4816, Vol. 7).

The monthly mean vitamin C content, in mg. per 100 ml., of the mixed morning milks of 29 Holstein and 9 Guernsey cows in June-July 1938 was 1·64 and 2·34, respectively. It varied from day to day and from cow to cow. Of 2 Holstein × Jersey cows sired by the same bull, one gave milk resembling that of Holsteins in vitamin C content, the other milk resembling that of Jerseys.

The vitamin C content of the colostrum of 14 cows of different breeds was high at first but fell rapidly to a minimum within a few days and then rose a little ; it was not the same in different lactations of the same cow.

In 12 cows of different breeds, the milk was generally richer in vitamin C in the later stages of lactation, and between October and January.

Substitution of 25 kg. fresh grass for 8 kg. rice straw in the diet of 3 cows raised the vitamin C content of the milk, but only slightly.

Differences between different quarters of the udder and different portions of the same milking, and after different intervals between milkings, were slight.

In laboratory-scale experiments on the effects of pasteurisation and storage, vitamin C loss was greatest after heating for 30 min. at 95° C. and cooling rapidly, and least after bringing to the boil and cooling rapidly ; boiled milk, unlike fresh milk, did not lose vitamin C when kept cold in the dark for 30 hr.

Vitamin C was rapidly destroyed by exposure of milk to light, especially direct sunlight ; red cellophane gave better protection than violet, yellow or green. It is recommended that " vitamin C milk " should be produced by adding ascorbic acid to resemble good human milk in vitamin C content (about 4 mg. per cent. in Japan, according to values quoted from their literature) ; it should be sold in red bottles.

Fe had little effect on vitamin C content, but the effect of Cu was serious.

Separated milk contained as much vitamin C as whole milk. Japanese spray-dried milk varied greatly with brand and age, from 0·6 to 9·4 mg. per 100 g. powder. Packing in nitrogen was not always advantageous, but blowing nitrogen through the milk during spraying assisted retention of added ascorbic acid. In winter in Hokkaido an opened tin retained its vitamin C for about a fortnight. Sweetened condensed milk contained from 2·24 to 3·28 mg. vitamin C per 100 g. undiluted, from a third to a half of that of the original milk ; vitamin C was lost on keeping, but different brands varied less than brands of dried milk. Unsweetened condensed milk had from 0·48 to 1·90 mg. vitamin C per 100 g. undiluted, from 15 to 60 per cent. of that of the original milk, and the amount did not vary with the age of the sample.

W. M. Deans.

3109

CARR, W. R. **Ascorbic acid content of baobab fruit.** *Nature*, 1955, **176**, 1273. [Govt. Analyst's Lab., P.O. Box 8042, Causeway, Salisbury, Federation of Rhodesia and Nyasaland.]

Bulked samples of the pulp of baobab (*Adansonia digitata*, L.) fruit from each of 10 trees contained from 175·0 to 445·4 mg. ascorbic acid per 100 g., mean 306·2. Estimation was by indophenol titration and by the method of Roe and Oesterling (Abst. 1225, Vol. 14). The amount of interfering substances and of dehydroascorbic acid was unimportant.—A. Hepburn.

3110

ZEMLYANUKHIN, A. A. Sezonnoe izmeneniya soderzhaniya vitamina C v nekotorykh rasteniyakh. [**Seasonal changes in the vitamin C content of certain plants.**] *Agrobiologiya*, 1955, No. 2, 136–137. [State Univ., Voronezh.]

The plants investigated were sugar beet, cucumber and cabbage. Changes in the distribution of vitamin C at different stages of development were related to the physiological functions of the leaves and stems, and to environmental changes of light, temperature, soil moisture and supply of minerals.

H. Scherbatoff.

3111

NOBLE, I. and GORDON, J. **Ascorbic acid and color retention in green beans cooked by different methods.** *J. Amer. Dietetic Assoc.*, 1956, **32**, 119–122. [Sch. Home Econ., Univ. Minnesota, St. Paul.]

Ten varieties of green bean were boiled in an open pan with sufficient water or cooked in a tightly closed pan with just enough water to prevent scorching or cooked in a pressure cooker at 15 lb. pressure or steamed.

The ascorbic acid content of the raw beans ranged from 12·0 to 22·0 mg. per 100 g. in the different varieties, average 16·5 mg. Replicate analyses showed considerable variation in the retention of ascorbic acid after cooking. The average percentage retention of ascorbic acid derived from 48 samples was, in the order of the cooking methods given above, 60, 71, 76 and 76 ; the first result was significantly different from the others. Beans cooked in the pressure cooker were greener than those cooked in the open pan ; both had almost the colour of the raw vegetable. Beans cooked by the other methods were yellow.

A. Hepburn.

See also Abst. 3383.

4. PHYSIOLOGY OF NUTRITION

ENZYMES

3112

BERGAMINI, A., BENDANDI, A., CHIEREGO, G. and MAGGI, G. Sul quadro enzimatico della steatosi epatica da dieta iperlipidica-ipoprotidica: variazioni dopo trattamento lipotropo. [**The enzyme pattern in fatty liver caused by a diet high in fat and low in protein: changes after treatment with lipotropic substances.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 521–523. [Ist. Clin. Med., Univ. Modena.]

Forty-five male rats weighing from 130 to 150 g. were maintained for 40 days on a diet high in fat and low in protein. Different substances reputed to be lipotropic were given and, in the liver, total fats, tributyrin esterase, alkaline β-glycerophosphatase and β-glucuronidase were estimated. The lipotropic substances were choline chloride 25 mg., methionine 100 mg., or inositol 60 mg., given daily by intramuscular injection, or the lipotropic factor of the pancreas given as 5 per cent. of the diet. With the diet alone, the fat content of the liver was nearly doubled. Any of the 4 lipotropic substances kept it normal.

Tributyrin esterase was slightly reduced in the liver with the diet alone, and choline and methionine had no effect on it; inositol restored the amount to normal, and the lipotropic factor of the pancreas raised it above normal. The diet alone increased β-glycerophosphatase, and all the four lipotropic substances decreased it. The amount of β-glucuronidase was not affected by the diet or by the lipotropic substances.—E. M. Hume.

3113

MCGEACHIN, R. L. **Effect of amino acids and proteins on amylase activities of body fluids.** *Biochim. biophys. Acta*, 1956, **19**, 391. [Dept. Biochem., Univ. Louisville, Ky.]

The amylase activity of diluted saliva was increased by about 20 per cent. when 50 mg. glycine or 7 mg. bovine plasma was added. Addition of both did not further increase the activity. Glycine increased activity by about 10 per cent. in the presence of as much as 0·1 mg. plasma albumin, but had no effect on the amylase activity of fresh or dialysed urine containing less than 0·1 mg. protein per ml. It was assumed that salivary amylase was different from amylase in urine or that urine contained a non-protein, non-dialysable activator of amylase. Serum amylase activity was not significantly increased by the addition of 9 amino acids in separate trials. A mixture of saliva and serum had more than the calculated amount of amylase activity, but the addition of glycine produced no further increase.—A. Hepburn.

3114

DE MARCO, B. and CUSMANO, F. La determinazione dell'anidrasi carbonica nei lattanti eutrofici, prematuri e distrofici. [**Estimation of carbonic anhydrase in well nourished, premature and dystrophic infants.**] *Lattante*, 1955, **26**, 388–400. [Ist. Provinciale Protezione Assistenza Infanzia, Genoa.] English summary.

Carbonic anhydrase was estimated by the colorimetric method of Philpot and Philpot (*Biochem. J.*, 1936, **30**, 2191) in the blood of 6 normal men, 10 normal women, 10 normal infants and 8 premature infants. Values for carbonic anhydrase were a good deal higher for men than for women. For normal infants they were about the same as for women; for premature infants they were considerably lower and for dystrophic infants a little lower still. It is thought that concentration of carbonic anhydrase in the blood could be used as a criterion of nutritional state and of maturity in the infant.—E. M. Hume.

3115

SHIRLEY, R. L., EASLEY, J. F., HAINES, C. E. WARNICK, A. C., WALLACE, H. D. and DAVIS, G. K. **Influence of dietary energy level on succinoxidase and lactic dehydrogenase of the heart of pregnant swine.** *J. Agric. Food Chem.*, 1956, **4**, 68–70. [Dept. Animal Husb. Nutrit., Univ. Florida, Gainesville.]

The 31 gilts, weighing on the average 114 lb., were in 2 groups running on pasture. Those of one group were fed to appetite, the others had half the amount of another ration, which supplied about the same quantities of protein, vitamins and minerals but only half the energy intake. All the gilts were mated at the second oestrus, about 106 days after they were put on the rations; half of each group were killed 3 days after mating and the rest 22 days later. Succinoxidase and lactic dehydrogenase were estimated in heart muscle.

The succinoxidase activity of left ventricle was significantly greater at both stages of gestation in the fully fed than in the restricted pigs. There was no significant effect of stage of gestation. In lactic dehydrogenase there was no significant difference.—D. Duncan.

3116

BOULANGER, P. Les aminoacide-oxidases dans les règnes végétal et animal. [**Aminoacid oxidases in the plant and animal kingdoms.** *Arch. Sci. biol., Bologna*, 1955, **39**, 593–604. [Lab. Chim. Biol., Fac. Méd., Lille.]

3117

La Du, B. N. and Zannoni, V. G. **A requirement for catalase in tyrosine metabolism: the oxidation of *p*-hydroxyphenylpyruvic acid to homogentisic acid.** *Nature*, 1956, **177**, 574–575. [Lab. Chem. Pharmacol., Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

3118

Savary, P. and Desnuelle, P. Sur quelques éléments de spécificité pendant l'hydrolyse enzymatique des triglycérides. [**Specificity in enzymic hydrolysis of triglycerides.**] *Arch. Sci. biol., Bologna*, 1955, **39**, 689–704. [Lab. Chim. Biol., Fac. Sci., Marseilles.]

During hydrolysis of 3 pure triglycerides, 2-oleodipalmitin, 1-oleodipalmitin and 1-palmitodiolein, and of several mixtures of natural or synthetic glycerides, it was found that pancreatic lipase attacked preferentially the external chains in positions 1 and 3, but chains in position 2 were eventually attacked. The hydrolytic reactions thus gave triglycerides → 1 : 2-diglycerides → 2-monoglycerides. The length and unsaturation of the chains did not affect the rate of breakdown.

D. Duncan.

3119

Stern, J. R., del Campillo, A. and Raw, I. **Enzymes of fatty acid metabolism. 1. General introduction; crystalline crotonase.**

Stern, J. R. and del Campillo, A. **2. Properties of crystalline crotonase.** *J. Biol. Chem.*, 1956, **218**; 971–983; 985–1002. [Dept. Pharmacol., Coll. Med., Univ. New York.]

3120

Diaz Cadavieco, R. Estudios sobre carboxilasas. [**Studies of carboxylases.**] *Acta cientif. venezol.*, 1955, **6**, 140–148. [Inst. Nac. Nutrición.] English summary.

3121

Tascher, R. and Müller, N. Zur Frage rassischer und geographischer Einflüsse auf die Serumphosphataseaktivität im Entwicklungsalter. [**Racial and geographical influences on serum phosphatase activity during development.**] *Ztschr. Kinderheilk.*, 1956, **77**, 497–503. [Med. Klin., Univ. Homburg, Saar.]

The values found by the authors (in the press [journal not indicated]) by the method of King and Armstrong for alkaline phosphatase in the serum of normal children from 1 to 16 years of age in their own locality are compared with those found by different methods by 11 other authors from several places in Europe, Canada, United States and Israel. It was concluded that race and geographical region had no effect except in so far as they might influence development. The authors' results show a steady fall from about 20 King Armstrong units to about 10 at age 7 in both sexes, and then a rise in girls to almost 16 at age 12, followed by a second fall; in boys the rise was about 2 years later and there was no second fall.

It is stated that acid phosphatase in serum did not vary with age, sex, race or locality.

W. M. Deans.

3122

Szczygłowa, M. and Secomska, B. Przydatność oznaczania fosfatazy alkalicznej w surowicy krwi do masowych badań nad stanem odżywienia oraz do celów diagnostycznych. [**The use of alkaline phosphatase estimation in blood serum for mass examination of nutritional status and for diagnostic purposes.**] *Rocz. Państwowego Zakł. Hig.*, 1955, **6**, 379–387. Russian and English summaries.

The method was that of Bessey *et al.* (Abst. 2569, Vol. 16; 1589, Vol. 22). Blood samples were taken from the pulp of the finger or heel. The results obtained by Bessey's method are in *p*-nitrophenol units; the factor 1·79 converts them to Bodansky units.

In 20 adult subjects the levels of alkaline phosphatase agreed well with those in the literature, except that in 4 with diseases of the liver and in a pregnant woman the estimated levels were higher.

Values for venous and capillary blood, in Bodansky units, were in one subject 2·8 and 2·5, in another 3·6 and 3·9, respectively.

To test the factor 1·79 used to convert *p*-nitrophenol units to Bodansky units, estimations were made by both methods. The tabulated results show good agreement except in 2 subjects with jaundice, which made colorimetric estimation difficult.—W. Z. Billewicz.

See also Absts. 3071, 3072, 3106, 3225, 3458.

DIGESTION AND ABSORPTION

3123

Flood, C. A. **Gastrointestinal function in health and disease.** *Med. Clins. N. Amer.*, 1955, **39**, 699–718. [Dept. Clin. Med., Coll. Phys. Surg., Columbia Univ., New York.]

3124

Le Magnen, J. La satiété induite par les stimuli sucrés chez le rat blanc. [**Satiety induced by sugars as stimuli in the white rat.**] *C.R. Soc. Biol.*, 1955, **149**, 1339–1342.

Fifteen adult male rats were given 2 meals daily of an adequate basal diet, each lasting 90 min. After 10 days test substances were given either orally or by stomach tube 15 min. before the morning meal and their effect on the amount of food consumed was noted.

After the ingestion of 5 ml. of a 10 per cent. solution of sucrose the intake of solid food was reduced by about 50 per cent. The administration of this same solution by stomach tube was without effect on food intake, as was the administration by stomach tube of water. In one experiment the ingestion of 5 ml. of a 0·25 per cent. solution of saccharin indicated an effect similar to that of sucrose, but in two subsequent experiments the saccharin was without effect. The administration by stomach tube of this solution of saccharin was also without effect. The ingestion of 5 ml. of a 2 per cent. NaCl solution, of 0·01 *N* acetic acid or of 0·005 per cent. quinine sulphate was without effect on subsequent food intake.—G. F. Garton.

3125

GEIGER, E. and PINSKY, J. J. **Effect of changes in environmental temperature on stomach emptying in rats.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 107–110. [Dept. Pharmacol., Med. Sch., Univ. S. California, Los Angeles.]

The nitrogen left in the stomach 2 hr. after a standard protein meal was taken as a measure of the emptying rate of the stomach. At room temperature over 80 per cent. of the N disappeared from the stomach in 2 hr. Removing the rats to temperatures of 3° or 37° C. immediately after they had finished the test meal delayed emptying of the stomach. Five days of acclimatisation to these temperatures was sufficient to allow the emptying time to return to normal. Decreased gastric motility as a result of increased production of adrenaline is suggested as the cause of the delay in emptying after sudden changes of temperature.

A. T. Phillipson.

3126

REYNELL, P. C. and SPRAY, G. H. **The simultaneous measurement of absorption and transit in the gastro-intestinal tract of the rat.** *J. Physiol.*, 1956, **131,** 452–462. [Nuffield Dept. Clin. Med., Univ. Oxford.]

Phenol red is not absorbed to any extent, but in rats only 90 per cent. of the phenol red given in a test meal can be recovered from the stomach when the animal is killed immediately after its ingestion. By subdividing the intestine and calculating the percentage of the marker present in a given segment, an estimate of the rate of movement along the intestine as well as of gastric emptying time can be made. Considerable variation between animals was found in gastric emptying time, and in the intestine propulsive movements became slower as the caecum was approached.

Glucose absorption starts in the stomach, and the 400 mg. in the test meals was absorbed by the time the meal was halfway through the small intestine. Iodide, included for comparison, was absorbed more slowly, not at all from the stomach.—A. T. Phillipson.

3127

KIMBEL, K. H., FISCHER, W., BÜNTE, H. and FRIK, W. Untersuchungen über enterale Antibiose bei der Ratte. 8. Der Einfluss von Tetracyclingaben auf die Magen-Darm-Passage. [**Studies on intestinal antibiotics in the rat. 8. Effect of tetracycline on the rate of transit through the digestive tract.**] *Ztschr. ges. exp. Med.*, 1955–56, **126,** 587–595. [Med. Klin., Univ. Erlangen.]

For part 7 see Abst. 311, Vol. 26.

The rate of passage of a barium meal given by stomach tube was studied in rats fasted for 48 hr. After a control study 25 rats received 25 mg. terramycin and another 25 had 25 mg. aureomycin daily in aqueous solution by stomach tube. In 10 rats of each group a barium meal was given 2 hr. after the first dose of antibiotic. Other tests were made after the antibiotics had been given for 14 and 26 days. The effect of 5 μg. vitamin B_{12} injected intraperitoneally daily for 3 days was studied also.

After a single dose of antibiotic, and especially after aureomycin, the rate of passage of the barium meal was increased, especially in the cranial part of the digestive tract. After 14 days the rate of passage was almost normal, and after 26 days it was significantly slower than normal, especially the emptying of the stomach. Again aureomycin had more effect than terramycin. Three days of treatment with vitamin B_{12} restored the rate of passage to normal.

Isolated loops of small intestine from rats showed a fall in tonus and increased activity in the presence of aureomycin solution. Vitamin B_{12} reduced activity without affecting tonus.

D. Duncan.

3128

DONNET, V. and GARNIER, L. Sur les modifications de la motricité intestinale à l'occasion du repas chez les chiens porteurs de fistules. [**Modification of intestinal motility during feeding in dogs with fistulae.**] *C.R. Soc. Biol.*, 1955, **149.** 1585–1587.

3129

KLAUS, W. and FEWSON, D. Untersuchungen über den Einfluss von Aureomycin auf die

Dünndarmbeschaffenheit bei Schweinen. [**Effect of aureomycin on the condition of the small intestine in pigs.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,** 364–374. [Tierzucht-Inst., Univ. Kiel.] English summary.

Studies were made of the small intestine of 49 pigs which had been fattened from 20 kg. to different weights on cereals with or without aureomycin, 10, 20 or 50 mg. per kg. feed. For measurement of length the intestine, cut into 3, was suspended under a pull of 130 g. in physiological saline. Volume was measured at fluid pressure of 20 cm. The intestine was then dried, weighed and analysed.

No connection was found between slaughter weight and length or volume of intestine. Aureomycin did not significantly affect length or dry weight of intestine, and there was no difference in chemical composition ; the volume of the intestine was less, in some groups significantly so.

W. M. Deans.

3130

ISHIHARA, Y. [**Experimental studies on the digestibility of milk proteins. 1. On the digestibility of human and cow's milk proteins by proteolytic enzymes *in vitro*. 2. On the digestibility of human and cow's milk proteins by human digestive juices. 3. Paper chromatography of amino acid liberated from human and cow's milk proteins by proteolytic enzymes or human digestive juice.**] *Shikoku Acta Med.*, 1955, **7,** No. 5, 41–45 ; 46–49 ; 50–56. [Dept. Paediat., Sch. Med., Tokushima Univ. In Japanese : English summary.

1. Samples of human and cow's milk were analysed for amino N after enzymic digestion for ½, 1, 2 or 3 hr. ; the results are tabulated in English as the amount found and as a percentage of total N. With pepsin the amount was small for both milks and the percentage slightly greater for human than for cow's milk. With trypsin the amounts were larger than with pepsin and the percentage was slightly greater for cow's than for human milk. With trypsin after pepsin the amounts were still greater and the percentage for human was greater than for cow's milk.

2. In similar studies with human gastric and duodenal juices amino N liberated from human milk was greater than from cow's milk both in amount and as a percentage of total N.

3. No amino acid was found after digestion of either milk with pepsin or gastric juice. With trypsin or duodenal juice the amounts of amino acids rose with time of digestion ; with duodenal juice arginine and lysine appeared earlier in human than in cow's milk. With trypsin after pepsin or with duodenal after gastric juice amino acids appeared earlier than with trypsin or duodenal juice alone.—D. Harvey.

3131

SCHIEBLER, T. Neuere morphologische Anschauungen über die Darmresorption. [**New morphological views on absorption from the intestine.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1885–1887. [Anat. Inst., Univ. Kiel.] An editorial review.

3132

DE LANGEN, C. D. Die Vasomotilität bei Sprue und anderen Resorptionsstörungen. [**Vasomotor action in sprue and other disorders of absorption.**] *Gastroenterologia*, 1956, **85,** 1–10. [Utrecht.] English and French summaries.

Almost without exception patients with sprue, tropical and non-tropical, and steatorrhoea have low blood pressure. From repeated studies of such patients the question arose : is the disorder of absorption or that of vasomotor control the primary ? Detailed studies of 3 patients with steatorrhoea showed low blood pressure ; low B.M.R. that did not rise when thyroid was given ; abnormal histamine and cantharidin reactions in the skin ; low venous and capillary pressure ; liability to faint ; low intramuscular pressure ; hydergen (from ergot) increased excretion of fat, presumably by reducing absorption ; all had periodic meteorism and flat blood sugar and blood fat curves in response to tests. Treatment partly reversed these deviations from normal, but blood pressure did not rise to normal. It is suggested that the disturbance of capillary circulation may be primary or the disorders of circulation and absorption may be inseparably associated.

I. Leitch.

3133

GRUSKAY, F. L. and COOKE, R. E. **The gastrointestinal absorption of unaltered protein in normal infants and in infants recovering from diarrhoea.** *Pediatrics*, 1955, **16,** 763–767. [Dept. Paediat., Sch. Med., Yale Univ., New Haven, Conn.] Spanish and Interlingua summaries.

In 21 infants recovering from diarrhoea and in 19 normal infants levels of egg albumin in serum after ingestion of the crystalline protein were estimated by an immunochemical method. Concentrations of egg albumin were significantly higher in infants with diarrhoea than in normal infants, and estimation of haematocrit showed that the difference was not one of haemoconcentration.

F. C. Aitken.

3134

MATTSON, F. H. **The digestion and absorption of fat.** *Food Res.*, 1956, **21,** 34–41. [Res. Div., Procter and Gamble Co., Cincinnati 31, Ohio.]

3135

BLOMSTRAND, R. and LINDQUIST, B. **The intestinal absorption of carbon-labelled oleic acid in the normal infant and in congenital bile duct atresia.** *Helv. paediat. Acta*, 1955, **10**, 627–639. [Dept. Physiol. Chem., Univ. Lund.] German, French and Italian summaries.

A mixture which consisted mainly of di- and triglycerides was prepared from commercial monopalmitin with the acid chloride of oleic acid-1-^{13}C. The labelled mixture was dissolved in olive oil and administered to a normal 5-month-old boy, a normal 9-month-old girl and a 12-month-old girl with congenital atresia of the bile ducts. The amount of labelled fatty acid absorbed was calculated from the difference between the amount of ^{13}C administered and that recovered from the faecal lipids, permitting a distinction between dietary and endogenous faecal fat.

On the average 85 per cent. of the oleic acid administered to the normal infants was absorbed, and 42 per cent. by the infant with biliary atresia. It was demonstrated that unabsorbed oleic acid was excreted as such, though a small proportion was hydrogenated, presumably by bacterial action.

G. A. Garton.

3136

BLOMSTRAND, R., LINDQUIST, B. and PÄÄBO, K. **The intestinal absorption of carbon-labelled oleic and palmitic acid in the normal infant and in cystic fibrosis of the pancreas.** *Helv. paediat. Acta*, 1955, **10**, 640–648. [Dept. Physiol. Chem., Univ. Lund.] German, French and Italian summaries.

Intestinal fat absorption was studied in a normal 8-month-old boy and in one aged 17 months with cystic fibrosis of the pancreas, one of the manifestations of which is steatorrhoea. In experiments similar to those described in the previous abstract glycerides containing ^{13}C-labelled oleic and palmitic acids were given.

The normal infant absorbed 93 per cent. of the labelled acids and the child with cystic fibrosis of the pancreas only 26 per cent. It is concluded that the pathological steatorrhoea is due to unabsorbed dietary fatty acids, though the non-dietary component of the faecal fatty acids was about twice that found in the normal child. In both infants a small proportion of the unabsorbed oleic acid was hydrogenated.—G. A. Garton.

3137

SMITH, A. H., KLEIBER, M., BLACK, A. L. and LUICK, J. R. **Transfer of phosphate in the digestive tract. 1. Swine.**

SMITH, A. H., KLEIBER, M., BLACK, A. L. and BAXTER, C. F. **2. Sheep.**

SMITH, A. H., KLEIBER, M., BLACK, A. L. and LOFGREEN, G. P. **3. Dairy cattle.** *J. Nutrition*, 1955, **57**, 497–506; 507–527; 1956, **58**, 95–111. [Dept. Animal Husb., Univ. California, Davis.]

1. ^{32}P was injected into the bloodstream of pigs 2, 4 and 8 months old. Animals in each age group were slaughtered at different times up to 48 hr. after injection. The radio-activity of the contents of the digestive tract was estimated and compared with that of the tissues of the segment from which they were taken. Secretion of inorganic P occurs in the small intestine and re-absorption in the large intestine.

The rate of decrease of activity in the plasma declined with age and so did the secretion of endogenous P into the small intestine.

2. ^{32}P was injected intravenously into lambs 1, 4 and 10 months old. The quantity found in the alimentary contents of the young lambs was small compared with that in older animals. The concentration in the contents was greatest in the rumen, omasum and abomasum, and it is calculated that the quantity entering the rumen across the rumen epithelium is greater than the quantity entering in the saliva. The omasal wall is considered also to secrete P into the contents. Very little enters the intestines.—A. T. Phillipson.

3. ^{32}P was injected into the jugular vein of calves, which received 2·6 to 9·9 mC. each, and cows, 4·7 to 17·1 mC., and they were killed from 0·5 to 72 hr. after injection. Samples of contents and tissues of the digestive tract of each animal were collected for estimation of total and radioactive P.

There was a large secretion of endogenous P in the cow; most of this was found in the rumen, where the apparent daily rate of secretion was estimated at about 66 g., but it was also estimated that almost the whole of this amount reached the rumen from the salivary glands. Thus secretion by rumen epithelium was very small in the cow, much less relative to liveweight than in the sheep (see above). The total secretion into the stomach of the cow was considerably greater than in the sheep, per unit of liveweight.

A small amount of P was secreted by the wall of the small intestine in the cow; in the calf most endogenous P was secreted by this tissue. Exchange of P between plasma and intestinal tissue was generally less in the cow than in the sheep.

R. Hill.

3138

STEWART, J. and MOODIE, E. W. **The absorption of magnesium from the alimentary tract of sheep.** *J. Comp. Pathol.*, 1956, **66**, 10–21. [Moredun Inst., Gilmerton, Edinburgh.]

Two hours after receiving magnesium sulphate by mouth sheep were anaesthetised and veins draining different parts of the digestive tract were exposed. The absorption of Mg was estimated by

comparing the concentration in blood draining the digestive tract with the concentration in blood from the carotid artery.

There was evidence of slight absorption of Mg from the rumen, abomasum, duodenum, and small intestine, but none from the caecum or colon.

When $MgSO_4$ was introduced through cannulae directly into different parts of the digestive tract more definite evidence of absorption was obtained. The principal sites were apparently the duodenum and small intestine, but absorption took place also from the rumen, abomasum and caecum. Mg given as nitrate was absorbed much more readily than as sulphate.

Absorption of Mg was generally accompanied by an increase of serum inorganic P but little change in serum Ca.—R. Hill.

3139

HAGEN, P. and ROBINSON, K. W. **The influence of hyaluronidase on absorption from the colon.** *Med. J. Austral.*, 1953, i, 848–849. [Physiol. Dept., Univ. Queensland.]

Absorption was tested by injecting the test solution into the colon, which was tied off, after it had been thoroughly washed through with physiological saline, or with distilled water in the experiment with NaCl. Six guineapigs, weighing about 450 g., were used for each test; they were given a measured volume of the test solution, 3 with and 3 without hyaluronidase, 10 Schering units per 50 ml. solution. After 2 hr. the colon was removed and washed out and the contents were made up to volume and analysed.

Glucose was not absorbed from the colon at all whether hyaluronidase was present or not, and the quantities of propionic acid, methionine, amino acid hydrolysate and NaCl absorbed were uninfluenced by the presence of hyaluronidase.

M. H. Pierce.

3140

CASTLE, E. J. **The rate of passage of foodstuffs through the alimentary tract of the goat. 1. Studies on adult animals fed on hay and concentrates.** *Brit. J. Nutrition*, 1956, **10**, 15–23. [Dept. Vet. Prevent. Med., Univ. Liverpool.]

Two experiments were made on each of 8 goats weighing from 26·6 to 57·3 kg., 6 castrated males and 2 females. All were kept in metabolism cages and fed on 400 g. calf nuts daily and meadow hay to appetite. For experiments each goat received 10 to 20 g. hay stained by boiling with basic fuchsin or brilliant green. Faeces were collected 11 hr. later, then every hour until stained particles were found, every 4 hr. for the next 2 days and then at longer intervals until no more stained particles were found. Coloured particles were collected on a gauze filter, counted and expressed in relation to dry weight of faeces.

In all the goats stained particles were first found in the faeces between 11 and 15 hr. after the meal of hay. The concentration rose sharply to a maximum after about 30 hr. and then fell to zero by the sixth or seventh day. Curves of excretion were sigmoid, and between the times at which 5 and 80 per cent. of the total recovery had been excreted the mean rate of excretion was 2·1 per cent. per hour and the range from 1·6 to 2·8 per cent. In all the goats 5 per cent. was excreted in about 16 hr., but the time taken to reach 95 per cent. excretion tended to be an individual characteristic. There was a negative correlation, just statistically significant, between feed intake and mean retention time. There was a significant positive correlation between time of 5 per cent. excretion and dry matter content of faeces. Mean retention time was not related to bodyweight.

D. Duncan.

3141

RADEFF, T. and STOJANOFF, I. Über die Bewegungen des Pansens und den Mechanismus des Wiederkauens. [**Movement of the rumen and the mechanism of rumination.**] *Arch. Tierernährung*, 1955, **5**, 331–347. [Inst. Exp. Veterinärmed., Bulg. Akad. Wiss., Sofia.]

The cranial and caudal parts of the dorsal rumen sac contract simultaneously. The secondary contraction occurs in sheep on the average 13 sec. after the primary and 28·25 sec. before the next primary. The secondary contraction is always the weaker and may be absent, with some reduction in the interval between primary contractions. The secondary contraction affects the caudal sac most strongly, and is accompanied by eructation. Contractions of the ventral sac follow those of the dorsal sac, but are weaker. Two contractions of the ventral sac may occur for each one of the dorsal sac. During rumination, regurgitation is accompanied by a pause in respiration and occurs just before contraction of the dorsal rumen sac and reticulum. Chewing occupies the time of the secondary rumen contraction and swallowing occurs after the second contraction of the ventral sac.—D. Duncan.

3142

AUGUSTO VALLENAS P., G. **Effects of the glycemic levels on rumen motility in the sheep.** *Amer. J. Vet. Res.*, 1956, **17**, 79–89. [Dept. Physiol., New York State Vet. Coll., Cornell Univ., Ithaca.]

The injection of glucose solutions, 0·7 to 1·0 g. per kg. bodyweight, into the jugular vein of sheep decreased the frequency of rumen movements and caused some depression of the strength of the contractions. The effect was considerable only with the higher dose. Insulin, 1 unit per kg. bodyweight, after an initial depression caused a large

increase in frequency. The changes after insulin appeared to have an inverse relation to blood sugar. The effect was reversed by injection of glucose. Emphasis is placed on the variability in the response to a given treatment even in the same animal, and possible mechanisms are discussed.

A. T. Phillipson.

3143

JOHNS, A. T. **Pasture quality and ruminant digestion. 2. Levels of volatile acids and ammonia in the rumen of sheep on a high-production pasture.** *N.Z. J. Sci. Technol.* [*A*], 1955, **37**, 323–331. [Grasslands Div., D.S.I.R., Palmerston North.]

The pasture described in part 1 (see Abst. 2896, Vol. 26) was grazed by 2 sheep with rumen fistulae. There was no marked change through the year in rumen total volatile fatty acid, which ranged from 10·1 to 18·7 m*M* per 100 ml., or in percentage proportions of different acids, which were acetic 50 to 62, propionic 21 to 30, butyric 12 to 17 and C_5 acids 3 to 10. The high protein content of the pasture was reflected in high rumen ammonia levels, from 35 to 130 mg. per 100 ml., but there was no close relation with pasture variations. When the sheep were changed to a hay diet, rumen ammonia and volatile fatty acid levels fell. The proportion of acetic acid increased, that of butyric acid decreased and that of propionic acid remained relatively constant. Possible effects on animal metabolism are discussed.—J. L. Corbett.

3144

HOFLUND, S., HOLMBERG, J. and SELLMANN, G. **Investigations on fat digestion and fat metabolism in ruminants. 2. Feeding unsaturated fats to dairy calves. 3. Influence of the rumen flora on fat digestion by sheep.** *Cornell Vet.*, 1956, **46**, 51–53 ; 53–57. [Dept. Cattle Sheep Dis., Royal Vet. Coll., Stockholm.]

For part 1 see Abst. 5290, Vol. 25.

2. Young calves in which the rumen had not begun to function were fed until they were from 1 to 5 months old on a mixture of whole milk, skimmed milk and linseed oil emulsion to give a fat content of 5 per cent. Depot fat was taken from several sites and its content of linoleic and linolenic acids was studied spectrophotometrically after alkali isomerisation.

The proportions of linoleic and linolenic acids in subcutaneous, mesenteric and perinephric fat were higher than those normally found in the depot fats of mature ruminants ; the percentage of linoleic acid ranged from 3·4 to 6·1 and that of linolenic acid from 1·7 to 4·8. It is concluded that unsaturated dietary fat is absorbed unchanged by young calves lacking the rumen organisms which, in the older animal, effect the hydrogenation of unsaturated fatty acids.

3. A sheep with a permanent rumen fistula was fed to appetite on a diet of oat grits, wheat bran, molasses and hay. After 300 ml. of a 33 per cent. emulsion of linseed oil had been introduced into the rumen samples of rumen contents were withdrawn at 6, 12, 24, 36, 48 and 60 hr. for estimation of the linoleic and linolenic acid content of the fat. A similar experiment was made with 500 ml. of the linseed oil emulsion.

Linolenic acid disappeared from the rumen fat very rapidly, but the fall in linoleic acid content was much slower, demonstrating conversion of the trienoic to the dienoic acid by hydrogenation.

Similar experiments were made after introduction of 5 g. potassium chlorate or 0·25 g. of a fungicide into the rumen. No conclusion could be drawn from the experiment in which potassium chlorate was used to kill the " infusoria ", since the linseed oil emulsion probably broke down owing to weakened rumen contractions. The hydrogenation of linoleic acid was demonstrated after administration of the fungicide, though not as clearly as in the initial experiments, probably because of a disturbance in the symbiotic relations of the rumen organisms.—G. A. Garton.

3145

ANDERSON, C. M. **The metabolism of sulphur in the rumen of the sheep.** *N.Z. J. Sci. Technol.* [*A*], 1956, **37**, 379–394. [Canterbury Agric. Coll., Lincoln.]

A ewe with a rumen fistula was fed to appetite on lucerne hay containing 0·28 per cent. total S. For experiments it was fed from 7.30 to 9.0 a.m. and then placed in a bare pen ; rumen contents were sampled 1½ hr. later and the substance to be studied was introduced. Further samples were taken at intervals thereafter. The capacity of the rumen was about 4 litres.

Sulphide, $Na_2S \cdot 9H_2O$, almost all disappeared from the rumen within 2½ hr. when given at about 113 μg. S per ml. contents, and over half disappeared within 30 min. Blood sulphide rose briefly and returned to normal within 1 hr. It was concluded that most of the sulphide, as H_2S, was absorbed through the rumen epithelium. Sulphate was given in doses of 30, 60 and 90 g. There was rapid reduction to sulphide, which reached its peak of concentration after 2½ hr. with the smallest and 5 hr. with the largest dose, and then declined steadily. The peak was 97 μg. S per ml. after the largest dose of sulphate, 2250 μg. S per ml. The increase in crude protein S was between 0·05 and 0·1 mg. per ml. and was not related to the amount of sulphate given. Sulphide concentration in the rumen was not affected by addition of 1·04 g. S as 100 g. casein or 1·34 g. S as 5 g. cystine.

In experiments *in vitro*, with washed suspensions of rumen microflora, production of sulphide from sulphate was not very sensitive to *p*H. Release of sulphide from casein and uptake of sulphide by micro-organisms were greatest at *p*H 6. Sulphide was utilised quite rapidly, but not as fast as sulphate was reduced. Cyanide added with sulphide was detoxicated, with production of thiocyanate.

Slices of liver and kidney from a sheep took up sulphide during incubation; the liver slices took up S at a rate equivalent to 0·6 g. sulphide per hr. for a whole liver of 600 g., and at this rate the liver could collect any sulphide likely to be absorbed from the rumen.

It was not found possible to produce signs of S deficiency in 4 sheep given KCN for 6 weeks.

D. Duncan.

See also Absts. 2893, 2966, 2996, 3270, 3277, 3329, 3360, 3404.

COMPOSITION OF BODY FLUIDS AND TISSUES

BLOOD

3146

Rourke, G. M., Du Toit, C. H. and Wood, E. **Normal laboratory values.** *New Engl. J. Med.*, 1956, **254**, 29–35. [Chem. Lab., Massachusetts Gen. Hosp.]

Normal values, quantity of blood or other biological fluid required and reference to method are tabulated for a number of constituents of human blood and urine, with a few for cerebrospinal fluid and miscellaneous values.—W. M. Deans.

3147

Cottom, D. G. **Foetal haemoglobin and post-maturity.** *J. Obstet. Gynaecol. Brit. Empire*, 1955, **62**, 945–948. [St. Thomas's Hosp., London.]

The amount of foetal haemoglobin in umbilical cord blood was measured at 24 births by a modification of the method of Brinkman and Jonxis. The results are expressed as percentages of the Haldane standard. In babies born at term the average level was 70 per cent.; higher levels were obtained before term, and lower levels after term. The agreement between the foetal Hb levels and the calculated age suggested that the former might be useful as an objective index of maturity.

A. M. Thomson.

3148

Ruggieri, P. and Marchi, M. Ricerche sulla specificità antigene delle emoglobine umane normali (adulta e fetale) mediante precipitazione in agar. [**Antigenic specificity of normal human haemoglobins, adult and foetal, studied by precipitation in agar.**] *Riv. Ist. sieroterap. ital.*, 1955, **30**, 405–413. [Ist. Clin. Med., Univ. Rome.] English summary.

Immunological studies by diffusion in agar showed that Hb from an adult human subject contained a proportion of foetal Hb. Rabbits inoculated with crystalline human adult Hb produced 2 specific antibodies, one against adult and one against foetal Hb. Foetal Hb caused production of only one antibody.—D. Duncan.

3149

Derrien, Y., Laurent, G. and Roques, M. Recherches sur la fraction alcalinorésistante de l'hémoglobine de l'homme adulte normal. [**The alkali-resistant fraction of haemoglobin in the normal adult man.**] *Arch. Sci. biol., Bologna*, 1955, **39**, 650–670. [Lab. Chim. Biol., Fac. Méd., Marseilles.]

3150

Hawkins, W. W., Leonard, V. G. and Speck, E. **The total body hemoglobin in children and its relation to caloric and iron requirements.** *Metabolism*, 1956, **5**, 70–78. [Maritime Reg. Lab., Nat. Res. Counc., Halifax, N.S.]

Hb, heights and weights of 1800 children aged 6 to 17 years were measured. From these were selected children who were within ± 15 per cent. of both average height and average weight for their age and sex of Canadian children. About 2/3 met these standards. These observations were the basic data. Other values presented were obtained from the literature or computed from the basic data from relationships established in the literature; they were surface area, blood volume, total Hb, total Fe in Hb, total energy expenditure per hr., and ratios of total Hb to total energy expenditure per hr. and of oxygen available per hr. to oxygen expenditure.

In boys the ratio of Hb to energy expenditure increased from 2·4 at age 6 to 4·6 at age 17. In girls the ratio increased from 2·5 at age 6 to 3·4 at age 12 to 17.

Estimated metabolic Fe requirements, based on yearly increment and yearly loss, are tabulated by age and sex. In general Fe requirement of boys and girls increased with age up to puberty. Requirements of boys aged 13 to 15 exceeded those of girls of the same age in spite of menstrual losses in the girls.—F. C. Aitken.

3151

Walker, A. R. P., Fletcher, D. C., Reynolds, P. A., Bersohn, I. and Sonnenfeld, E. D.

Reduction to normal levels of the high erythrocyte sedimentation-rates in apparently healthy South African Bantu men. *Nature*, 1956, **177**, 480–481. [Human Biochem. Res. Unit, S. African Inst. Med. Res., Johannesburg.]

In African mine-workers the mean red cell sedimentation rate (Wintrobe) was lower, comparable with normal values, in those who had been in employment for from 4 to 15 months than in others at the beginning of their service. For groups of different origin with, in brackets, the number of subjects the values at the beginning of service were: Shangaans (75) $11{\cdot}5 \pm 11$, Pondos and Xosas (47) 12 ± 9 and a tropical group (75) 29 ± 10 mm.; the corresponding values after the period were (25) $3{\cdot}5 \pm 2{\cdot}5$, (31) $3{\cdot}0 \pm 2{\cdot}5$, (30) $3{\cdot}5 \pm 4{\cdot}0$ mm. For a mixed group of 15 who were all studied both on arrival and after service the values were 16 ± 11 and $3{\cdot}0 \pm 2{\cdot}5$ mm.

By the common biochemical tests many showed liver dysfunction, but no explanation can be offered. It is thought that the change may be nutritional in origin, since the diet supplied by the mining companies is much better than that which the Africans are accustomed to in their homes.

D. Harvey.

3152

MacDonald, M. A., Krueger, H. and Bogart, R. **Rate of efficiency of gains in beef cattle. 4. Blood hemoglobin, glucose, urea, amino acid nitrogen, creatinine, and uric acid of growing Hereford and Angus calves.** *Oregon Agric. Exp. Stat. Tech. Bull.* No. 36, January 1956, pp. 34.

For part 3 see Abst. 5801, Vol. 25.

The chemical composition of the blood of 45 male and female calves of the 2 breeds was studied. A pelleted ration consisting of 2 parts alfalfa and 1 part concentrates was given from 500 to 800 lb. liveweight. Blood samples were taken at each weight. Data are presented in tables for blood sugar, Hb, urea N, amino N, creatinine and uric acid.—J. N. Aitken.

3153

Gelineo, A., Raievskaia, T. and Gelineo, S. La concentration d'hémoglobine dans le sang chez quelques oiseaux. [**Haemoglobin concentration in the blood of some birds.**] *C.R. Soc. Biol.*, 1955, **149**, 1411–1413. [Lab. Biol. Méd., Fac. Méd., Paris.]

In 13 species of birds found in Jugoslavia the average Hb value was found to be 13·3 g. per 100 ml. It was higher for the wild species, average 13·5 g. per 100 ml., than for the domestic species, 11·2 g., and higher in male than in female birds.

G. F. Garton.

3154

Tanaka, T. and Rosenberg, M. M. **Effect of testosterone and dienestrol diacetate on hemoglobin levels of cockerels and capons.** *Poultry Sci.*, 1955, **34**, 1429–1437. [Dept. Poultry Husb., Univ. Hawaii, Honolulu.]

3155

Thompson, M. D. **The serum protein pattern of African infants in Uganda.** *Trans. Roy. Soc. Trop. Med. Hyg.*, 1956, **50**, 77–81. [Mulago Hosp., Uganda.]

Data are tabulated for total protein, albumin and 4 globulin fractions for 120 estimations on samples of blood from 110 African infants in Uganda, all of whom had been exposed to malaria and among whom the proved incidence was 79 per cent. The mean values with standard deviations and ranges are given for the first month of age, for months 2 and 3 and thereafter at 3-monthly intervals and for the period 12 to 18 months. Frequency of sickling trait is also recorded.

The pattern of proteins in the first month is the same in Uganda as it is at birth in Europe and the United States and, as happens in these countries, there are changes during the first 9 months of age. In Uganda these changes give an adult pattern different from that in Europe and the United States (see Abst. 559, Vol. 26). The present work forms the basis of a study, now in progress, of the effects of protection from malaria.—D. Harvey.

3156

Yoshida, H. **Electrophoresis of sera of breast-fed infants and its relation to nutritional dystrophy of their mothers. Studies on the nutrition of children in Hirosaki area (22nd report).** *Tohoku J. Exp. Med.*, 1955, **63**, 69–79. [Dept. Paediat., Sch. Med., Hirosaki Univ.]

For earlier work see Abst. 4477, Vol. 23.

Estimations of total protein and electrophoretic analyses were made on sera from 101 infants in 6 groups. For 32 infants aged from 1 to 12 months, breast-fed by mothers without nutritional dystrophy, mean values were; total protein 6·05 g. per 100 ml., percentage distribution albumin 58·5, α-globulin 15·3, β-globulin 15·1, γ-globulin 10·9. For 18 infants of the same age and also breast-fed but by mothers with signs of nutritional dystrophy, corresponding average data were 6·40 g. and 50·5, 17·4, 16·0 and 15·9 per cent. For 25 infants aged from 13 to 24 months, partly artificially fed on food rich in carbohydrate and partly breast-fed by mothers without nutritional dystrophy, average data were 6·49 g. and 53·6, 16·3, 14·7 and 15·3 per cent.; for 6 infants aged from 16 to 24 months fed like these by mothers with nutritional dystrophy, 6·96 g. and 48·4, 19·2, 16·0 and 16·4 per cent. For

12 infants aged from 6 to 21 months and undernourished but without signs of disease, averages were 6·28 g. and 55·3, 14·5, 15·3 and 14·8 per cent. and for 8 infants aged from 3 to 20 months who had been breast fed for only a few months, of whom 5 had nutritional dystrophy and among whose mothers 4 were affected, 5·92 g. and 48·1, 15·3, 14·8 and 20·3 per cent. The findings are compared with those by Karte for German infants (Abst. 601, Vol. 24).

Children wholly breast-fed do not show signs of nutritional dystrophy, but in the blood of those whose mothers have the disease the electrophoretic pattern, with its fall in albumin and rise in γ-globulin, resembles that in children in whom the disease is clinically apparent.—D. Harvey.

3157

CHOREMIS, C. and MOSCHIDIS, C. **Paper electrophoresis of serum proteins in infantile toxicosis.** *Acta paediat.*, 1956, **45**, 24–31. [Paediat. Clin., Univ. Athens.] French, German and Spanish summaries.

3158

MOGGI, P. and FRANCALANCIA, L. Fisiopatologia dei polisaccaridi legati alle proteine seriche nell'infanzia. [**Physiology and pathology of the polysaccharides bound to serum proteins in infancy.**] *Riv. Clin. pediat.*, 1955, **56**, 573–595. [Clin. Pediat., Univ. Florence.] English and French summaries.

Several methods for estimating polysaccharides were tested, and that of Dische (*Mikrochemie*, 1929, **1**, 33) with carbazole was selected. Polysaccharides and total protein were estimated in the blood serum of 55 healthy infants and children of all ages up to 12 years, of 13 premature infants and of 90 subjects with different diseases, and in the cord blood of 6 newborn infants and in the blood of their mothers. At ages from birth to 6 months, the mean values were for total protein 6·1 g. per cent. and for polysaccharides 97·1 mg. per cent., and at from 8 to 12 years the corresponding values were 6·82 and 109·8. Both values increased gradually with age so that the ratio between them remained almost constant.

E. M. Hume.

3159

LIDDELOW, B. **Serum protein levels in normal non-pregnant and pregnant women.** *Med. J. Austral.*, 1953, ii, 332–334. [Dept. Pathol., Women's Hosp., Melbourne.]

Serum protein estimations, based on total Kjeldahl N, were made each month on from 20 to 25 normal pregnant women. Normal values for non-pregnant women were obtained from 23 blood donors of child-bearing age ; the mean value was 7·04 g. per 100 ml. The average values for the pregnant women were lower than those previously reported in the literature, possibly owing to differences in environment and diet. For the last 7 months of pregnancy the mean was below 6·5 g. per 100 ml. There was a progressive decline up to the eighth month, and then a small rise in the ninth month. Values previously reported in the literature showed the same trends but at a higher level. Large differences between the maximum and minimum values for each month emphasised the doubtful clinical importance of a slightly low serum protein value during pregnancy.

M. H. Pierce.

3160

POIDEVIN, L. O. S. **Preliminary report on amino acids and serum protein variations throughout pregnancy.** *Med. J. Austral.*, 1954, i, 105–107. [Univ. Adelaide.]

A group of over 100 pregnant women, including nearly equal numbers of primiparae and multiparae, was divided into those in whom pregnancy was normal with or without previous history of toxaemia, or in whom toxaemia was present in the current pregnancy. Samples of urine and blood were collected in the morning 5 times during pregnancy, in the labour ward, and 6 weeks after delivery. Amino acids were estimated by chromatography, a number being assigned to each spot according to the depth of colour produced with ninhydrin. Serum proteins were studied by paper electrophoresis. Normal values were obtained from non-pregnant healthy women of the same age group.

The amino acid content of the urine rose, and that of the serum fell, during the third trimester in both normal and toxaemic pregnancies, possibly owing to a fall in renal threshold. There was a general fall of total serum protein throughout both types of pregnancy, owing mainly to a fall of albumin, which was greater in toxaemic pregnancies. In normal pregnancies there was an increase of α_1-, α_2- and β-globulin and a decrease of γ-globulin. In toxaemic pregnancies the increase of α_1-globulin was greater and the decrease of γ-globulin less.—M. H. Pierce.

3161

ANDREU URRA, J. and RIVERO FONTÁN, J. L. Las proteinas del plasma en las colagenosis. [**Plasma proteins in collagen diseases.**] *Rev. clín. española*, 1955, **59**, 153–156. [1. Clín. Méd., Univ. Seville.] English, German and French summaries.

Serum total protein was within normal limits in 3 patients with generalised and one with localised scleroderma. Two of those with generalised scleroderma had low serum albumin and high γ-globulin ; the third showed falls in albumin and

γ-globulin after treatment with adrenocorticotropic hormone. A patient with Libman Sacks disease had low albumin and high γ-globulin, but one with chronic lupus erythematosus had normal serum proteins, and in one with dermatomyositis the changes were small. Six estimations in 15 months on serum from a patient with Weber Christian disease or recurrent febrile nodular panniculitis showed fluctuations with treatment. It is concluded that abnormal serum protein levels in collagen diseases are a result and not a cause of the diseases.—D. Duncan.

3162

BELEN'KII, N. G., KRYLOVA, N. N., CHERTKOV, I. L. and ZUEVA, L. D. Izuchenie tzirkulyatzii v organizme belkov lechebnoi syvorotki s pomoshch'yu radioioda (I 131). [**A study of the circulation of the proteins of medicinal serum with the help of radio-iodine (^{131}I).**] *Dokl. Vses. Akad. Sel'skokhoz. Nauk V.I. Lenina*, 1955, No. 4, 34–36.

Blood serum proteins of dog and rabbit were labelled with ^{131}I by incubation of serum for 24 hr. with labelled KI, after which free I was removed by dialysis against tap water and the proteins were incorporated into fresh serum. The labelled serum was given intravenously to 9 rabbits in doses of from 3 to 10 ml. per kg. bodyweight, and the radio-activity of blood samples was estimated after 1, 10 and 30 min. and 1, 2, 3, 24, 48 and 96 hr. A third of the labelled protein remained in the circulation 3 hr. after the injection and 10 per cent. was still present after 4 days. In 5 rabbits killed 96 hr. after the injection, there were individual differences in the distribution of radioactivity among the organs, but high concentrations were found most often in the lungs, liver and kidney.

Labelled serum was given by vein to 2 dogs in doses of 11 and 13 ml. per kg. bodyweight and the radio-activity of blood samples was estimated 5 min. and 1, 3, 6, 24 and 48 hr. later. After 6 hr. 70 per cent. of the ^{131}I injected was still in the circulation, and 30 per cent. after 48 hr. The dogs were then killed and the greatest amounts of radioactivity were found in the lungs, liver and spleen, all organs which have an active part in metabolism of proteins.

The rate of removal of injected proteins from the circulation is thought to be about the same in man as in the dog.—H. Scherbatoff.

3163

COHEN, S., HOLLOWAY, R. C., MATTHEWS, C. and MCFARLANE, A. S. **Distribution and elimination of ^{131}I- and ^{14}C-labelled plasma proteins in the rabbit.** *Biochem. J.*, 1956, **62,** 143–154. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

The rate of elimination of protein labelled with ^{131}I and its distribution between intra- and extravascular pools varied considerably in rabbits given labelled protein intravenously. This was due more to variation between animals than to differences in the labelled protein. Homologous and autogenous plasma were indistinguishable in this respect.

When plasma proteins were labelled with ^{131}I or ^{14}C equilibration times were similar. Plasma specific activity declined exponentially during the 3 to 4 weeks of the experiment and fibrinogen, globulin and albumin were eliminated in that order of decreasing rate. The biological half-lives of plasma proteins were similar when measured with ^{131}I or ^{14}C. ^{131}I detached from plasma protein was rapidly excreted in the urine and provided an accurate measure of the rate of elimination of protein.

It is concluded that the distribution and elimination of albumin and globulin *in vivo* as estimated with plasma labelled with ^{131}I was similar to that of proteins labelled with ^{14}C.—A. Hepburn.

3164

IYER, G. Y. N. **Plasma amino acids in anaemia.** *Indian J. Med. Res.*, 1956, **44,** 29–30. [Med. Coll., Trivandrum.]

Ten amino acids were estimated in the fasting blood plasma of 50 patients with anaemia of the hypochromic type. Only glycine was found to be significantly higher than in the plasma of normal subjects.—J. S. Thomson.

3165

QUINCKE, E. Vergleichende Messung der Konzentrationen des freien Methionins im Serum und in der Leber von Kaninchen. [**Comparative measurements of the concentration of free methionine in serum and liver of rabbits.**] *Biochem. Ztschr.*, 1956, **327,** 383–392. [Med. Klin., Univ. Cologne.]

Four normal rabbits fasted for 12 hr. each received intravenously 100 μg. L-methionine labelled with from 0·5 to 2·4 mC of ^{35}S; this dose represents less than 1 per cent. of the total free methionine in the body. After 1 or 1½ hr. the chest was opened under ether narcosis and 80 ml. blood was obtained by heart puncture, and then the liver was quickly removed and freeze-dried. Specific activity and ^{35}S activity of free methionine in serum and liver fluid were estimated by an indirect method.

The concentration of free methionine in serum and in liver fluid was nearly the same.

The method, which is described, is supposed to avoid errors occurring in direct estimation and especially enzymic liberation of methionine from liver proteins.—D. Duncan.

3166

LANCET, M. and FISHER, I. L. **The value of blood uric acid levels in toxaemia of pregnancy.** *J. Obstet. Gynaecol. Brit. Empire*, 1956, **63,** 116–119. [Dept. Obstet. Gynaecol., Hadassah Municip. Hosp., Tel Aviv.]

The blood uric acid level was found to be raised in pre-eclampsia proportionately to the severity of the condition. It is not raised in idiopathic hypertension. [The biochemical methods used are not described.]—A. M. Thomson.

3167

BAKER, R. W. R., JOINER, C. L. and TROUNCE, J. R. **A study by paper electrophoresis of the serum-lipoproteins in diabetic and non-diabetic subjects.** *Quart. J. Med.*, 1955, **24,** 295–305. [Diabetic Clin., Guy's Hosp., London.]

3168

RAFSTEDT, S. **Studies on serum lipids and lipoproteins in infancy and childhood.** *Acta paediat.*, 1955, **44,** 589–592.

See Abst. 5090, Vol. 25.

3169

CIPOLLONI, C. and PACI, A. La lipemia nel lattante in condizioni fisiologiche. [**Blood lipids in the infant under physiological conditions.**] *Riv. Clin. pediat.*, 1955, **56,** 366–377. [Ist. Clin. Pediat., Univ. Pisa.] English and French summaries.

Total lipids, phosphatides, glycerides and 2 steroid fractions, one giving the Liebermann Burchard reaction and not precipitated by digitonin, and the other precipitated by digitonin, were estimated in the blood plasma of 35 infants between 3 and 12 months of age, breast-fed or artificially fed. Blood samples were taken 6 hr. after the last meal. All the values are tabulated. There were wide variations. The mean values in mg. per cent. were for total lipids 515 with range 363 to 642, phosphatides 188, 124 to 285, glycerides 104, 64 to 194 and total steroids 128, 70 to 181. There was no difference between the values for breast-fed and artificially fed infants.

E. M. Hume.

3170

PATERSON, J. C., CORNISH, B. R. and ARMSTRONG, E. C. **The serum lipids in human atherosclerosis. An interim report.** *Circulation*, 1956, **13,** 224–234. [Clin. Invest. Unit, Westminster Hosp., London, Ont.] Interlingua summary.

Serum lipids were estimated serially in 800 patients permanently confined to hospital, of whom some 550 were over 50 years of age. Chemical and morphological examinations were made on arterial tissue in 50 post-mortem studies and the degree of atherosclerosis was estimated.

Only increases in the cholesterol : phospholipin ratio and, possibly, the Sf 0–12 class of lipoproteins showed any relation to atherosclerosis.

The difficulty of assessing the severity of atherosclerosis in post-mortem material is discussed.

A. K. Lough.

3171

EVANS, J. D., WALDRON, J. M., OLEKSYSHYN, N. L. and RIEMENSCHNEIDER, R. W. **Polyunsaturated fatty acids in normal human blood.** *J. Biol. Chem.*, 1956, **218,** 255–259. [Sch. Med., Temple Univ., Philadelphia, Pa.]

Blood samples were taken from the antecubital vein of 7 young men and separated into cells and plasma, the polyunsaturated fatty acid content of each of which was estimated by the method of Herb and Riemenschneider (Abst. 66, Vol. 24).

Although the I value of plasma lipids and cell lipids was of the same order of magnitude, average 108 and 101, respectively, the percentage distribution of individual fatty acids was characteristically different. The average proportion of each acid, expressed as a percentage of the total fatty acids in plasma and cells, was: linoleic 25·0 and 7·84, linolenic 1·14 and nil, arachidonic 7·14 and 13·1, pentaenoic 1·45 and 2·87, hexaenoic 2·32 and 4·11.

G. A. Garton.

3172

KEYS, A., ANDERSON, J. T. and MICKELSEN, O. **Serum cholesterol in men in basal and non-basal states.** *Science*, 1956, **123,** 29. [Lab. Physiol. Hyg., Sch. Pub. Health, Univ. Minnesota, Minneapolis.]

Serum cholesterol was estimated in healthy men in the basal fasting state and 2, 3, 4 and 7 hr. after an ordinary breakfast or one including cholesterol emulsified in scrambled egg. During the test the men were either relatively inactive or doing moderately vigorous work on the treadmill or gardening. In the inactive subjects, serum cholesterol rose after the meal; in the active it was unaltered or fell. The rise in terms of total cholesterol in blood in 2 series of tests was greater than all the cholesterol in the meal. The rise is interpreted as an increase of lipoprotein to meet the demand for transport of newly absorbed fat. During exercise the rise in rate of blood flow and removal of nutrients to meet the increased needs explains the absence of a rise of lipoprotein and so of cholesterol.

The difference between basal and non-basal levels is so small as to be unimportant in comparative studies, especially of active subjects, but may explain part of the difference in susceptibility to coronary disease between active and sedentary subjects.—I. Leitch.

3173

MICHALEC, Č. **The nature of cholesterol esters in human blood serum.** *Biochim. biophys. Acta*, 1956, **19**, 187–188. [Central Biochem. Labs., Univ. Hosp., Prague.]

Cholesterol and cholesteryl esters from human blood serum were separated by paper chromatography as described earlier (Abst. 1439, Vol. 26). Paper chromatography of the component fatty acids of the esters on Whatman No. 3 paper impregnated with 10 per cent. (v/v) paraffin oil in ether and acetic acid as the mobile phase indicated the presence of palmitic, oleic and linoleic acids.

G. A. Garton.

3174

BRUCK, E. and WEINTRAUB, D. H. **Serum calcium and phosphorus in premature and full-term infants. A longitudinal study in the first three weeks of life.** *Amer. J. Dis. Child.*, 1955, **90**, 653–668. [Statler Res. Labs., Child. Hosp., Buffalo, N.Y.]

Serum Ca, inorganic P, phosphatase and K, and blood and serum *p*H and CO_2 were estimated in samples taken before the first feed and at intervals during the first 3 weeks of life from 51 premature and 21 term infants; the cord blood of 41 of the infants was examined. The feeds for the premature infants consisted of an Alacta preparation, evaporated milk, human milk or mixed or alternating human and cow's milk; all received 1250 "units" vitamin D daily in calciferol and 50 mg. ascorbic acid, starting on the eighth day of life. The feeds for the term infants consisted of whole cow's milk, human milk, or mixed or alternating human and cow's milk; no vitamin supplement was given except to one sick infant.

Serum Ca was, in general, considerably lower and fluctuated more widely in the premature than in the term infants. The lowest Ca level recorded was before the infant was fed; the longer the fast the lower, in general, the serum Ca. There was no significant difference between premature and term infants in serum inorganic P; when fasting was prolonged for more than 36 hr. or when cow's milk was given the P level rose, but after human milk it fell. In 69 per cent. of the intervals between the taking of blood samples from each individual infant the Ca level rose whether the P rose or fell; in 31 per cent. the Ca level fell, usually with a rising P level. In individual infants the curves of Ca and P ran parallel as often as in opposite directions. When the infants were fed on human milk, serum Ca consistently rose; serum P rose in about one-third and fell in two-thirds of the infants. When cow's milk was given, Ca rose in 60 per cent. and fell in 40 per cent. of the infants; P rose in 73 per cent. and fell in 27 per cent. The mean Ca and the mean P on cow's milk were higher than before feeding. The serum phosphatase levels were not indicative of rickets. The minimum Ca level attained was not related to birthweight within the range between 1400 and 2500 g. The rate of growth during the sampling period could not be evaluated from the weight gain and could not be correlated with serum Ca values. The Ca and P levels in cord blood showed no relation to the subsequent values. Few of the premature infants with low serum Ca had any commonly recognised sign of tetany. The correlation of these signs with the Ca level at the time of observation was not significant statistically. In 6 infants who were ill with other diseases serum Ca was below 8 mg. per 100 ml. Three infants died; all had signs and serum Ca levels of tetany. The *p*H and K levels had no statistically significant effect on the presence or absence of signs of tetany in patients with low serum Ca.

G. F. Garton.

3175

DAS GUPTA, S. K. and SINGH, M. **Studies on serum sodium and potassium levels and on the twenty-four hours' urinary excretion of 17-ketosteroids in healthy adults.** *Indian J. Med. Res.*, 1956, **44**, 31–36. [Dept. Biochem., Med. Coll., Amritsar.]

Average serum Na in 15 healthy men in the Punjab was 326 $\pm$ 3 mg. and in 17 women 323 $\pm$ 1 mg. per 100 ml. Corresponding figures for K were 19·2 $\pm$ 0·3 and 18·3 $\pm$ 0·2 mg. per 100 ml. Excretion of 17-ketosteroids was 16·94 $\pm$ 0·91 and 8·56 $\pm$ 0·75 mg. daily, respectively.

J. S. Thomson.

3176

HASHIMOTO, T. **Protein-bound iodine levels in children with nutritional dystrophy. Studies on the nutrition of children in Hirosaki area (26th report).** *Tohoku J. Exp. Med.*, 1955, **63**, 103–107. [Dept. Paediat., Sch. Med., Hirosaki Univ.]

Protein-bound I (PBI) of sera from children with nutritional dystrophy was estimated. The average PBI in the sera of 8 healthy children was 6·04 μg. per cent. $\pm$ 0·89. The 35 boys from 8 to 10 years old with nutritional dystrophy were divided into 2 groups according to the severity of the clinical signs. In 11 of the 21 boys more severely affected and in 2 of the 14 others, PBI was below 4 μg. per cent. As very low serum albumin has been found in children with nutritional dystrophy, low PBI may be evidence of depressed thyroid function or of low serum albumin; this is to be the subject of further investigation.

B. W. Simpson.

3177

PALACIOS MATEOS, J. M. Valor clinico de la determinacion simultanea de cobre y hierro en el suero. [**Clinical value of simultaneous estimation of copper and iron in serum.**] *Rev.*

clín. española, 1955, **59**, 78–82. [Inst. Invest. Méd., Madrid.] English, German and French summaries.

Fe and Cu were estimated simultaneously in serum from 15 normal subjects, 9 men and 6 women, and from 47 patients with a variety of disorders.

Mean values, in μg. per 100 ml., were for the normal subjects Fe 139·3 and Cu 137·5; for men 140·7 and 126·0, for women 138·0 and 149·0. In epidemic hepatitis the mean values for 10 patients were 252·3 and 172·8, *i.e.*, a large increase in Fe and a moderate increase in Cu. Seven subjects with cirrhosis had means of 168·2 and 277·8, a moderate increase in Fe and a large increase in Cu. In 3 patients with obstructive jaundice both Fe and Cu were normal. In 3 with haemochromatosis both values were high, 210 and 337·6. Cu was very low, mean 61·3, in 3 patients with Wilson's disease. Values are given for several other disorders.

It is suggested that such analyses have a clinical value, *e.g.*, in differential diagnosis of the 3 liver disorders named.—D. Duncan.

See also Absts. 2678, 2693, 2730, 2777, 2782, 3114, 3179, 3243, 3262, 3303, 3315, 3456, 3469, 3478, 3479.

LYMPH, CEREBROSPINAL FLUID, ETC.

3178

HUISMAN, T. H. J. Onderzoek naar het gehalte aan verschillende aminozuren van de liquor cerebrospinalis. [**Study of the amount of different amino acids in cerebrospinal fluid.**] *Nederland. Tijdschr. Geneesk.*, 1955, **99**, 3357–3361. [Kinderklin., Acad. Ziekenhuis, Groningen.] English summary.

Amino acids in human urine, plasma ultrafiltrate and cerebrospinal fluid ultrafiltrate were compared by chromatographic methods. Most of the amino acids found in plasma were present in the cerebrospinal fluid in concentrations of 1 mg. per litre or less. Glutamine and glutamic acid alone were in much higher concentrations than in plasma. It is concluded that cerebrospinal fluid is not derived from plasma by simple filtration, but that there is a selective barrier, probably in the choroid plexus. The possible significance of the high concentration of glutamic acid is discussed briefly.—D. Duncan.

3179

GIUSTI, M. I livelli emato-liquorali del Ca, P e K in condizioni normali e patologiche, con particolare riguardo alla spasmofilia. [**Concentration of Ca, P and K in the blood and cerebrospinal fluid in normal and pathological conditions, especially in relation to spasmophilia.**] *Riv. Clin. pediat.*, 1955, **56**, 49–72. [Clin. Pediat., Univ. Florence.] English and French summaries.

3180

FRIEDMAN, A. and LEVINSON, A. **Cerebrospinal fluid inorganic phosphorus in normal and pathologic conditions.** *Arch. Neurol. Psychiat., Chicago*, 1955, **74**, 424 – 440. [Julian D. Levinson Res. Found., Chicago, Ill.]

3181

ALPERS, J. B. and RALL, J. E. **The metabolism of iodine in cerebrospinal fluid.** *J. Clin. Endocrinol.*, 1955, **15**, 1482–1498. [Sloan-Kettering Inst., New York.]

3182

ANTONINI, E., CASORATI, V. and CRIFÒ, S. Amino-acidi della perilinfa. [**Amino acids of perilymph.**] *Experientia*, 1955, **11**, 496–497. [Inst. Chim. Biol., Univ. Rome.]

Perilymph was obtained from young horses 15 to 30 min. after death; it was collected with a capillary pipette through the fenestra rotunda, and each ear yielded 0·015 to 0·025 ml. Samples of blood and cerebrospinal fluid were taken from the same horses. Two-dimensional chromatography on paper permitted identification of amino acids.

Aspartic acid, glutamic acid, phosphocolamine, glycine, serine, taurine, threonine, alanine, glutamine, lysine, arginine, γ-aminobutyric acid, proline, valine, leucine, tyrosine and phenylalanine were identified. The composition was much more like that of blood than that of cerebrospinal fluid.

D. Duncan.

3183

FREEMAN, T. and JOEKES, A. M. **Differential protein pattern in serum and oedema fluid in patients with various causes of oedema.** *Acta med. scand.*, 1956, **153**, 243–252. [St. Mary's Hosp., London, W.2.]

Protein fractionation was by filter paper electrophoresis. Data presented showed in most of the 14 subjects a higher relative concentration of albumin as percentage of total protein in oedema fluid than in serum.—F. C. Aitken.

3184

SCHWARTZ, I. L. and THAYSEN, J. H. **Excretion of sodium and potassium in human sweat.** *J. Clin. Invest.*, 1956, **35**, 114–120. [Hosp. Rockefeller Inst. Med. Res., New York.]

3185

GORE, J. T. **Factors influencing the physical and chemical properties of saliva.** *J. Dent. Res.*, 1956, **35**, 102–108. [Univ. Pennsylvania, Philadelphia.]

The concentration of carbohydrate in whole saliva collected during 24-hr. periods from the author on a restricted carbohydrate intake rose from 6 p.m. until 2 p.m. The concentration in parotid saliva remained low and fairly constant, but that in mandibular saliva, which was much greater, rose until 10 p.m. and remained high during the night. Single meals high in carbohydrate temporarily increased the concentration in the whole saliva. The rate of secretion of saliva declined until about 6 a.m., then increased sharply. The rate of secretion of mandibular was on the average less than that of parotid saliva.

These results and previous work (Absts. 513, 4747, Vol. 8; 2583, Vol. 13) seemed to indicate that a high-carbohydrate diet increased the carbohydrate concentration in whole saliva as well as the ratio of the rate of secretion of mandibular : parotid saliva, especially during the night.

The most reliable tests were made on saliva collected in the early morning after fasting. Smoking, talking, movement of the tongue, lips and cheeks and physical activity may increase the rate of secretion. The preparation of the mouth and the method of collecting saliva influence the chemical and physical properties of the saliva.

A. Hepburn.

See also Absts. 2687, 3146.

TISSUES

3186

McCance, R. A. and Widdowson, E. M. **The chemical structure of the body.** *Quart. J. Exp. Physiol.*, 1956, **41**, 1–17. [Med. Res. Counc. Dept. Exp. Med., Univ. Cambridge.]

This is the text of the Sharpey-Schafer Memorial Lecture given at Edinburgh University in October 1955 by Professor McCance.

The main part deals briefly with the effect of development and nutrition on the water, N, K and Na in the body.

During development the percentage of total and extracellular water in the body decreases and the N increases. The N : K ratio increases. Further work showed that K in the serum of man and pig decreased considerably from foetus to adult, but protein increased and Na also to a slighter extent. The N : K ratio increased similarly in human and pig muscle and also the N : P ratio; total and extracellular water decreased. Liver and heart cells altered similarly with development, but reached adult composition at a much earlier age. The composition of red cells did not appear to change.

Underfeeding leads to loss of fat and increase in the percentage of water, chiefly extracellular water, in the body. Muscles from cockerels undernourished from an early age were shown to contain more extracellular fluid than those of day-old chickens. Similar but smaller changes were produced by underfeeding at a later age. The N : K ratio in muscle from several species and in whole bodies was not affected by underfeeding and increased during development. Weanling rats fed on a low-protein diet of cassava and bananas such as that which produces kwashiorkor in African babies did not show a change in the N : K ratio in the muscles.—A. Hepburn.

3187

Trotter, M. and Peterson, R. R. **Ash weight of human skeletons in per cent. of their dry, fat-free weight.** *Anat. Rec.*, 1955, **123**, 341–358. [Dept. Anat., Sch. Med., Washington Univ., St. Louis, Mo.]

The long limb bones of 10 white men and the complete skeletons of 6 additional white men and 1 negro were available for study. The technique is described in detail and discussed. Tables are presented showing the ash weight as percentage of dry fat-free weight in the bones from each body.

The men ranged in age from 41 to 89 years. In long limb bones, but not in other bones, the percentage ash weight was slightly lower in older than in younger subjects. In 6 complete skeletons the total percentage of ash varied from 64·8 to 66·9; in the seventh the percentage was 54·5. In 2 complete skeletons the percentage of ash of all bones fell within close range of each other. In 5 skeletons there were bones with ash weights 5 per cent. or more below that of the complete skeleton.

F. C. Aitken.

3188

Walker, A. R. P., Strydom, E. S. P., Reynolds, P. A. and Grobbelaar, B. G. **The composition and density of thoracic vertebral bodies from South African Bantu adults habituated to a very high iron intake.** *S. African J. Lab. Clin. Med.*, 1955, **1**, 254–262. [Human Biochem. Res. Unit, S. African Inst. Med. Res., Johannesburg.]

For previous work see Abst. 1058, Vol. 24.

Vertebral bodies, mainly from the fifth thoracic vertebrae, were removed at consecutive post-mortem examinations from 77 Bantu and 11 European adults. The primary cause of death was not siderosis or osteoporosis.

The vertebrae from 31 Bantu found to have moderate siderosis and from 12 Bantu with severe siderosis, including 2 with collapsed vertebrae, contained on the average 433 $\pm$ 272 and 1430 $\pm$ 381 mg. per cent. Fe on a dry weight basis, compared with 33·4 $\pm$ 14 for the Europeans. Siderosis was not necessarily associated with low mineral density, as there was no apparent correlation between concentrations of Fe and of ash or Ca on either a percentage or a volume basis.

Siderosis is thought not to be the principal cause of collapse and osteoporosis of the vertebrae occasionally found in the adult Bantu.—A. Hepburn.

3189

CASTER, W. O., PONCELET, J., SIMON, A. B. and ARMSTRONG, W. D. **Tissue weights of the rat. 1. Normal values determined by dissection and chemical methods.**

CASTER, W. O. and ARMSTRONG, W. D. **2. Changes following 700 r total body x-irradiation.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 122–126; 126–129. [Dept. Physiol. Chem., Univ. Minnesota, Minneapolis.]

1. The data tabulated were obtained by a combination of partial dissection and chemical analysis. The procedure is described.

2. The loss of bodyweight after total body exposure to X-rays was due mainly to loss of muscle mass. The percentage of weight lost was greatest in spleen, thymus and marrow, but these tissues are too small to have an appreciable effect on change in total bodyweight.—F. C. Aitken.

3190

WATERLOW, J. C. and WEISZ, T. **The fat, protein and nucleic acid content of the liver in malnourished human infants.** *J. Clin. Invest.*, 1956, **35,** 346–354. [Trop. Metabol. Res. Unit, Med. Res. Counc., Jamaica, B.W.I.]

Liver samples obtained by biopsy from 12 severely undernourished infants with fatty livers showed a great excess of fat, a slight but doubtful increase of water and a high glycogen content. The protein and ribonucleic acid contents of the biopsy specimens were measured and related to deoxyribonucleic acid. These measurements were made soon after the infants were admitted to hospital and were repeated after one or 2 months; on admission the babies were put on a diet of diluted skimmed milk calculated to provide about 8 g. protein daily, but after biopsy the strength of the milk mixture was increased by stages until an intake of 2 to 3 pints of cow's milk daily had been achieved; supplementary foods were then given. When it was assumed that the deoxyribonucleic acid content per cell and per liver remains constant, the results showed that at the time of admission the infants had on the average lost 40 per cent. of their liver protein and ribonucleic acid. Evidence suggesting that the assumption of constant deoxyribonucleic acid is not valid in this study is discussed; the errors introduced by the assumption tended to decrease, rather than to exaggerate, the differences found between biopsies before and after treatment. It is concluded that measurements of this type give useful statistical information about a group of subjects, but are of little value as a guide to the state of an individual.—G. F. Garton.

3191

BRÜCKEL, K. W. and PIETZONKA, H. Über den Fett- und Eisengehalt der Leber. [**The fat and iron content of the liver.**] *Klin. Wochenschr.*, 1956, **34,** 102–103. [Städt. Krankenhaus, Stuttgart, Bad Cannstatt.]

Estimation of the fat and iron content of liver material obtained by biopsy from 25 men and 12 women showed that in moderately or severely fatty livers the Fe content was generally low, and in specimens showing siderosis the fat content was usually low.—L. Wills.

3192

BRÜCKEL, K. W., PIETZONKA, H. and PFEILSTICKER, K. Zur Klinik und Histochemie des Eisenstoffwechsels der Leber. [**Clinical importance and histochemistry of iron metabolism in the liver.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 132–135. [Städt. Krankenhaus, Stuttgart, Bad Cannstatt.]

After a discussion of the significance of serum Fe in diagnosis, material obtained at liver biopsy or immediately after death from 32 [number deduced from diagram] male and 23 female patients, mostly with liver damage of one kind or another, is reported on. Siderin was demonstrated histochemically (see Brückel and Pietzonka, *Klin. Wochenschr.*, 1955, **33,** 1102 and preceding Abst.). The findings are shown in diagrams, with 4 degrees of Fe deposition and 4 degrees of fatty infiltration, and are discussed in detail. There tended to be 2 types of distribution of Fe, much siderin with low total Fe, especially in the final stages of cirrhosis, or high total Fe with little siderin. Siderin deposits were seldom found in women. In the authors' view, disturbance of Fe-protein metabolism in the liver and fatty infiltration are independent pathological processes.

W. M. Deans.

3193

RUSSELL, J. A. and BLOOM, W. L. **Extractable and residual glycogen in tissues of the rat.** *Amer. J. Physiol.*, 1955, **183,** 345–355. [Dept. Biochem., Div. Basic Sci., Emory Univ., Emory University, Ga.]

Tissues used were from young adult rats maintained on Purina laboratory chow. After extraction of liver and muscle samples with 10 per cent. trichloroacetic acid, the carbohydrate remaining in residues was liberated from the protein by digestion with hot concentrated alkali. This material had the properties of glycogen. The quantities of glycogen found in the residues from trichloroacetic acid extraction of muscle, heart, diaphragm and liver were in substantial agreement with the amounts of residual glycogen indicated by difference between total glycogen, obtained by alkali digestion, and extractable glycogen.

When muscle, heart or liver samples were extracted with tungstic, metaphosphoric or sulphosalicylic acid or by boiling followed by adjustment to *p*H 5 the same amounts of glycogen were obtained as when they were extracted with trichloroacetic acid ; extraction with water alone or with dilute H_2SO_4 yielded much larger proportions of the glycogen present. Precipitation of the proteins in the latter extracts was accompanied by removal of consistent quantities of glycogen with the protein.

Parallel estimations were made of total glycogen and glycogen extractable by trichloroacetic acid in the gastrocnemius muscle, heart, diaphragm and liver of rats in a variety of conditions. The proportion of extractable glycogen was not constant but varied in consistent manner with the amount of glycogen present. In muscle and heart and at higher concentrations of glycogen in liver and diaphragm, the extractable glycogen ran parallel to the total glycogen over a wide range of concentrations while the residual glycogen remained relatively constant in amount. With decreasing concentrations of glycogen in liver and diaphragm both fractions were diminished, but the extractable portion fell more rapidly than the residual, so that at extremely low concentrations very little of the glycogen was extractable with trichloroacetic acid. The residual or non-extractable glycogen of muscle and heart was susceptible to some extent to breakdown *in vivo* but appeared to be less labile than the extractable fraction.—G. F. Garton.

3194

CORSINI, F. Alcuni dati chimici sul fegato di cavie dopo inanizione. **[Some chemical data on the liver of guineapigs after starvation.]** *Boll. Soc. ital. Biol. sper.*, 1955, **31,** 578–579. [Ist. Clin. Pediat., Univ. Bologna.]

Three guineapigs were deprived of food until they died after 5 days. Their livers and those of 3 guineapigs not starved were analysed for N, P fractions and pentoses. In the starved guineapigs the non-precipitable N showed no difference, the precipitable N very little, the total acid-soluble P a decrease, the inorganic P a moderate increase, and the organic acid-soluble P a marked decrease. There was a great decrease in the amount of pentoses.—E. M. Hume.

3195

MAIBAUER, D. and HERKEN, H. Vorkommen und Anreicherung von Inosit und Inositderivaten in den Zellfraktionen von Gehirn und Leber. **[Occurrence and accumulation of inositol and inositol derivatives in cell fractions of brain and liver.]** *Arch. exp. Pathol. Pharmakol.*, 1956, **227,** 456–466. [Pharmakol. Inst., Freie Univ., Berlin.]

Meso-inositol was estimated with *Saccharomyces carlsbergensis* 4228 ATCC 9080 by an adaptation of the method of Atkin *et al.* (György, Title 1253, Vol. 20).

When slices of organs, mostly from rats and mice but sometimes from rabbits and cats, were incubated aerobically or anaerobically for 1½ to 2 hr. at 37° C. in Ringer solution with phosphate buffer and glucose in a Warburg apparatus, brain and ganglia of the sympathetic nervous system gave up from 2 to 4·4 μg. inositol per mg. dry weight to the medium, but liver, pancreas and thyroid gave none. Subsequent hydrolysis of brain slices with HCl yielded a further 3 μg. inositol, in agreement with the results of Taylor and McKibbin (Abst. 4423, Vol. 23) ; but their different method apparently did not include the readily available fraction, so that the total amount of inositol in the central nervous system is higher than has hitherto been recorded.

Cell fractions from liver and brain of rats were then investigated. Nuclei, mitochondria, microsomes and cell plasma from liver all contained inositol, but free inositol was found only in the cell plasma. Cell plasma from brain contained 10 times as much as that from liver and 100 times as much as blood serum, and considerable amounts, both free and bound, were found in the other brain cell fractions.

The results are discussed with reference to the role of inositol in the metabolism of brain phospholipins and in the functioning of nerve cells.
W. M. Deans.

3196

DEL VECCHIO, A., KEYS, A. and ANDERSON, J. T. **Concentration and distribution of cholesterol in muscle and adipose tissue.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 449–451. [Lab. Physiol. Hyg., Univ. Minnesota.]

Cholesterol was estimated in muscle and in adipose tissue which had been separated by dissection from beef, veal, pork, sucking pig, mutton, lamb, chicken, rabbit and human abdominal wall.

The cholesterol content of muscle tissue, apart from associated fat, in all adult mammals studied and in the dark flesh of chickens was 40 to 50 mg. per 100 g. Higher values, 113 mg. and 138 mg. per 100 g., were found for 2 elderly human subjects aged 65 and 67 ; white meat of chickens contained about 30 mg. cholesterol per 100 g.

A general tendency was for muscle cholesterol to be considerably higher in young, growing animals than in adults of the same species. The cholesterol content of adipose tissue was always greater than that of the corresponding muscle, and was also more variable.—G. A. Garton.

3197

DEL VECCHIO, A., KEYS, A. and ANDERSON, J. T. Sull'esistenza di complessi lipoproteici nel tessuto muscolare. [**Lipoprotein complexes in muscular tissue.**] *Arch. Sci. biol., Bologna,* 1955, **39,** 705–710. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

A dry preparation of myosin from the muscle of a rabbit contained some lipids, including cholesterol. The close similarity in concentration of cholesterol obtained from 2 preparations suggested that the cholesterol exists as a lipoprotein complex with the myosin.—D. Duncan.

3198

CHEEK, D. B. and WEST, C. D. (with GOLDEN, C. C. and DOYLE, E. M.) **An appraisal of methods of tissue chloride analysis : the total carcass chloride, exchangeable chloride, potassium and water of the rat.** *J. Clin. Invest.*, 1955, **34,** 1744–1755. [Child. Hosp. Res. Found., Cincinnati, Ohio.]

Blood samples were taken from 45 rats after intramuscular injection of NaBr. The rats were then killed and the dried fat-free carcases were ground and analysed for total chloride by 3 methods : the open Carius method with digestion of the tissue at 104° to 105° C. by boiling on a hot-plate, or at 96° to 97° C. by immersion in boiling water, and an alkaline ash procedure with estimation of Cl by the micro-diffusion method of Conway. The last method gave the most reproducible results and the best recovery of added chloride. Values obtained by digestion on a hot-plate were frequently low. The temperature during digestion appeared to be important.

The exchangeable Cl estimated from the volume of distribution of Br in the serum was nearly equal to the total carcase Cl. Neither was appreciably affected by the substitution of isotonic saline for drinking water in the diet.

Total body Cl, water and K bore a simple linear relation to lean body mass.—A. Hepburn.

3199

PORTER, H. and ADAMS, R. D. **The copper content of brain and liver in hepatic encephalopathy.** *J. Neuropathol. Exp. Neurol.*, 1956, **15,** 61–64. [Neurol. Serv., Massachusetts Gen. Hosp., Boston.]

In 11 subjects who had died in coma associated with liver disease there was no consistent increase of total Cu content of liver or brain tissue.

D. Duncan.

3200

FRANÇOIS, J., RABAEY, M. and DENUCÉ, J. M. Étude des acides aminés de l'alpha-crystalline pure par la chromatographie sur papier. [**Amino acids of pure α-crystallin studied by paper chromatography.**] *Ann. Oculist.*, 1956, **189,** 103–120. [Clin. Ophthalmol., Univ. Ghent.] English summary.

3201

FRANCIS, C. M. **Lipids in the retina.** *J. Comp. Neurol.*, 1955, **103,** 355–381. [Med. Coll., Trivandrum, India.]

3202

BURNETT, G. W. and LOBENE, R. R. **Studies of the composition of teeth. 2. Spectrochemical analysis of enamel and dentin from Syrian hamsters.** *J. Dent. Res.*, 1955, **34,** 814–819. [Dept. Dent. Res., Dent. Div., Army Med. Serv. Grad. Sch., Washington, D.C.]

For part 1 see Title 662, Vol. 25.

The results of spectrographical analysis of the total ash of dentine and enamel from incisor and molar teeth of hamsters for 34 elements are tabulated, with conversion factors for whole tissue. Apart from Ca and P, only Fe, Mg [wrongly given as Mn in summary] and Na exceeded 0·1 per cent. in the ash. Traces of 11 or 12 other elements were consistently found.—W. M. Deans.

3203

SIMMONDS, D. H. **The amino acid composition of keratins. 3. The amino acid composition of different qualities of wool.** *Austral. J. Biol. Sci.*, 1955, **8,** 537–540. [Biochem. Unit, Wool Textile Res. Lab., C.S.I.R.O., Melbourne.]

The amino acid composition of Merino and Corriedale wool, of 70's and 56's quality respectively, was compared with that of Merino 64's quality (see part 1, Abst. 4666, Vol. 24). The pattern of composition of the 3 wools was similar, although differences of over 10 per cent. were found for some amino acids. The analyses were replicate estimations of the same wool hydrolysate and did not include sample variations.

A. Hepburn.

See also Absts. 2699, 2718, 2735, 2869, 3165, 3300, 3362, 3407, 3472, 3511, 3516, 3616.

DUCTLESS GLANDS AND HORMONES

3204

CAMPOS ZAMORANO, H. Restricción alimenticia y glándulas endocrinas en el conejo. [**Restricted diet and endocrine glands in the rabbit.**] *Rev. Chilena Educac. fis.*, 1955, **21,** 1074–1079.

Seventeen male and 31 female rabbits, 30 to 50 days old at the beginning, were divided into 3 groups and given normal diets in which, over the experimental period of 18 days, intake increased from 175 Cal. and 10 g. to 964 Cal. and 56 g. (to appetite): 151 and 8 to 481 and 28 (partial restriction) and 71 and 4 to 212 and 12 (severe restriction). In the groups in that order, final weights of skeleton were 94·5, 67·3 and 42·9 g., and the ratios to bodyweight $\times 10^3$ were 48, 45 and 49; of pituitary 18, 14 and 11 mg. and the ratios $\times 10^6$ were 9, 9 and 11; of thyroid 137, 147 and 70 mg. and 69, 99 and 77; of adrenals 221, 235 and 182 mg. and 116, 160 and 209; of ovaries 405, 347 and 283 mg. and 219, 228 and 317. Sexual maturity, as judged by the reaction of the ovary to (chorionic) gonadotropin, was not delayed by restriction of food. There were 2 deaths in each of the first 2 groups and 11 in the severely restricted.

I. Leitch.

3205

GILLMAN, J. and GILBERT, C. **The participation of the adrenal and thyroid in fat metabolism in hypophysectomised baboons (*Papio ursinus*).** *Experientia*, 1956, **12,** 65–66. [Dept. Physiol., Univ. Witwatersrand, Johannesburg.] German summary.

The results were for 30 baboons, 3 normal, 9 adrenalectomised, 13 thyroidectomised and 5 hypophysectomised (1 also thyroidectomised). All the hypophysectomised baboons received 0·5 mg. thyroxine 3 times weekly.

Bilateral adrenalectomy led to progressive depletion of the fat depots and loss of weight. Thyroidectomy was not associated with development of fatty liver even after 4 years. Hypophysectomised baboons gained weight steadily, but did not develop fatty livers even after 8 months. The bodyweight decreased for 7 to 14 days during daily administration of cortisone or adrenocorticotropic hormone; it then increased as appetite improved, and large quantities of subcutaneous fat were deposited. Adequate amounts of thyroxine prevented this increase of weight and reduced the amount of blood lipids. Withdrawal of cortisone and thyroxine rapidly produced fatty livers.—A. Hepburn.

3206

BOLLIGER, A. **The adrenals of the koala (*Phascolarctos cinereus*) and their alleged relationship to eucalyptus leaf diet.** *Med. J. Austral.*, 1953, i, 917–919. [Gordon Craig Res. Lab., Dept. Surg., Univ. Sydney.]

It has been claimed that the leaf-eating marsupials, koala and common possum (*Trichosurus vulpecula*), possess constitutionally rudimentary or hypofunctional adrenals, and that the low activity of the glands may be associated with a diet of eucalyptus leaves. The adrenals of 3 koalas and 60 possums were therefore examined.

The adrenal tissue of the koalas constituted from 0·006 to 0·008 per cent. of the bodyweight, and of the possums from 0·008 to 0·015 per cent., compared with from 0·01 to 0·02 per cent. in most mammals. The adrenals of the koala were histologically of the usual mammalian pattern. Contrary to belief, all the possums examined possessed two adrenal glands, and the zona glomerulosa was always present in both males and females. Possums were kept healthy for several years in the laboratory on a diet without eucalyptus leaves.

No evidence was found to suggest that there is adrenal insufficiency in koalas, or that eucalyptus leaves contain any substance resembling adrenal hormone.—M. H. Pierce.

3207

GOLDMAN, M. L., RONZONI, E. and SCHROEDER, H. A. **The response of the adrenal cortex of the rat to dietary salt restriction and replacement.** *Endocrinology*, 1956, **58,** 57–61. [Dept. Int. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

The findings in 96 young male rats are described. A diet with only 0·0047 per cent. sodium produced in 4 days some enlargement of the adrenals, with widening of the zona glomerulosa, loss of cholesterol and loss of ascorbic acid, the last not significant. Restoration of salt to the diet after 43 days gave rapid recovery to normal in 48 hr.

I. Leitch.

3208

ROSENMAN, R. H., ST. GEORGE, S., FREED, S. C. and SMITH, M. K. **The effect of potassium deficiency upon adrenocortical secretion in the rat.** *J. Clin. Invest.*, 1955, **34,** 1726–1729. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

It has been shown that the low blood pressure and poor response to pressor drugs in rats, which characterise the reaction to a diet lacking K, are relieved by cortisone. To test whether the characteristic response to K deficiency is due to failure of function of the adrenal cortex, adrenal corticosteroids were measured in blood from the adrenal vein in young male rats on a K-deficient diet. The

rates of secretion of 3-keto-Δ^4-steroids, as corticosterone, and of 17:21-dihydroxy-20-ketosteroids, as 17-hydroxycorticosterone, were similar in deprived rats, rats on deficient diet with added KCl and rats on stock diet.—I. Leitch.

3209

DE LA BARREDA, P., ALCALÁ, R. and LÓPEZ FRESCO, J. Sobre algunas constantes de supervivencia en perros adrenoprivos bilaterales. Relación de la composición electrolítica con el peso y la presión arterial. [**Constants of survival in dogs with both adrenals removed. Relation of electrolyte composition to weight and arterial pressure.**] *Rev. clín. española*, 1955, **59**, 13–15. [Inst. Invest. Méd. Clín., Madrid.] English, German and French summaries.

The subjects were 11 dogs with adrenals removed at 2 operations 6 to 10 days apart; they received deoxycorticosterone acetate and cortisone subsequently. Six had a diet of offal and 5 a diet of potato, rice, bones and oil. Variations in weight, arterial pressure and serum electrolytes are presented in a table.

The meat-fed dogs survived for 27 to 44 days; 3 of the others died after 10, 13 and 22 days, the rest survived indefinitely. The dogs on the mixed diet maintained most nearly normal their bodyweight, arterial pressure and serum electrolytes.

D. Duncan.

3210

LINDNER, H. R. and FERGUSON, K. A. **Influence of the adrenal cortex on wool growth and its relation to 'break' and 'tenderness' of the fleece.** *Nature*, 1956, **177**, 188–189. [C.S.I.R.O., Div. Animal Health and Prod., Sheep Biol. Lab., Prospect, N.S.W.]

Intramuscular injections of adrenocorticotropic hormone, 40 I.U. daily, or of cortisone acetate, 1·8 mg. per kg. bodyweight daily, or local applications of hydrocortisone ointment depressed or completely arrested growth of wool. It is suggested that temporarily increased activity of the adrenal cortex may be a common physiological mechanism underlying the phenomena of "tenderness", "break", "rising of the fleece" and possibly "cotted fleece".—J. L. Corbett.

3211

ROBINSON, K. W., HOWARD, B. and MACFARLANE, W. V. **Observations on seasonal fluctuations in 17-ketosteroid output in the subtropics and tropics.** *Med. J. Austral.*, 1955, ii, 756–759. [Dept. Physiol., Univ. Queensland.]

See also Absts. **3016, 3103, 3422, 3677.**

3212

BUNGART, H. Untersuchungen an Schilddrüsen von Hirschen aus freier Wildbahn. [**Studies on the thyroids of deer in the wild.**] *Frankfurter Ztschr. Pathol.*, 1955–56, **67**, 13–27. [Pathol. Inst., Duisburg.]

Thyroids were obtained from 88 deer, some in all months of 1954 except September. Activity was estimated in 60 glands which had no sign of post-mortem change; relation between bodyweight and thyroid weight was found for 42 animals.

The histological picture of nearly all the glands examined was typical of the inactive thyroid, with large follicles, flat epithelial cells and basophil colloid. A few glands were moderately active. The absolute weight of the glands ranged from 2 to 13 g. Relative to bodyweight the thyroids were largest in young males, 0·125 g. per kg. bodyweight, and smallest in adult males, 0·104 g. per kg. Values for young and adult females were 0·119 and 0·121 g. per kg. There was little difference in activity with size of the gland. Signs of activity were commoner in thyroids of young and male than in adult and female deer.—D. Duncan.

3213

ROCHE, J., MICHEL, R., WOLF, W. and NUNEZ, J. Sur deux nouveaux constituants hormonaux du corps thyroïde, la 3 : 3′-diiodothyronine et la 3 : 3′ : 5′-triiodothyronine. [**Two new hormone constituents of the thyroid, 3 : 3′-diiodothyronine and 3 : 3′ : 5′-triiodothyronine.**] *Biochim. biophys. Acta*, 1956, **19**, 308–317. [Lab. Biochem. Gén., Coll. de France, Paris.] English and German summaries.

3214

GOLDSMITH, R. E. and EISELE, M. L. **The effect of iodide on the release of thyroid hormone in hyperthyroidism.** *J. Clin. Endocrinol.*, 1956, **16**, 130–137. [Metabol. Lab., Cincinnati Gen. Hosp., Ohio.]

To 11 patients with hyperthyroidism a tracer dose of 250 μC. ^{131}I was given orally and 72 hr. later synthesis of thyroid hormone was blocked by methylmercaptoimidazole (MMIA) given by mouth, 40 mg. every 8 hr. for 16 to 20 days, divided into 2 periods of 8 to 10 days each. In the second period I was given as NaI, 50 mg. every 12 hr. During both periods γ-ray counts were made twice daily over the thyroid. In 2 instances anterior pituitary thyrotropin was given simultaneously with the NaI in doses of 15 mg. every 12 hr. intramuscularly. Daily counts were plotted against time on semi-logarithmic paper and the slopes of the curves were analysed.

In all the patients the rate of release of hormone was less after NaI was given. When thyrotropin was given with NaI the rate was not slowed down but remained the same as when MMIA was given alone. It is suggested that the slowing effect of iodide on the rate of secretion of thyroid hormone

is probably the result of some interference with thyrotropin activity.—B. W. Simpson.

3215

HIGHLEY, D. R. and PARKER, H. E. **Effects of liver fractions on thyroid function of the rat.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 638–640. [Dept. Biochem., Purdue Univ., West Lafayette, Ind.]

The 120 rats of both sexes were divided into 2 groups given diets containing 58 and 400 p.p.m. I. These 2 groups were subdivided into groups treated with soluble and insoluble fractions of pork liver, dried pork liver and 0·01 per cent. thiouracil, respectively. The diets were adjusted so that each contained the same amount of protein. Thyroid weight and I content, thyroid protein-bound I (PBI), plasma PBI, B.M.R. and average weekly weight gains were estimated. On the 42nd day of the experiment blood samples were taken, thyroids were excised and PBI was estimated in both.

A goitrogenic substance was found in the liver fraction insoluble in water. In the rats on the diet containing 58 p.p.m. I the insoluble liver fraction produced almost as much goitre as 0·01 per cent. thiouracil. When the diet contained 400 p.p.m. I the goitre was prevented. Dried liver was as effective as water-insoluble liver, but rats given dried liver had very poor growth. The concentration of I in the thyroids of rats given the insoluble liver fraction and low dietary I was about one-third of the normal. This decrease was due to loss of thyroid PBI. When adequate I was present in the diet, not only did thyroid PBI return to normal but plasma PBI values were nearly doubled. Insoluble liver and dried liver increased thyroid size from 7 to 12 mg. per 100 g. bodyweight when I intake was low. There was no difference in thyroid size when I intake was high. Thiouracil increased thyroid size and reduced thyroid I at both levels of I intake. No significant difference of B.M.R. was found in any group.

B. W. Simpson.

3216

ANDREWS, E. D. and WHITTEN, L. K. **The effect of phenothiazine on thyroid glands of sheep.** *N.Z. J. Sci. Technol.* [*A*], 1956, **37,** 414–418. [Animal Res. Stat., Dept. Agric., Wallaceville.]

The mean wet weight of thyroids of sheep given 120 g. phenothiazine in 6 doses during 13 weeks was similar to that of untreated sheep. The mean percentage of iodine in glands of phenothiazine-treated sheep was nearly twice that in glands of untreated sheep.—J. C. Gill.

3217

GARREN, L. and GREEP, R. O. **Effects of thyroid hormone and propylthiouracil on eruption rate of upper incisor teeth in rats.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 652–655. [Harvard Sch. Dent. Med., Boston, Mass.]

Of 23 rats 80 days old, 8 were fed on rat chow containing 0·5 per cent. dried thyroid, 8 on processed chow containing 0·15 per cent. propylthiouracil (PTU) and 7 on ground rat chow. Four rats on PTU were changed to the diet containing thyroid at the end of 5 weeks for 2 weeks. The incisor eruption rate was measured by the method of Schour (*Amer. J. Anat.*, 1932, **50,** 397) once a week.

After 2 weeks on the diet containing thyroid, the growth of incisors was 30 per cent. greater than in the normal rats. Thereafter it declined and was almost normal at the end of 5 weeks. These rats lost weight and 3 died. In the group given PTU, eruption slowed in the second week and in the fourth week reached a minimum of half the normal. After that there was no further decrease. When dried thyroid was substituted for PTU the growth of incisors increased within 1 week by 260 per cent.; this increase was maintained during the next week.

The upper incisors of the rats given PTU had an increased amount of dentine per unit area. The pulp chamber was partly obliterated. The rats given thyroid had incisors with large pulp chambers and a decreased amount of dentine. Since reduced growth of incisors was due to lack of thyroid hormone, its measurement might be of use in demonstrating hormonal activity.—B. W. Simpson.

3218

SHELLABARGER, C. J. **A comparison of triiodothyronine and thyroxine in the chick goiter-prevention test.** *Poultry Sci.*, 1955, **34,** 1437–1440. [Med. Dept., Brookhaven Nat. Lab., Upton, Long Island, N.Y.]

Cockerels were maintained on commercial laboratory chow, and on the 13th day of age were weighed, wing-banded and assigned to experimental groups of the same average weight. In order to enlarge the thyroids, 0·1 per cent. thiouracil was added to the diet. Daily subcutaneous injections of 0·84 or 3·0 μg. triiodothyronine or 3·0 mg. thyroxine or distilled water in the volume of 1 ml. were given from the 14th day. The birds were killed on the 24th day and the thyroids were weighed.

No difference in ability to reduce thyroid size was found between the hormones in chicks, though in rats triiodothyronine reduces the enlarged glands 3 to 4 times as rapidly as thyroxine. This suggests a species difference in response.

B. W. Simpson.

See also Absts. 2948, 2949, 3104, 3271, 3374, 3380, 3950.

3219

DURY, A. **Lipides distribution and phospholipide turnover in tissues of rabbit shortly after growth**

hormone. *Proc. Soc. Exp. Biol. Med.*, 1955, **90**, 623–628. [Dorn Lab. Med. Res., Bradford Hosp., Pa.]

Rabbits which had been kept for several weeks on a pellet diet were each given a subcutaneous injection of 5 mg. purified anterior pituitary growth hormone per kg. bodyweight or of physiological saline. Immediately afterwards they were each given 0·5 mC. of ^{32}P-labelled phosphate by intravenous injection. Three hours later a small sample of heart blood was obtained and 6 hr. after the phosphate injection a large sample of heart blood was taken and the animals were killed. Whole liver and aorta were removed for chemical analysis.

All the animals which received growth hormone showed moderately increased liver weight and glycogen and lipid content and increased plasma glucose and lipid values; aorta showed significantly less neutral fat. The ^{32}P studies showed that growth hormone promoted synthesis of phospholipins; aortic phospholipin turnover did not differ from that of the control animals.

G. A. Garton.

3220

LIBBY, D. A., MEITES, J. and SCHAIBLE, P. J. **Growth hormone effects in chickens.** *Poultry Sci.*, 1955, **34**, 1329–1331. [Dept. Poultry Husb., Michigan State Univ., East Lansing.]

Growth hormone, 1 to 2 mg. daily, testosterone, 0·25 to 0·5 mg. daily, and diethylstilboestrol, 0·5 mg. daily, were injected subcutaneously into 4-week-old White Leghorn cockerels for 28 days. Protamone was incorporated into the feed of 2 groups. No hormone had any effect on growth or feed efficiency. Diethylstilboestrol decreased comb size and increased the fat content of the thigh flesh. In 1-week-old chickens growth hormore decreased growth rate and reduced feed efficiency but had no significant effect on weight of comb, liver or spleen or on blood sugar. Injection of growth hormone into the allantoic sacs of 14-day-old embryos had no effect on the bodyweight of newly hatched chickens. These effects are in contrast to those found in some mammals.

J. S. Thomson.

3221

GUGGENHEIM, K. **The effect of nutritional deficiency on the pitressin inactivating ability of the liver.** *Amer. J. Clin. Nutrit.*, 1956, **4**, 71–73. [Lab. Nutrit., Dept. Biochem., Hebrew Univ.-Hadassah Med. Sch., Jerusalem.]

See also Absts. 2949, 3016, 3473, 3956.

3222

MUKHERJEE, S. K., DE, U. N. and MUKERJI, B. **Studies in experimental diabetes. 3. Effect of oestrogen therapy and its combination with intravenous glucose and intravenous sodium glycerophosphate in experimental (alloxan) diabetes in rats.** *Indian J. Med. Res.*, 1956, **44**, 59–66. [Central Drug Res. Inst., Lucknow.]

Oestrogen in daily subcutaneous injections was entirely successful in combination with intravenous glucose, and partly successful alone or in combination with sodium glycerophosphate, in curing alloxan diabetes in female rats.

F. C. Aitken.

3223

BAUM, G. J. and MEYER, R. K. **Influence of diethylstilboestrol on lipids in intact and hypophysectomized cockerels.** *Endocrinology*, 1956, **58**, 338–346. [Dept. Zool., Univ. Wisconsin, Madison.]

Total blood lipids of immature cockerels forcibly fed on a synthetic diet with or without added fat rose after removal of the pituitary, after intramuscular injection of diethylstilboestrol, and further after both treatments. Oestrogen increased the depot fat of intact cockerels on a normal or fat-free diet, but had no effect on the depot fat of hypophysectomised birds. Diethylstilboestrol improved the rate of gain in intact cockerels, but did not affect the efficiency of gain.

A. K. Lough.

3224

PIETERSE, P. J. S. and ANDREWS, F. N. **The estrogenic activity of alfalfa and other feedstuffs.** *J. Animal Sci.*, 1956, **15**, 25–36. [Dept. Animal Husb., Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Ovariectomised mice were used for assay of the oestrogenic potency of alfalfa, at different stages of maturity, in 4 successive crops during the spring and summer of 1954. Oestrogenic activity of first growth increased significantly in the early budding stage, declined in early flowering and then increased and remained high until flowering had finished and the plant was in the seed-head stage. In second, third and fourth growth, the pattern of oestrogenic activity differed and the total quantity was much less than in spring growth; in general, there was less oestrogenic activity at the budding stage with a tendency for increased potency with maturity.

All parts of the alfalfa plant possessed oestrogenic activity, but the leaves were more potent than the flowers, and the stems showed least activity.

A wide variety of legumes contained significant amounts of oestrogens, but there was considerable variation among species and among samples within species. By comparison, the oestrogenic activity of grasses, grains and oilseed products was low.

T. R. Preston.

See also Abst. 3175.

ENERGY EXCHANGE AND SPECIFIC DYNAMIC ACTION

3225

KREBS, H. A. Die Steuerung der Stoffwechselvorgänge. [**The regulation of metabolic processes.**] *Deutsch. med. Wochenschr.*, 1956, **81**, 4–8. [Dept. Biochem., Univ. Oxford.]

The basic unit which determines the rate of a metabolic reaction is the enzyme-substrate system. Maximum rate of reaction rarely occurs in physiological conditions and the limiting factor is usually the quantity of substrate. This is supported by the finding that addition of intermediary products to tissues usually increases the rate of intermediary reactions. Yet there are some reactions which do not depend on the supply of substrate, but on a pacemaker.

Alternative metabolic pathways can result either from the choice of alternative reactions (as in the choice of carbohydrate, fat or protein as source of energy) or from the choice of different directions of the same metabolic path (*e.g.*, synthesis or breakdown of fatty acids). Alternative pathways are never completely independent; for example, oxidation of lactate or triosephosphate or glutamic acid or malic acid or β-hydroxybutyric acid depends on their competition for a common enzyme, pyridine nucleotide (DPN). The one oxidised depends on their relative rates of reaction under the given conditions. Reactions depending on DPN are commonly subordinate to pacemakers. There are two main kinds of pacemaker. One is hormonal. The other is comparable to feedback mechanisms such as thermoregulators controlling gas or electrical supplies to incubators; the heat liberated from the gas produces self-limiting conditions by which the gas is shut off until the limiting conditions are removed. A biological feedback mechanism is the regulation of respiration by CO_2; there are many others. The "purposeful" adaptation of production of energy to physiological needs can be explained to a great extent by the specific character of the enzyme system.

D. Duncan.

3226

MITCHELL, H. H. **The specific dynamic action of food.** *Scientia*, 1955, **49**, June, pp. 7. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

It is difficult and inconvenient to measure specific dynamic action completely since it may continue for many hours, but it may be estimated with sufficient accuracy from intermittent measurements and a sigmoid prediction curve. After similar meals, in the same animal, it differs with the physiological state, *e.g.* growth, lactation, exercise, and the plane of nutrition. The S.D.A. of individual components of diet is not important except for instance in particular contexts such as muscular work, when meat, but not glucose or fat, will raise heat output; or in reference to deficiencies of amino acids and the specific effects of some amino acids. Theories to explain it as due to work of digestion, metabolism of plethora, stimulation of metabolism, *e.g.*, by fatty acids in the ruminant, explain at most only small parts of the whole; that of waste heat in its modern form in relation to such chemical reactions as occur in the tricarboxylic acid cycle appears more acceptable but does not exclude the others, not even the possible participation of endocrine glands, for "it seems inconceivable that they are silent bystanders".—I. Leitch.

3227

ARKHANGEL'SKAYA, N. A. Regulyatziya obmena veshchestv v organizme nedonoshennogo rebenka posle priema pishchi. [**Regulation of metabolism in premature infants after feeding.**] *Fiziol. Zh. SSSR Sechenova*, 1954, **40**, 431–440. [Akad. Med. Nauk SSSR.]

The gaseous metabolism of 20 premature infants was studied in an attempt to find out if there was a difference between the effects of natural and artificial feeding on metabolism. The first feed was not followed by the rise in metabolic rate usual after suckling; this rise was established after 2 to 3 days. When the children were transferred to breast feeding there was a fall in post-prandial metabolic rate at first, and later a rise. It is concluded that a composite reflex is involved in the regulation of metabolism after food has been given to such infants by an artificial method.

D. W. Taylor.

3228

DELAGE, J., LE BARS, H., LEROY, A. M. and SIMMONET, H. Influence du repas sur le rythme respiratoire du porc. [**Effect of feeding on respiratory rhythm in the pig.**] *Ann. Zootech.*, 1955, **4**, 173–187. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

Five pigs weighing from 30 to 60 kg. were kept in metabolism cages and fed on a standard ration, twice daily. They were always fed by one attendant, who entered the room for that purpose only. The pigs were accustomed to wear a pneumograph.

The respiratory rhythm before feeding was usually more rapid in the afternoon than in the morning, 16·9 and 14·5 respiratory movements per min. for 4 pigs. During a meal the rate increased by about 80 per cent., with a wide individual variation of from 41 to 163 per cent. The increase began when feeding was expected, and all the pigs were especially sensitive to the

smell of the food, which contained fishmeal. As the pigs approached satiety the rate of eating fell, and with it the rate of respiration. The rate of respiration continued to fall more slowly after the meal, but had not reached the pre-prandial level after 1 hr.

In pigs anaesthetised with chloralose and fed by stomach tube the respiratory rate increased by about 20 per cent. and declined only slowly. It is concluded that there are 2 components of the increase in normal pigs, one due to muscular activity and the other caused by the presence of feed in the digestive tract.—D. Duncan.

3229

KAISHIO, Y., HASHIZUME, T., AMBO, S., ABE, G., MASUBUCHI, T., ABE, M., MORIMOTO, H., HORII, S., KURATA, Y., ISHIHARA, M. and TSUCHIYA, H. **[Metabolism of matter and energy in cattle.]** *Bull. Nat. Inst. Agric. Sci., Chiba, Japan* [*G*], 1955, No. 11, 157–226. In Japanese : English summary 227–231.

The respiration chamber was of the open-circuit type, designed for separate collection of urine and faeces. The apparatus is described in detail with diagrams and photographs.

Fasting heat production of 4 black native Japanese cows was measured during four 12-hr. periods at the end of 5 days of fasting, which had been preceded by 7 days of feeding on wild grass hay. The heat production was from 11·2 to 15·1 Cal. per kg. bodyweight daily.

Feeding experiments with 4 bulls and 5 cows were made. The calculated requirements for maintenance were, for bulls and cows, respectively : digestible crude protein 150 and 135 g., total digestible nutrients 1·157 and 1·067 kg. per 100 kg. liveweight.—T. D. Bell.

3230

ASMUSSEN, E. and HEEBØLL-NIELSEN, K. **Physical performance and growth in children. Influence of sex, age and intelligence.** *J. Appl. Physiol.*, 1956, **8**, 371–380. [Lab. Theory Gymnastics, Univ. Copenhagen.]

The children were aged from 7 to 17 years. The results of tests were referred to height. In some tests boys were superior to girls. Sex differences were most pronounced in the younger children. Age appeared to influence physical capacities apart from its influence on body dimensions. In normal boys with I.Q. values above 110, mean 120, physical performance was not significantly different from that of boys with I.Q. values above 95 and below 110, mean 103, but mentally retarded boys with an average I.Q. of 83, range 70 to 90, performed less well than normal boys.—F. C. Aitken.

3231

STREEF, G. M. De betekenis van de arbeidsphysiologie voor de landbouw. **[The significance of the physiology of work for agriculture.]** *Landbouwk. Tijdschr.*, 1954, **66**, 804–816. [Lab. Physiol. Dieren, Landbouwhogesch., Wageningen.] English summary.

The general principles governing expenditure of energy in work are briefly reviewed, with special reference to agricultural work and the saving to be achieved by the use of machines, *e.g.*, milking machines, and implements suited to the work to be done. See Absts. 3153, 3943, 4516, 4518, Vol. 23 ; 1991, 3259, Vol. 24 and Glasow and Müller (singling beet), *Ber. Landwirtsch.*, 1952, **30**, 327 ; Michaelis and Müller (milking), *Arbeitsphysiol.*, 1943, **12**, 249 ; and Wirths and Hettinger (planting potatoes), *Deutsch. Landwirtsch. Presse*, 1954, **77**, 142.—I. Leitch.

3232

SCHILLING, J. A., HARVEY, R. B., BECKER, E. L., VELASQUEZ, T., WELLS, G. and BALKE, B. **Work performance at altitude after adaptation in man and dog.** *J. Appl. Physiol.*, 1956, **8**, 381–387. [Dept. Surg., Sch. Aviation Med., Randolph Field, Tex.]

The 3 senior authors were the subjects tested under field conditions at altitudes of 760 and 14,900 ft. above sea level, the latter at Morococha, Peru, where the average pressure was 450 mm. Hg. Under experimental conditions 4 selected and trained dogs were tested in a chamber where the pressure simulated that at 19,000 ft. above sea level. The work was walking at 92 m. per min. on a treadmill ; its severity was increased gradually by a constant and continuous increase in grade. Pulse rate, inspiratory and expiratory volumes, oxygen and CO_2 in expired air, and lactic and pyruvic acids and Hb in blood were estimated and counts of red and white blood cells and measurements of haematocrit were made. There were similar studies with the dogs, which had undergone minor surgical operations to permit measurements of their pulse rates and blood pressure. These measurements were made in the men at the lower altitude, at the higher after acclimatisation for 10 weeks and again at the lower 2 weeks after returning ; in the dogs they were made at 760 ft., at 19,000 ft. and again at 760 ft. after 5 months' acclimatisation to the high altitude. The findings are presented graphically for the individual men and as average values for the dogs.

In the men ventilation rate and ventilatory equivalent, defined as ventilation in litres per litre oxygen consumed, were, for a given load of work, greater at the high than at the low level and there was no associated increase of pulse rate. In the

dogs this change was relatively much smaller than in the men. Oxygen consumption at the 2 levels did not differ greatly in men or in dogs. The characteristic changes in Hb, haematocrit and in red cell volume were seen, and in the men, it took about 4 months for the sea-level values to reappear. The small number of estimations of the blood acids showed that, especially after exercise, the level of lactic acid was lower and that of pyruvic acid higher at the high altitude than at the low.—D. Harvey.

3233

BAKER, P. T. and DANIELS, F. (Jr.) **Relationship between skinfold thickness and body cooling for two hours at 15° C.** *J. Appl. Physiol.*, 1956, **8**, 409–416. [Quartermaster Res. and Development Command, Natick, Mass.]

In a chamber with mean dry bulb temperature 59·3° F. (15·2° C.) and wet bulb temperature 56·1° F. (13·4° C.), relative humidity 82 per cent., and air speed from 79 to 98 ft. per min., fat men, with 19 per cent. body fat, almost nude, had after 2 hr. higher rectal temperatures by on the average 1·2° F. (0·7° C.) and lower skin temperatures by 5·9° F. (3·3° C.) than thin men with 1 per cent. body fat.

J. S. Thomson.

3234

GELINEO, S. and KOCAROV, R. Influence de la température d'adaptation sur l'intensité des échanges respiratoires chez le rat au cours des différentes saisons. [**Effect of adaptation temperature on the intensity of respiratory exchange in the rat at different seasons.**] *C.R. Soc. Biol.*, 1955, **149**, 1652–1654. [Inst. Physiol., Fac. Sci., Univ. Belgrade.]

In experiments with rats it was found that metabolic adaptation to environmental temperature, as estimated from oxygen consumption, required about 15 days. Oxygen consumption was measured at 30°, 10° and 5° C. in rats adapted to different ranges of environmental temperature; the lower the temperature to which they were adapted, the higher the oxygen consumption at all 3 experimental temperatures. In another group of rats placed in January in a temperature of 25° to 28° C. there was no adaptation during the spring months, in fact until June.—D. Duncan.

3235

CASADY, R. B., LEGATES, J. E. and MYERS, R. M. **Correlations between ambient temperatures varying from 60°-95° F. and certain physiological responses in young dairy bulls.** *J. Animal Sci.*, 1956, **15**, 141–152. [N. Carolina State Coll., Raleigh.]

The effect of environmental temperatures from 60° to 95° F., at humidities of 10 and 14·5 mm. Hg, on physiological responses of 4 Holstein bulls was studied when the bulls were 18 and 31 months old. They were kept at each temperature for from 29 to 50 days. Environmental temperature was significantly correlated with rectal temperature, scrotal and rump skin temperatures, respiratory rate and water consumption. Rectal temperature was less closely correlated with other physiological measurements, apart from respiratory rate, which was closely associated with rectal temperature for air temperature between 80° and 90° F.

A delayed response of rectal temperature and respiratory rate to environmental temperature in the second experiment, until the environmental temperature reached 80° F., was thought to be due to improved thermoregulation with advancing age.—T. R. Preston.

3236

YEATES, N. T. M. **Photoperiodicity in cattle. 1. Seasonal changes in coat character and their importance in heat regulation.** *Austral. J. Agric. Res.*, 1955, **6**, 891–902. [Div. Animal Health Proc., C.S.I.R.O., Sir William Macgregor Sch. Physiol., Univ. Queensland.]

In two groups of Shorthorn calves, one subjected to a reversed seasonal trend in length of day and the other to natural daylight, a deep hair coat of winter type was associated with decreasing length of day and a flat glossy coat with increasing length of day. Seasonal temperature differences were without effect on the coat.

Animals exposed to decreasing light which had a deep winter coat, had significantly less heat tolerance, measured by exposing them to a temperature of 105° F. for 3 hr., than animals with a smooth summer coat. Clipping the hair from all animals resulted in both groups having the same heat tolerance, showing that difference in heat tolerance was directly attributable to type of hair coat and not to difference in metabolic state with which hair coat might have been associated.

T. R. Preston.

3237

GELINEO, S. Température d'adaptation et production de chaleur chez les oiseaux de petite taille. [**Adaptation temperature and heat production in small birds.**] *Arch. Sci. physiol.*, 1955, **9**, 225–243. [Inst. Physiol., Fac. Sci., Belgrade.]

The 9 species of birds were pigeon (*Columba domestica*), turtle dove (*Turtur risorius*), linnet (*Acanthis cannabina*), greenfinch (*Chloris chloris*), siskin (*Chrysomitris spinus*), canary (*Serinus canaria*), goldfinch (*Carduelis carduelis*), brambling (*Fringilla montifringilla*) and sparrow (*Passer domesticus*); all but the canary were caught in the Belgrade district. They were tamed to accept the presence of man and accustomed to the metabolism

cage, which is described and illustrated. They were fasted for 12 hr. before experiments.

All the birds adapted their basal heat production in response to changes in environmental temperature. The time required for complete adaptation varied from 1 to 4 weeks [*secondes*, in the summary, is presumably a misprint for *semaines*], according to the species. In the pigeon, adapted B.M.R. at 1° to 3° C. was 1083 Cal. per sq. m. per 24 hr., and at 29° to 32° C., 833 Cal. When the bird was adapted to the lower temperature, polypnoea appeared during exposure at 33·4° C., when heat production was 981 Cal. per sq. m. per 24 hr., but when it was adapted to the higher temperature polypnoea did not appear until the temperature of the respiratory chamber reached 36·7° C., and heat production was 856 to 923 Cal. Values for B.M.R. and thermal neutrality are tabulated for all 9 species when adapted to 3 different environmental temperatures. The greatest increase in metabolism was 85 per cent. in the siskin adapted to cold. Adaptation to cold increased resistance to cold in all species: maximum metabolism occurred at a lower temperature and body temperature was maintained better. A canary and a goldfinch when adapted to warm environment died in cold less extreme than they had survived when adapted to cold. It is concluded that seasonal changes in temperature, even when they are as extreme as in the Belgrade area, are gradual enough to allow adaptation.—D. Duncan.

See also Absts. 3150, 3274, 3526, 3552.

CARBOHYDRATES

3238

PINES, K. L. **Carbohydrate metabolism.** *Med. Clins. N. Amer.*, 1955, **39**, 831–844. [Dept. Med., Coll. Phys. Surg., Columbia Univ., New York.]

3239

FORSYTH, B. T. and PLOUGH, I. C. **The protein-sparing effect of carbohydrate with and without testosterone.** *J. Lab. Clin. Med.*, 1955, **46**, 840–847. [Dept. Metabol., Med. Div., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

The 3 volunteer subjects were a 58-year-old man with alcoholic cirrhosis of the liver, a man of 24 with Reiter's syndrome in remission and a man of 23 with rheumatoid spondylitis. All were ambulatory during experiments. The first 2 had a solid basal diet, the third a liquid diet; their protein intakes were stable at 0·7, 1·1 and 1·5 g. per kg. bodyweight daily, respectively.

The patient on the lowest N intake was in positive N balance for the whole 36 days of experiment; testosterone propionate increased N retention slightly, increased carbohydrate intake increased it considerably and the effect persisted for the whole 18 days of supplementation. Similar effects were found in the other 2 patients, who had 1 and 2 negative balances, respectively, on the basal diet, slight improvements with testosterone and greater and persistent improvement, for 15 and 16 days, with increased carbohydrate intake. The extra carbohydrate was given 2 to 4 hr. after meals. The N-sparing effect varied from 1·0 to 1·7 mg. N per added calorie. Testosterone was not effective during carbohydrate supplementation.

D. Duncan.

3240

DUNCAN, L. J. P. **The intravenous glucose tolerance test.** *Quart. J. Exp. Physiol.*, 1956, **41**, 85–96. [Dept. Therap., Univ. Edinburgh.]

Two intravenous sugar tolerance tests were made, between 5 and 14 days apart, in 28 normal adults and 21 patients with mild diabetes mellitus which allowed withdrawal of insulin for 48 hr. before tests. All the subjects had a diet containing at least 250 g. carbohydrate daily for 4 days and were fasted for 15 hr. before tests. The blood sugar values obtained during the tests were used to compare 2 indices of glucose tolerance.

The " total index " was obtained by the method of Bastenie *et al.* [The reference should read Conard *et al.*; see Abst. 4539, Vol. 23], who called it the coefficient of carbohydrate assimilation. The " increment index " was that of Amatuzio *et al.* (*J. Clin. Invest.*, 1953, **32**, 428) [the names of the authors are without exception wrongly spelt]. Both indices were found to be reproducible in the same subject. It is deduced that the rate of removal of blood glucose is more nearly proportional to the excess above fasting concentration than to the total concentration, and that the " increment index " is the more reliable of the two tested.—D. Duncan.

3241

POLITZER, W. M. **Glucose-tolerance test: a comparison of results in the African and European.** *S. African J. Lab. Clin. Med.*, 1955, **1**, 270–272. [S. African Inst. Med. Res., Johannesburg.]

Sugar tolerance tests with 50 g. glucose were made on 2 groups each of 42 patients in hospital with disorders known not to affect carbohydrate

metabolism. The Africans were 18 men and 24 women aged from 14 to 59 years and the Europeans 19 men and 23 women aged from 20 to 55 years. Average values for glucose during fasting and at 30-min. intervals were for Africans 75, 98, 106, 97 and 85, and for Europeans 84, 126, 131, 114 and 92 mg. per 100 ml. blood as estimated by the method of King and Garner (*J. Clin. Pathol.*, 1947–48, **1**, 30). The differences were statistically significant, and endocrine activity is proposed for further study in the search for an explanation.

D. Harvey.

3242

TEST, C. E., NICHOLS, R. L., LANDAU, R. L., RICKETTS, H. T. and LOUGHEAD, R. **A study of the "flat" oral glucose tolerance curve and its relation to rate of emptying of the stomach.** *Amer. J. Med. Sci.*, 1956, **231**, 69–74. [Dept. Med., Indiana Univ. Sch. Med., Indianopolis.] Interlingua summary.

Of 26 patients in whom the rise in a sugar tolerance curve had not exceeded 30 mg., 10 gave a normal response when re-examined and were discarded. More detailed tests were made on the others, but findings in relation to time of emptying of stomach were inconsistent. Seven of the 16 showed flat curves for venous and rather low peaks for capillary blood and in 5 of these the fall of inorganic P in serum was less than 15 per cent. of the fasting value. From the findings for that group retardation of absorption from the intestine is thought to be the most likely explanation of the phenomenon.

In the end 15 of the original 26 patients showed normal responses.—D. Harvey.

3243

KRITZER, M. D., SHRIFTER, N. and DEMETRIOU, J. A. **Carbohydrate metabolism. 1. A study of changes in serum inorganic phosphorus during glucose-tolerance test in normals, diabetics, and prediabetic women.** *Arch. Int. Med.*, 1956, **97**, 62–67. [Dept. Med., Univ. S. California Sch. Med., Los Angeles.]

The pre-diabetics were 30 women with normal glucose tolerance who had given birth to large babies. The diabetics were 16 diabetic mothers whose glucose tolerance had been normal 3 years previously at the birth of their babies and 13 elderly subjects with long-standing mild diabetes. Serum inorganic P levels were estimated during oral glucose tolerance tests in these subjects and in normal young women.

Values in pre-diabetics differed little from normal. Those in diabetes of long standing were consistently above normal and those in recent diabetes were consistently below normal. Serum inorganic P levels were estimated also during intravenous glucose tolerance tests in normal subjects and in patients with diabetes of long standing. A greater and earlier drop in P level occurred in normal subjects than in the diabetics. It was not found in normal subjects given glucose by mouth.

The results are discussed in relation to the role of the liver in P metabolism.—F. C. Aitken.

3244

TAGNON, R. F. and DEVREUX, S. **Effect of intravenous injection of fructose, with and without ACTH administration, on the level of blood glucose.** *J. Clin. Endocrinol.*, 1955, **15**, 1475–1481. [Lab. Exp. Med., Univ. Brussels.]

3245

BUNDING, I. M., DAVENPORT, M. E. (Jr.) and SCHOOLEY, M. A. **The glucose tolerance test in swine and its implications.** *J. Animal Sci.*, 1956, **15**, 234–241. [Armour Labs., Vet. Res. Dept., Chicago, Ill.]

Oral glucose tolerance tests were made on pigs of mixed breed, including mature lactating sows and growing pigs. The animals were fasted for 16 to 24 hr. before tests and the dose of glucose was 0·5 or 1 g. per lb. bodyweight. Blood samples were taken before and ½, 1, 2 and 3 hr. after the glucose was given.

There were large differences in glucose tolerance even between littermate pigs on the same ration. Of 6 littermate barrows (castrated males) the 3 with good tolerance were all heavier than the 3 with poor tolerance. Of 24 pigs tested, 3 had curves of diabetic type; 2 of these were lactating sows. Two pigs stunted as a result of past hog cholera infection had poorer tolerance than their well grown normal littermates.—D. Duncan.

3246

SHULL, K. H. and MAYER, J. (with SILIDES, D. J.) **Analysis of the blood sugar response of obese-hyperglycemic mice and normal mice to hormones: insulin, glucagon, and epinephrine.** *Endocrinology*, 1956, **58**, 220–225. [Dept. Biol. Chem., Harvard Med. Sch., Boston, Mass.]

The fall in fasting blood sugar 2½ hr. after obese and non-obese mice were given 20 units insulin per kg. bodyweight was similar, 130 and 117 mg. per 100 ml. blood, but in the non-obese the fall caused convulsions and death. If fasting began 24 hr. before insulin was given the reductions were again similar, 61 and 54 mg., respectively. In the obese mice the level of 31 mg. was reached without convulsions and they recovered without food. They survived also if the fasting was continued and treatment repeated 24 hr. later.

In similar experiments 25 μg. glucagon or adrenaline was given intraperitoneally and the

change after 30 min. was studied. In obese mice the increases were 79 and 149 mg., but if the animals had fasted for 12 hr. before treatment the changes were greater, 197 and 249 mg. per 100 ml. blood, respectively. In tests with glucagon alone on animals on a carbohydrate-free diet (see Abst. 3353, Vol. 24) the increase was 85 mg., comparable with that in obese mice on a normal diet. In non-obese animals the increases with glucagon and adrenaline were 44 and 189 mg. without fasting and 7 and 119 mg., respectively, with fasting for 12 hr. before treatment.—D. Harvey.

3247

GERRITZEN, F. Is insuline-deficiëntie hetzelfde als diabetes mellitus ? **[Is lack of insulin the same as diabetes mellitus ?]** *Nederland. Tijdschr. Geneesk.*, 1955, **99,** 3674–3680. [The Hague.] English summary.

3248

BARTA, L. and KOCSIS, M. **The effects of intravenous glucose administration on the diabetic metabolism.** *Ann. paediat.*, 1956, **186,** 65–78. [1. Dept. Paediat., Med. Sch., Univ. Budapest.] German and French summaries.

3249

SHREEVE, W. W., BAKER, N., MILLER, M., SHIPLEY, R. A., INCEFY, G. E. and CRAIG, J. W. **C^{14} studies in carbohydrate metabolism. 2. The oxidation of glucose in diabetic human subjects.** *Metabolism*, 1956, **5,** 22–34. [Radioisotope Unit, Veterans Admin. Hosp., Cleveland Ohio.]

For part 1 see Abst. 3764, Vol. 25.

2. Eight diabetic subjects from whom insulin was withdrawn and 4 normal subjects were injected with radio-active glucose after fasting for about 16 hr. Of 5 stable diabetics, 2, who were deprived of insulin for 65 and 120 hr. from the last dose to the injection of glucose compared with 15 to 27 hr. for all the other diabetics, developed moderate ketosis and along with 3 labile diabetics with severe ketosis produced less than normal amounts of $^{14}CO_2$. The rate of oxidation of glucose in g. per kg. per hr. was below normal in one of the stable diabetics with ketosis and in 2 of the labile subjects. The percentage contribution of glucose to CO_2 during the 6 hr. of study changed little in normal or diabetic subjects.

The glucose pool in normal subjects, stable diabetics and labile diabetics was calculated as 24, 26 and 30 per cent. of bodyweight. The mean rate of total glucose turnover was 0·085, 0·10 and 0·19 g. per kg. per hr. and the rate constant 0·69, 0·19 and 0·30 per cent. per min.

A. Hepburn.

3250

HAUSBERGER, F. X. and HAUSBERGER, B. C. **Overall glucose utilization in steroid diabetic guinea pigs.** *Amer. J. Physiol.*, 1955, **183,** 302–306. [Daniel Baugh Inst. Anat., Jefferson Med. Coll., Philadelphia, Pa.]

Utilisation of glucose by adult male guinea-pigs was estimated during a pre-experimental period when the animals received to appetite weighed amounts of Purina rabbit checkers and 50 g. lettuce daily and during an experimental period when steroid diabetes had been produced by subcutaneous injection of cortisone or hydrocortisone. The amount of glucose utilised was calculated from the carbohydrate content of the food, from the gluconeogenesis from protein with a D : N ratio of 3·65 and from the amount of glucose in the urine. It was assumed that all the N.P.N. in urine represented protein utilised for gluconeogenesis equally in both control and experimental periods.

All the guineapigs injected with steroids and maintained in a healthy condition fully compensated for the loss of glucose by increased food intake and increased gluconeogenesis. The amount of glucose utilised by the diabetic guinea-pigs was not diminished.—G. F. Garton.

3251

PATTERSON, J. W. **Effect of a high fat fructose and casein diet on diabetic cataracts.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 706–708. [Dept. Anat., Sch. Med., Western Reserve Univ., Cleveland, Ohio.]

Two groups, each of 10 male rats rendered diabetic by intravenous injection of 40 mg. alloxan monohydrate per kg. bodyweight, with blood sugar levels consistently above 350 mg. per 100 ml., were given, respectively, a diet of unlimited amounts of water and ground dog chow and a diet of 50 per cent. fructose, 25 per cent. maize oil and 25 per cent. casein. Blood sugar was estimated at least once a week and the eyes of the rats were examined daily for cataract. On the fructose, fat and casein diet the blood sugar remained high, but cataracts were prevented and growth was accelerated.—G. F. Garton.

3252

NATH, M. C. and SAHU, V. K. **Prevention of alloxan diabetes by a condensation product of glucose and acetoacetate. 1.**

NATH, M. C. and BHATTATHIRY, E. P. M. **Prevention of alloxan diabetes by a condensation product of glucose and acetoacetate. 2.** *Metabolism*, 1956, **5,** 3–10 ; 11–17. [Dept. Biochem., Univ. Nagpur, India.]

See also Abst. 3092.

1. In rats, glucose followed immediately by acetoacetate or the sodium salt of their condensation product, 2-tetrahydroxybutyl-5-methyl-4-carbethoxyfuran, prevented both diabetes and the decrease of reduced glutathione in the blood when injected 45 min. before alloxan. Acetoacetate alone increased sugar and caused a lower level of reduced glutathione in the blood. In experiments with rabbits, acetone, β-hydroxybutyric acid or acetate could not replace acetoacetate when they were injected with glucose.

2. The condensation product prevented alloxan diabetes in 50 per cent. of rabbits when injected 5 min. before alloxan in the molecular proportion of 0·5 : 1. Protection increased as the ratio increased, to reach 75 per cent. at a ratio of 2 : 1. Blood urea and plasma alkaline phosphatase, which increase in alloxan diabetes, remained normal.

1 : 2-Dienolglucose, which occurs in normal blood and was produced by hydrolysis of the condensation product or by incubation of glucose at *p*H 7·2 and 30° C., combined with alloxan *in vitro*, perhaps to give alloxanic acid, a compound which does not produce diabetes.—A. Hepburn.

3253

Gómez F. de la Cruz, A. Estudio de los fenomenos hipoglucemicos en resecados gastricos. [**Hypoglycaemic phenomena after gastric resection.**] *Rev. clín. española*, 1954, **52**, 323–331. [Málaga.] English, German and French summaries.

Ten ml. ether instilled into the duodenum or the proximal part of the jejunum in human subjects produced a fall in the blood sugar ; the effect was greater from the jejunum. The tube alone produced a similar but much smaller effect. Of 423 subjects with partial resection of the stomach, mostly the Billroth II operation, 22 had hypoglycaemic symptoms afterwards. These began between 15 and 30 days after operation in 19 subjects and from 3 to 5 months later in the other 3. The blood sugar curves in response to glucose were normal in 19, diabetic in 2 and diabetoid in 1. Ether always brought about a fall in blood sugar, which was especially profound in 6 ; these 6 also showed small falls in response to the tube alone or to HCl. Free HCl was present in gastric secretion from 20 of the 22 patients and was secreted in response to histamine in the others.

It is suggested that the fall in blood sugar is a response to stimulation of nerves in the intestine by mechanical or chemical stimuli. It differs from the dumping syndrome.—D. Duncan.

3254

Koulischer, N. and Pickering, D. E. (with Cole, M.) **Glycogen-storage disease. A study on the effect of sodium *l*-thyroxine and glucagon.** *Amer. J. Dis. Child.*, 1956, **91**, 103–112. [Dept. Paediat., Univ. California Med. Centre, San Francisco.]

Reports are presented of 3 infants with von Gierke's disease treated with high-protein, galactose-free diet and *l*-thyroxine daily. All improved. When sodium-*l*-thyroxine was given for 6 weeks there was a significant loss of non-fermentable reducing substances in blood and reduced insulin sensitivity. In von Gierke's disease response to glucagon was below normal. When glucagon was given daily during the seventh week of *l*-thyroxine administration the blood sugar response to a single dose of glucagon was greater at the end of the week than at the beginning. Such an effect on glucagon tolerance was not found when glucagon was given for 1 week before the beginning of treatment with *l*-thyroxine.—F. C. Aitken.

3255

Adcock, L. H. and Gray, C. H. **Metabolism of sorbitol.** *Nature*, 1956, **177**, 329–330. [Dept. Chem. Pathol., King's Coll. Hosp. Med. Sch., London, S.E.5.]

Two subjects, one normal and one diabetic, were given, by mouth, 35 g. sorbitol uniformly labelled with ^{14}C and with total activity 30 μC. Within 1 hr. expired CO_2 was highly radio-active and it remained so for more than 8 hr. It is suggested that as much as 90 per cent. of the activity appeared in that form ; only about 10 per cent. was in urine and faeces.—D. Harvey.

3256

Fournier, P. Action de cellobiose et de la glucosamine, composés typiquement structuraux, sur l'utilisation du calcium. [**Action of cellobiose and glucosamine, typical structural compounds, on calcium utilisation.**] *C.R. Acad. Sci.*, 1956, **242**, 674–676.

The effect on the coefficient of utilisation of Ca of carbohydrates was studied as described earlier (Abst. 745, Vol. 25). Maltose, lactose or cellobiose formed 12 per cent. of the diet or glucosamine 6 per cent. The coefficients of utilisation of Ca with these 4 substances were 19·9, 33·5, 32·7 and 50·2 per cent. Cellobiose thus behaved as a typical structural carbohydrate, but glucosamine was remarkable for its large effect. Glucosamine was found to favour the accumulation of organic matter in the long bones, and the suggestion is made that it may enter into the formation of cartilage.

D. Duncan.

3257

Fournier, P. and Digaud, A. Étude du métabolisme des glucides de structure. Excrétion

d'acide α-cétoglutarique. [**Metabolism of structural carbohydrates. Excretion of α-ketoglutaric acid.**] *C.R. Acad. Sci.*, 1956, **242**, 1221–1223.

Young rats fed on a diet containing lactose, mannose or glucosamine excreted much more α-ketoglutaric acid in the urine than rats given glucose or sucrose.—A. Hepburn.

3258

LONGLEY, R. W., SHIRKEY, A. L., ALVIG, O. H. and ROE, J. H. **Rate of glycogenesis in the liver of the rat after parenteral administration of glucose, fructose and invert sugar.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90**, 510–511. [Dept. Biochem., Sch. Med., George Washington Univ., Washington, D.C.]

The rates of formation of glycogen in rat liver after intraperitoneal injections of fructose, sucrose or glucose decreased in that order. The rate during the first 3 hr. was about twice as high with fructose as with glucose.—A. Hepburn.

3259

WINTERNITZ, W. W. and LATTANZI, W. E. **Liver glycogen reserves in experimental diabetic ketosis.** *Endocrinology*, 1956, **58**, 232–234. [Dept. Physiol., Sch. Med., Yale Univ., New Haven, Conn.]

Male rats weighing 180 to 240 g. and fed on Purina chow were made diabetic by intravenous injection of alloxan. They were killed from 10 days to 3 months later, some after they had fasted for 24 hr.

In 7 fed and 8 fasted normal rats, respectively, liver glycogen was 6·49 and 0·12 per cent. Corresponding values for 11 and 17 diabetic rats were 1·81 and 2·16. Blood sugar values for the 4 groups in the same order were 100, 78, 401 and 177 mg. per 100 ml., and blood ketones 1·19, 7·96, 17·4 and 8·08 mg. per 100 ml. The high blood ketone values of the diabetic rats were thus not dependent on depletion of liver glycogen.—D. Duncan.

3260

BERTRAND, F. and LASZT, L. Papierelektrochromatographie des Leberglykogens normaler und diabetischer Ratten. [**Electrochromatography on paper of liver glycogen from normal and diabetic rats.**] *Biochem. Ztschr.*, 1956, **327**, 354–361. [Physiol. Inst., Univ. Fribourg.]

Liver glycogen fractions which could be distinguished by the ultracentrifuge (Abst. 657, Vol. 26) could not be separated electrophoretically. There were qualitative differences in the iodine colours of the fractions.—H. G. Bray.

3261

SHULL, K. H. and MAYER, J. **The turnover of liver glycogen in obese hyperglycemic mice.** *J. Biol. Chem.*, 1956, **218**, 885–896. [Dept. Biol. Chem., Harvard Med. Sch., Boston, Mass.]

Naturally obese hyperglycaemic mice had the same percentage of glycogen in the liver as their normal littermates, but had twice as much total glycogen because their livers were larger. Mice made obese with gold thioglucose had enlarged livers and more total glycogen. The obese mice had significantly greater amounts of glycogen in leg muscles than the normal mice. The turnover of liver glycogen, measured by the incorporation of glucose uniformly labelled with ^{14}C, was about 6 times as rapid for total glycogen and 3 times as great per g. liver and per mg. glycogen in the obese as in the normal mice.—A. Hepburn.

3262

MORRISON, A. B. **The effect of dextran on serum proteins and serum cholesterol.** *Quart. J. Exp. Physiol.*, 1956, **41**, 51–57. [Med. Res. Counc. Dept. Exp. Med., Univ. Cambridge.]

Ten ml. of blood was withdrawn from the saphenous vein of 4 dogs after they had fasted all night. Each animal was then given 20 ml. per kg. bodyweight of a 10 per cent. salt-free solution of dextran in 5 per cent. dextrose. From 3 dogs a sample of blood was withdrawn 6 hr. after the infusion; the next morning a sample of blood was withdrawn from the saphenous vein of each. In similar experiments on 10 rats 1 ml. blood was obtained from the tail vein in the morning. The animals were then lightly anaesthetised, the femoral vein was exposed and 3 ml. of the 10 per cent. salt-free dextran in 5 per cent. dextrose was injected. The following day the rats were again anaesthetised and blood was withdrawn from the aorta while the heart was still beating. The Hb value, haematocrit and cholesterol content of each sample were estimated and electrophoretic studies of the proteins were made. In the samples from the dogs the serum proteins were estimated chemically.

In the dogs Hb and haematocrit were well below their initial values 6 hr. after the infusion but returned to "normal" after 24 hr. Serum cholesterol and total protein remained lower than they were initially; electrophoretic studies confirmed that there was a fall in serum globulin. Results in the rats were similar to those in the dogs; when the changes in the red blood cell constituents due to the dilution had disappeared there remained a decrease in serum globulin and serum cholesterol.—G. F. Garton.

See also Absts. 3185, 3193, 3222, 3286, 3314, 3411–13, 3457, 3474, 3503, 3504, 3515, 3641, 3721.

PROTEINS AND PROTEIN DERIVATIVES

3263

EISEN, H. N. and TABACHNICK, M. **Protein metabolism.** *Med. Clins. N. Amer.*, 1955, **39,** 863–879. [Inst. Indust. Med., Post-Grad. Med. Sch., Univ. New York.]

3264

DAUM, K., TUTTLE, W. W., GUGEDAHL, A., ROBERTS, H. and SALZANO, J. **Nitrogen, calcium and phosphorus utilization by 12- to 14-year-old boys.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 36–38. [Dept. Nutrit., State Univ. Iowa, Iowa City.]

During an experiment on the effects of altered breakfast habits on the physiological responses of boys aged 12 to 14 years (Abst. 5169, Vol. 25) data were collected at intervals from 6 members of the groups on utilisation of N, Ca and P.

The mean N, Ca and P balances were positive during all the periods with breakfast. Two subjects had a negative N balance during the period of no breakfast and one subject had a negative P balance during the cereal and milk period. Ca and P were utilised at about the same levels in all 3 periods. Mean N retention was significantly greater with the cereal and milk breakfast than with no breakfast. There was no significant difference in N retention between the periods with cereal and milk and with bacon, egg and milk breakfasts. The height changes which occurred during the study were within the predicted range for the age group studied. The weight changes were erratic; 2 subjects were above and one in the predicted weight range. One subject, who was on a restricted diet because of his tendency toward overweight, did not gain.

G. F. Garton.

3265

PHANSALKAR, S. V. and PATWARDHAN, V. N. **Utilization of animal and vegetable proteins. Nitrogen balances at marginal protein intakes and the determination of minimum protein requirements for maintenance in young Indian men.** *Indian J. Med. Res.*, 1956, **44,** 1–10. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

Patwardhan *et al.* (Absts. 601, 5353, Vol. 20) found that Indian adults excreted more N in the urine when vegetable protein in the diet was replaced by animal protein, contrary to the findings of Murlin *et al.* (Absts. 3402, 3403, 3405, Vol. 8) with American adults on a lower intake of protein. To clear up the discrepancy, 4-day balance experiments were made with 5 healthy Indian men aged from 21 to 27 years, on diets comparable to those of Murlin *et al.*, supplying about 40 g. protein and 3250 Cal. daily. Nearly 80 per cent. of the protein was supplied by (1) eggs, (2) a mixture of rice, pulses and whole wheat flour, or (3) wheat flour of 70 per cent. extraction. Details are given of the other foods and proximate composition of the diets and of the methods of collecting and analysing samples of urine and faeces.

When egg protein was replaced by protein from cereals and pulses, urinary N fell and faecal N rose but positive N balances were maintained, except in 1 subject who was losing N on the egg diet; but when egg protein was replaced by wheat protein, urinary N rose and N balances declined or became negative, in agreement with the results of Murlin *et al.* The average biological value and egg replacement value, calculated by the methods of Murlin *et al.*, were: cereals and pulses, 111, 103; wheat alone, 86, 88. The values for wheat agree well with those of Murlin *et al.* The results are additional evidence for the value of pulses in conjunction with cereals. The discrepancy referred to at the outset is explainable by the fact that Murlin *et al.* used a single cereal and Patwardhan *et al.* a mixture of cereals and pulses.

The literature on N requirement is discussed. The subjects of Murlin *et al.* were in N equilibrium at an intake of 73 to 80 mg. N per kg. bodyweight and 3·2 to 3·8 g. N per sq. m. body surface; the Indians, who were lighter, on 88 to 150 mg. per kg. bodyweight and 3·6 to 4·5 g. per sq. m. body surface. The results for the first 2 diets yielded the equation

$$y = 0{\cdot}4047x - 1{\cdot}4365,$$

where y = N balance and x = N intake, both in g. per sq. m. body surface. From this it was deduced that for N equilibrium 3·55 g. N per sq. m. body surface is required daily, equivalent to 38·2 g. protein from cereals and pulses for an adult of 5 ft. 6 in. and 70 kg., in fairly close agreement with the results of Hegsted *et al.* (Abst. 3303, Vol. 16) for a vegetable protein diet. For wheat 46 g. is tentatively suggested.—W. M. Deans.

3266

WILLIAMSON, M. B. **Protein metabolism during healing of wounds.** *Clin. Chem.*, 1956, **2,** 1–15. [Dept. Biochem., Sch. Med., Loyola Univ., Chicago, Ill.]

A review with 111 references.

3267

REISS, E., PEARSON, E. and ARTZ, C. P. (with BALIKOV, B.) **The metabolic response to burns.** *J. Clin. Invest.*, 1956, **35,** 62–77. [Surg. Res. Unit, Brooke Army Med. Centre, Fort Sam Houston, Tex.]

Balances of N, K, P, Ca, Mg, Na and Cl were measured in 4 men and 1 woman who had burns covering from 25 to 70 per cent. of body surface and of second or third degree. They were given in rotation one of 3 basal diets supplying daily about 2000 Cal., to which was added a mixture of eggs, dried milk and Dextri-Maltose. If the full amounts were taken the patient received about 4700 Cal. and 200 g. protein. Full descriptions are given of the patients' conditions and of the methods of study; charts are reproduced to show the mean daily balances, generally for 10-day periods, during treatment, which lasted in all for between 60 and 180 days.

In the catabolic phase N balance was negative for 28, 36, 31, 30 and 15 days in the different subjects, mainly because of large amounts in urine. With 1 g. N taken as equivalent to 30 g. tissue the patients lost between 8·2 and 11·7 kg. lean body tissue in the catabolic phase. Changes in fat stores were taken as the difference between actual change of weight and the change of lean tissue calculated from the N balance; they were substantial in both catabolic and anabolic phases. In the catabolic phase K balance was variable but generally negative. Ca and P balances were difficult to interpret and changes in Mg balance were parallel to the amounts excreted in faeces. A consistent finding was that, in the early stages, the negative N balance could not be related to the balances of K and P; there may have been destruction of tissue relatively rich in N or retention of K and P in intracellular fluid or with glycogen.

D. Harvey.

3268

Strickler, J. H., Rice, C. O. and Treloar, A. E. **Observations on the relationship of output to intake for total fluids, nitrogen, potassium, sodium, and chloride for perisurgery patients under parenteral nutrition.** *Surgery*, 1956, **39**, 152–160. [Med. Sch., Univ. Minnesota, Minneapolis.]

From an assessment of balance observations collected from 102 adult surgical patients on complete parenteral nutrition for an average of 5 days each, yielding 488 "patient days" for estimation in each of the items under study, it was found that the average patient requires 2·75 litre fluid, 18 g. N, 70 m. equiv. K, 90 m. equiv. Na and 90 m. equiv. chloride every 24 hr. to balance output and thus maintain equilibrium. It is emphasised that each individual must be considered, as many vary greatly from the average.

G. F. Garton.

3269

Schwartz, M. K., Bodansky, O. and Randall, H. T. **Metabolism in surgical patients. 1. Nitrogen metabolism in totally gastrectomized patients. 2. Fat and mineral metabolism in totally gastrectomized patients.** *Amer. J. Clin. Nutrit.*, 1956, **4**, 45–50; 51–60. [Surg. Metabol. Sect., Div. Exp. Surg., Sloan-Kettering Inst., New York.]

1. Seven patients who had had total gastrectomy 4 months to 5 years previously and who were free of recurrent disease at the time of study were given controlled intakes of identical diets during 15 three-day metabolic periods and N excretion was measured. Faecal N was significantly related to N intake. The amount of dietary N necessary to prevent negative N balance was significantly greater in the gastrectomised patients than in normal persons.

2. In the same patients and 2 others fat, Ca, P, Mg and K were estimated in faeces and urine excreted during each metabolic period. Eight of the 9 patients excreted abnormally large amounts of faecal fat. The regression line representing the relation between fat intake and excretion was significantly different from that in normal persons. The average excretion of faecal fat, 20·2 per cent. of the intake, was significantly higher than that calculated from normal persons. The metabolism of Ca, P, Mg and K, as represented by the regression equations relating total excretion to total intake, did not differ in the gastrectomised patients from those in normal persons.—G. F. Garton.

3270

Harris, R., Norman, A. P. and Payne, W. W. **The effect of pancreatin therapy on fat absorption and nitrogen retention in children with fibrocystic disease of the pancreas.** *Arch. Dis. Childhood*, 1955, **30**, 424–427. [Hosp. Sick Child., Gt. Ormond St., London.]

In 12 children treatment with 5 g. pancreatin 4 times a day increased mean fat absorption from 46 to 67 per cent. and mean N balance from − 3·75 to + 1·61 g. Larger amounts of pancreatin, 15 g. 4 times a day, slightly increased fat absorption, to 71 per cent., and substantially increased N retention, to 10·77 g. This last increase was attributed to the N of the pancreatin; the 60 g. daily increased average daily protein intake by about 25 per cent. Children gained weight when given the higher level of pancreatin. The lower level is probably sufficient for enzyme activity.—F. C. Aitken.

3271

Crispell, K. R., Parson, W. and Hollifield, G. (with Brent, S.) **A study of the rate of protein synthesis before and during the administration of l-triiodothyronine to patients with myxedema and healthy volunteers using N-15 glycine.** *J. Clin. Invest.*, 1956, **35**, 164–169. [Dept. Int. Med., Sch. Med., Univ. Virginia, Charlottesville.]

The rate of protein synthesis in 6 patients with primary myxoedema, as measured with ^{15}N-glycine (see Abst. 4569, Vol. 23), was below the range found for 5 healthy volunteers. Five were in slight to moderate positive N balance. The administration of triiodothyronine to 4 of the patients for up to 10 days produced a negative N balance with no consistent change in the rate of protein synthesis. Continued administration in 2 of them restored the N balance and increased the rate of protein synthesis, in one to a normal level. Triidothyronine decreased the rate of protein synthesis in a normal subject and gave a slightly negative N balance.—A. Hepburn.

3272

Krymskii, L. D. Morfologicheskie izmeneniya v razlichnykh organakh pri alimentarnoi belkovoi nedostatochnosti i ikh obratimost. [**Morphological changes in organs in dietary protein deficiency and their reversal.**] *Vop. Pitan.*, 1956, **15,** 28–32. [Inst. Pitan., Akad. Med. Nauk. SSSR, Moscow.]

3273

Heinicke, H. R., Harper, A. E. and Elvehjem, C. A. **Protein and amino acid requirements of the guinea pig. 1. Effect of carbohydrate, protein level and amino acid supplementation.** *J. Nutrition,* 1955, **57,** 483–496. [Dept. Biochem., Univ. Wisconsin, Madison.]

Groups of 5 guineapigs were adapted to mixtures of the experimental diets with 20 per cent. alfalfa meal. One group then received the basal diet of sucrose or dextrin 78, casein 10, maize oil 4, salts 4, potassium acetate 2·5, MgO 0·5, choline chloride 0·35, DL-methionine 0·3, vitamin mixture 0·25 and DL-tryptophan 0·1 per cent. with 18 per cent. roughage in the form of Solka-Floc ; fresh water with added vitamin C was given once or twice daily. For other groups casein or amino acids were added at the expense of carbohydrate. Originally it was intended to measure growth when graded levels of casein, 10 to 30 per cent., were given for 4 weeks, after which the livers would be analysed for fat, but the 10 and 15 per cent. casein groups were discontinued after 2 weeks.

After 4 weeks supplements of urea and amino acid were tried with the 20 and 25 per cent. casein groups, respectively. The 6 groups receiving either sucrose or dextrin and 20, 25 and 30 per cent. casein were used to study the effect of supplements of amino acids in experiments which lasted 4 to 8 days.

No definite protein-sparing action was found with dextrin, and differences between the sucrose and dextrin diets were usually slight. In general, the responses to combined amino acid supplements were slightly greater with sucrose diets, but in a few instances dextrin appeared more effective. The amino acid in shortest supply in casein was arginine, apparently because the guineapig has a high arginine requirement and because of the relatively low level and limited availability of arginine in casein. With supplements of arginine, methionine was limiting in the 25 per cent. casein and sucrose diets and both tryptophan and methionine were limiting in the 20 per cent. casein and sucrose diets. The guineapig was shown to be extremely sensitive to changes in the diet, such as the omission of an essential item or the addition of a component in excess.—G. F. Garton.

3274

Donovan, G. A. and Balloun, S. L. **Effect of dietary protein and energy on chick liver fat accumulation.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 692–694. [Dept. Poultry Husb., Iowa State Coll., Ames.]

Groups of 10-day-old chicks, which had been maintained on a complete basal diet, were fed to appetite for 10 days on 10 different diets which varied in protein content from 14 to 30 per cent. ; 5 diets were of low energy value, 720 Cal. productive energy per lb., and 5 of high energy value, 1055 Cal. per lb.

There was an inverse relation between the amounts of dietary protein and of liver fat ; the energy value of the diet did not appear to influence liver fat.—G. A. Garton.

3275

Dalgliesh, C. E. **Metabolism of the aromatic amino acids.** *Advances in Protein Chem.*, 1955, **10,** 31–150. [Postgrad. Med. Sch., Ducane Rd., London.]

3276

Sassen, A. Revue de la toxicité des acides aminés. [**Review of the toxicity of amino-acids.**] *Acta gastro-enterol. belg.*, 1955, **18,** 944–961. [Lab. Thérap. Exp., Univ. Louvain.] Flemish, English, German and Spanish summaries.

3277

Mellinkoff, S. M., Frankland, M., Boyle, D. and Greipel, M. **Relationship between serum amino acid concentration and fluctuations in appetite.** *J. Appl. Physiol.*, 1956, **8,** 535–538. [Dept. Med., Sch. Med., Univ. California, Los Angeles.]

Serum amino acid and blood sugar were estimated in normal volunteers and patients without disease affecting carbohydrate or protein metabolism at intervals after a breakfast with 20 g. protein, infusions of hydrolysed casein with or without glucose, or ingestion of hydrolysed casein.

Experiments were with from 9 to 13 subjects. When each blood sample was taken the subject was asked whether he was hungry. The serum amino acid concentration was reciprocally related to the crude assessment of the state of appetite in all experiments. The blood sugar was similarly related to appetite after infusions of glucose and hydrolysed casein, but casein alone, infused or ingested, caused both blood sugar and appetite to decrease.—A. Hepburn.

3278

IMPERATO, C., LO BIANCO, S. and SALA, I. Comportamento nel lattante sano e nell'immaturo della curva aminoacidemica e dell'aminoaciduria dopo carico orale di aminoacidi. [**Concentration of amino acids in the blood and urine of healthy and premature infants after oral administration of amino acids.**] *Lattante*, 1955, **26,** 489–503. [Ist. Clin. Pediat., Univ. Parma.] English summary.

Amino-acid N was estimated by Folin's method in the blood of 4 premature and 15 term babies, before and after oral administration of 1 g. per kg. bodyweight of a protein hydrolysate (Nesmida Nestlé). Amino acids were estimated in the urine by paper chromatography before administration of the hydrolysate and for 6 hr. afterwards. The same estimations were made on 3 of the babies given a milk meal with and without the hydrolysate.

The mean value of α-amino N in the blood in mg. per cent. for babies from 1 to 2 months old was 7·6, but for premature infants it was 11·5. After administration of the hydrolysate the peak value was reached within from 30 to 60 min. in premature infants. In term infants the response was much more variable ; some showed little rise, if any.

In the urine response varied greatly in different individuals. In some there was increase in the amount of amino acids, and amino acids not present before appeared in the urine, but in others, and particularly in the premature infants, there was very little change.

After a milk meal the blood value rose somewhat, and after a milk meal with hydrolysate the curve of response was only slightly higher than that with hydrolysate alone. In the urine there was little change after the milk meal, but some increase when the hydrolysate was given as well.—E. M. Hume.

3279

HEIM, L. and KAFFANKE, V. Die funktionsdiagnostische Bedeutung fortlaufender Aminosäurenbestimmungen in Blut und Urin bei kindlicher Hepatitis. [**Importance for the estimation of (liver) function of repeated estimation of amino acids in blood and urine of children with hepatitis.**] *Ann. paediat.*, 1955, **185,** 348–361. [Kinderklin., Univ. Würzburg.] English and French summaries.

The subjects were 19 children from 3 to 13 years old with jaundice, usually due to epidemic hepatitis ; for 10 to 14 days during treatment total amino N was estimated daily in 24-hr. urine and the amino acids were separated by paper chromatography. Serum bilirubin was estimated also.

There was a strong positive correlation between the total output of amino N and the degree of icterus. In one child with haemolytic icterus there was no such relation, and the amino N output remained within normal limits. Serum amino N remained normal in all the children. Alanine and glycine were found in all chromatograms of urine and taurine in most. Glutamic acid, serine and valine were often present, leucine, methionine, proline, threonine and aspartic acid only in the more severely affected patients. In serum amino acids the only change found was a slight increase in taurine in the worst cases.

It is concluded that estimation of amino acids in urine can give a diagnostic test for even the mildest hepatitis.—D. Duncan.

3280

EVERED, D. F. **The excretion of amino acids by the human. A quantitative study with ion-exchange chromatography.** *Biochem. J.*, 1956, **62,** 416–427. [Med. Unit, University Coll. Hosp. Med. Sch., University St., London, W.C.1.]

Daily excretions of amino acids and midday plasma amino acid levels were estimated by ion-exchange chromatography for 5 healthy subjects, one of whom excreted much β-amino*iso*butyric acid, one child with phenylketonuria, one child and 4 adults with the Fanconi syndrome, 2 subjects with the "Hartnup syndrome", a new form of hereditary aminoaciduria, one adult with cystinuria and 2 adults suffering from a new syndrome in which excessive excretion of glycine occurs and is associated with severe osteomalacia.

The normal subjects and each of the patients studied showed distinct patterns of amino acid excretion ; patients with the same syndrome showed characteristically similar patterns. In the patient with phenylketonuria the output of phenylalanine was high and the plasma level was raised, but phenylalanine clearance was normal. Low or normal plasma amino acid levels were found in the adult form of the Fanconi syndrome, the Hartnup syndrome and β-amino*iso*butyric aciduria. The approximate plasma clearances of some amino acids were of the order to be expected of the glomerular filtration rate. The appropriate plasma clearance of β-amino*iso*butyric acid in the subject

who excreted that substance indicated that little, if any, was re-absorbed from the renal tubule, although the other amino acids were excreted in normal amounts by the subject. β-Amino*iso*-butyric acid was estimated in the urine of 15 healthy men and 9 healthy women; 19 subjects excreted 4 to 28 mg., 3 subjects excreted on the average 55 mg. and 2 subjects excreted 177 and 116 mg. daily.—G. F. Garton.

3281

ROSE, W. C., BORMAN, A., COON, M. J. and LAMBERT, G. F. **The amino acid requirements of man. 10. The lysine requirement.** *J. Biol. Chem.*, 1955, **214**, 579–587. [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

For parts 9 and 11 see Absts. 5243, Vol. 25 and 695, Vol. 26.

The minimum L-lysine requirement to maintain N balance in normal young men was 0·4 to 0·8 g. daily and the minimum daily requirement is tentatively designated as 0·8 g.; 1·6 g. daily is recommended as a safe allowance when formulating diets to avoid amino acid deficiencies.

In 2 subjects the administration of D-lysine immediately induced negative N balances, and so it is concluded that little, if any, of the D-isomer is utilised by man.—G. F. Garton.

3282

ROSE, W. C., WIXOM, R. L., LOCKHART, H. B. and LAMBERT, G. F. **The amino acid requirements of man. 15. The valine requirement; summary and final observations.**

ROSE, W. C. and WIXOM, R. L. **16. The rôle of the nitrogen intake.** *J. Biol. Chem.*, 1955, **217**, 987–995; 997–1004. [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

For parts 12, 13 and 14 see Absts. 2002–4, Vol. 26.

15. With the same methods as before, positive N balance was maintained in 5 young men on minimum daily intakes of from 0·8 to 1·6 g. DL-valine. Since L-valine was twice as valuable and D-valine had no value, the minimum daily intake may be expressed as 0·4 to 0·8 g. L-valine, and 1·6 g. L-valine is designed as the safe daily intake.

The work of the whole series of papers, involving 45 human experiments and lasting 12 years, is briefly discussed. The report of Albanese *et al.* (Abst. 2431, Vol. 14) that histidine deficiency led to production of an abnormal indoxyl compound could not be confirmed in tests with 2 subjects, nor could the report from the same source (Holt *et al.*, Title 2376, Vol. 12) that deprivation of arginine adversely affects spermatogenesis.

16. Normal young men received diets with the safe intakes of the 8 essential amino acids and extra N was provided as urea and glycine to bring the daily intake to 10 g. The N balance was studied for 6 days and then the N intake from urea and glycine was reduced in stages, with 4 days for adjustment and a 6-day balance trial at each stage, until the minimum intake compatible with positive balance was found. Intakes of essential amino acids and energy were constant.

There were 2 subjects, each of whom gained weight during the experiment; one weighed initially 82 and the other 67·6 kg. For each the minimum N intake compatible with positive balance was 3·5 g., of which 1·42 g. came from essential amino acids and 0·52 g. was in amino acid isomers believed to be of no value; another 1·21 g. came from glycine and there were small amounts in the rest of the diet. It was concluded that the true minimum requirement was surprisingly small, probably between 2·28 and 2·55 g.—D. Duncan.

3283

AMATUZIO, D. S., HAGEN, P. S. and EVANS, R. L. **The incorporation of N^{15}-labeled glycine in the plasma protein, plasma phospholipids, blood nonprotein nitrogen and splenic tissue in man.** *J. Lab. Clin. Med.*, 1956, **47**, 241–247. [Dept. Med., Univ. Minnesota, Minneapolis.]

Two men, 65 and 73 years old, with hereditary sphaerocytosis were given parenterally glycine labelled with ^{15}N during 24 and 90 hr., respectively. Blood samples were analysed by mass spectrography. The isotope concentration in the phospholipins, plasma protein and N.P.N. rose rapidly to a maximum, the N.P.N. having 3 times as much ^{15}N excess as plasma protein, and then slowly declined. After about 30 days the isotope concentrations in the blood components were almost the same. Curves were drawn from which the rates of disappearance of isotope were calculated. When the spleen was removed from 1 patient after 69 days the splenic pulp (devoid of red blood cells and plasma proteins) had the same excess of ^{15}N as the comparable plasma protein sample.

A. Hepburn.

3284

DESHPANDE, P. D., HARPER, A. E., QUIROS-PEREZ, F. and ELVEHJEM, C. A. **Further observations on the improvement of polished rice with protein and amino acid supplements.** *J Nutrition*, 1955, **57**, 415–428. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

In extension of work already reported (Abst. 699, Vol. 26) groups of 6 rats were given a diet with rice, 87 per cent., and containing maize oil, salts, choline and vitamins. With L-lysine and DL-threonine at 0·4 and 0·5 per cent., respectively, a mixture of histidine, tryptophan, methionine and phenylalanine alone or with arginine, valine, leucine or *iso*leucine prevented deposition of excess fat in the liver but did not improve rate

of growth. When, with these same levels of lysine and threonine, all the essential amino acids were provided, rate of growth was good, but if one acid only were removed it was found that *iso*-leucine, leucine, histidine and, to a less extent, valine were limiting growth; methionine and tryptophan were intermediate in their action and arginine and phenylalanine relatively unimportant. If the amounts of leucine, *iso*leucine, histidine or valine were increased and if tryptophan, methionine and phenylalanine were added, it was still not possible to attain the rate of growth got in the present work with a supplement of good animal protein such as fibrin, pork, casein or kidney meal or in the earlier with a good synthetic diet.

The findings are discussed. It is concluded that more information than is supplied by chemical analyses is required to decide which may be the limiting amino acids in such diets and that a diet which is mainly of rice should, in practice, be supplemented with foods containing well-balanced proteins.—D. Harvey.

3285

SWICK, R. W. and HANDA, D. T. **The distribution of fixed carbon in amino acids.** *J. Biol. Chem.*, 1956, **218,** 577–585. [Div. Biol. Med. Res., Argonne Nat. Lab., Lemont, Ill.]

Rats fed on a diet free of non-essential amino acids and arginine and with $Ca^{14}CO_3$ incorporated much more ^{14}C into the proline, glutamic acid, arginine and aspartic acid of the liver, muscle and small intestine than rats receiving casein. The incorporation into serine, glycine and alanine was only slightly greater. Proline and arginine in the liver seemed to have a precursor other than, or in addition to, glutamic acid, and more than trace quantities of dicarboxylic amino acids could apparently be synthesised from CO_2 and triose.

A. Hepburn.

3286

BAVETTA, L. A. and ERSHOFF, B. H. **Comparative effects of dietary sucrose and cornstarch on tryptophan requirement of the rat.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 349–351. [Dept. Biochem. Nutrit., Univ. S. California, Los Angeles.]

A synthetic diet free from tryptophan was prepared with 60·8 per cent. sucrose and 24 per cent. of an acid hydrolysate; in a variant of this diet the sugar was replaced by an equal amount of maize starch. To groups of 20 weanling female rats each diet was given alone or with added tryptophan, 0·6, 1·8 or 5·4 g. per kg. diet. For 2 more groups the hydrolysate was replaced by whole casein. Records were kept of bodyweight and of weights of ovaries and uteri until death or to 18 weeks of age, the period for which feeding was continued.

After 28 days on the diets without tryptophan 16 rats survived in the starch but only 1 in the sugar group. With the smallest amount of tryptophan the average weights were all much greater in the starch than in the sugar group, but with the 2 larger amounts there was no difference between the groups. Those with intact casein in place of the hydrolysate did best. It is concluded that the source of carbohydrate in a diet modifies the tryptophan requirement of the rat.

D. Harvey.

3287

SCOTT, E. B. **Histopathology of amino acid deficiencies. 4. Tryptophan.** *Amer. J. Pathol.*, 1955, **31,** 1111–1129. [Dept. Anat., Sch. Med., Univ. S. Dakota, Vermillion.]

For part 3 see Abst. 2256, Vol. 25.

4. Four rats received a purified diet containing 19 amino acids, 10 others the same diet except that tryptophan was omitted. Others were pair-fed on amounts of control diet equal to those eaten by deprived rats. All were killed after 30 days and tissues were examined histologically.

Some of the changes were similar to those seen earlier in rats deprived of phenylalanine, threonine or histidine, *i.e.*, reduction in size of acidophil cells of the anterior pituitary and complete destruction of basophil cells producing gonadotropic hormone, atrophy of the testes and accessory sex organs and involution of the thymus. Specific effects of deficiency of tryptophan appeared to be moderate to heavy deposition of fat in liver cells, myocardial lesions and deposition of unidentified crystals in the thymus.—D. Duncan.

3288

ARNSTEIN, H. R. V. and KEGLEVIC, D. **A comparison of alanine and glucose as precursors of serine and glycine.** *Biochem. J.*, 1956, **62,** 199–205. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

The radio-activity of serine, glycine, alanine, aspartic acid and glutamic acid was estimated in the proteins of the mixed internal organs of young rats fed for 13 to 20 days on a synthetic diet containing L-[β-^{14}C]-alanine, L-^{14}C-alanine, D-1-^{14}C-glucose or D-^{14}C-glucose.

Glycine, then serine, had the lowest activity in all experiments. Both aspartic and glutamic acids contained more radio-activity after glucose-1-^{14}C than after uniformly labelled glucose, but glycine was less active. Deficiency of pteroylglutamic acid, but not of vitamin B_{12}, reduced the transfer of ^{14}C from alanine or glucose into glycine but not into serine. Degradation of radio-active serine and glycine originating from uniformly labelled glucose showed a uniform distribution of ^{14}C. Serine from glucose-1-^{14}C had 55 to 65 per cent. of the total radio-activity in the β-carbon atom.

Serine was thought to be an important intermediate in glycine biosynthesis. Serine formation did not require pteroylglutamic acid or previous formation of glycine and apparently utilised a C_3 precursor more closely related to an intermediate of the glycolytic pathway of glucose than to pyruvate.—A. Hepburn.

3289

FORBES, R. M., VAUGHAN, L. and NORTON, H. W. **Studies on the utilization of dietary isoleucine by the growing albino rat. 1. Isoleucine requirements determined with amino acid mixtures.** *J. Nutrition*, 1955, **57**, 593–598. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Studies were made on 28 weanling rats given 6 g. daily of diets containing either 10 or 18 per cent. of amino acid mixture and complete except for *iso*leucine. Seven levels of *iso*leucine to each level of amino acid mixture were obtained by the addition of appropriate amounts of a solution containing 24 mg. DL-*iso*leucine per ml. to each diet, equivalent to 1·5, 2·0, 2·5, 3·0, 3·5, 4·0 and 4·5 per cent. L-*iso*leucine in the amino acid mixture. Each period lasted 6 days; urine was collected for estimation of N during the last 4 days. The experiment was so designed that in 3 experimental periods, each of 7 rats received a different amount of *iso*leucine in each period.

The minimum amount of L-*iso*leucine required to promote minimum loss of N in the urine was found to be 2·2 per cent. of the amino acid mixture, or 2·6 per cent. of the conventional protein equivalent of the diets, irrespective of the total N content of the diet.—G. F. Garton.

3290

MERTZ, E. T. and GOLUBOW, J. **Effect of optical antipodes of 6-hydroxy norleucine (hexahomoserine) on growth and hematopoiesis in rats.** *J. Nutrition*, 1956, **58**, 51–58. [Dept. Biochem., Purdue Univ., Lafayette, Ind.]

Eight groups of 4 weanling female rats were given a ration containing, per 100 g., casein 19, sucrose 29·8, dextrose 37·75, minerals 5·2, cottonseed oil 5, cod liver oil 1, celluflour 2, vitamin B_{12} 2·2 μg. and vitamin supplement 0·25 g.; the ration contained 1·2 per cent. L-lysine, according to microbiological assay of the casein. Hydroxynorleucine replaced an equivalent amount of dextrose in 7 groups. The resolution of 6-hydroxy-DL-norleucine, the preparation of the enantiomorphs of hydroxynorleucine and the optical purity of the enantiomorphs are described. Food and water were given to appetite. The rats were weighed weekly. On the 28th day, red blood cell counts were made on tail blood.

At the highest level of administration, 1 per cent., the D-isomer reduced the average weight gain to about one-fourth of that of the rats not given hydroxynorleucine, without causing a significant reduction in the average red cell count. The same level of the L-isomer reduced the average weight gain to half of that of the controls and the average red cell count to about one-third.

G. F. Garton.

3291

BENTON, D. A., HARPER, A. E., SPIVEY, H. E. and ELVEHJEM, C. A. **Leucine, isoleucine and valine relationships in the rat.** *Arch. Biochem. Biophys.*, 1956, **60**, 147–155. [Dept. Biochem., Sch. Agric., Univ. Wisconsin, Madison.]

For previous work see Abst. 702, Vol. 26.

The addition of 3 per cent. leucine to a basal diet containing 9 per cent. casein, methionine and tryptophan reduced the growth rate of rats and increased the requirement of both *iso*leucine and valine. At high intakes valine, *iso*leucine and phenylalanine each reduced the utilisation of leucine, and they also antagonised one another.

A. Hepburn.

3292

BENTON, D. A., HARPER, A. E., SPIVEY, H. E. and ELVEHJEM, C. A. **Phenylalanine as an amino acid antagonist for the rat.** *Arch. Biochem. Biophys.*, 1956, **60**, 156–163. [Dept. Biochem., Sch. Agric., Univ. Wisconsin, Madison.]

The addition of 3 per cent. phenylalanine or tyrosine reduced the growth rate of rats fed on the basal diet (cf. previous Abst.). Threonine prevented this, but was only partly effective against a supplement of 5 per cent. phenylalanine. When tryptophan was omitted the reduction of growth caused by phenylalanine was not prevented by threonine. Phenylalanine had no specific antagonism and appeared to affect the utilisation of the amino acid most limiting for growth. Fatty infiltration of the liver caused by deficiency of threonine in the basal diet was reduced by phenylalanine.—A. Hepburn.

3293

CZOK, G. and LANG, K. Über einige Wirkungen von L-Glutaminsäure, D-Glutaminsäure und γ-Aminobuttersäure. [**Some actions of L-glutamic, D-glutamic and γ-aminobutyric acids.**] *Arch. exp. Pathol. Pharmakol.*, 1955, **227**, 214–220. [Physiol. Chem. Inst., Johannes Gutenberg Univ., Mainz.]

Rats weighing 200 to 250 g. received a diet of dried milk and wheatmeal with a little cod liver oil, and drinking water to appetite. They were kept in suspended cages which recorded activity. Activity was recorded for 3 hr. beginning 30 min. after administration by stomach tube of water (control experiments) or solutions of L-glutamic

acid, D-glutamic acid or γ-aminobutyric acid; the amino acids were given to 32, 8 and 24 rats, respectively. In relation to control tests, L-glutamic acid and γ-aminobutyric acid significantly increased activity and D-glutamic acid decreased it, but not significantly. The increases in activity with the 2 first-named amino acids were proportional to intake, but were much greater with γ-aminobutyric than with L-glutamic acid.

The irritability of rats as judged by the response to electrical stimulation was increased by all 3 substances, but L-glutamate was 4 times as effective as D-glutamate and 5 times as effective as γ-aminobutyric acid.

In improvement of flavour of meat broth, tested on men and women, L-glutamate was 26 times as effective as D-glutamate.

In toxicity tests with groups of 8 mice the LD50 of all 3 amino-acids was about 12 g. per kg. bodyweight by mouth. Intra-peritoneal injections gave LD50 for L-glutamate 3·75, for D-glutamate 4·70 and for γ-aminobutyric acid 5·2 g. per kg.

D. Duncan.

3294

KLOTZSCHE, C. Zur Frage der erhöhten Acetylcholinbildung im Gehirn nach langdauernder Glutaminsäurefütterung. [**Increased formation of acetylcholine in the brain after long-continued administration of glutamic acid.**] *Arch. exp. Pathol. Pharmakol.*, 1956, **227**, 409–413. [Bundesgesundheitsamt, Pettenkofer Inst., Berlin-Dahlem.]

In normal rats the content of glutamic acid plus glutamine, estimated in the pooled organs of 5 animals by the microbiological method of Hac *et al.* (Abst. 2002, Vol. 15) was for brain 180, liver 95 and kidneys 105 mg. per cent.; in white mice, brain 160, liver 90. Giving 1·25 g. *l*(+)-glutamic acid per kg. bodyweight by mouth [daily ?] for 6 weeks raised the values to 340, 185, 150; 280, 170, respectively. Glutamic acid was known to slow the pulse (Klotsche, *Arzneimittel-Forsch.*, 1954, **4**, 85), but it did not do so in rats in which the pulse rate had been raised by cutting the vagi. This suggested that the reduction of pulse rate was due to increased formation of acetylcholine in the brain.

Since work (*e.g.*, Abst. 1269, Vol. 18) on pernicious anaemia had suggested antagonism between folic acid and glutamic acid or acetylcholine, a test was made with 40 mice which had had glutamic acid for 6 weeks. The pulse rate was low in 26. All had glutamic acid for 4 days more, and 1 mg. folic acid per 20 g. bodyweight daily by subcutaneous injection. The effect was to restore pulse rate to normal in 20 of the 26 and to raise it in 12 of the 14 in which it had not been reduced by glutamic acid.

Another experiment with mice showed that folic acid did not affect the toxicity of the cholinesterase inhibitor diethyl*iso*prophylmethylpyrimidyl-thiophosphoric acid ester (Diazinon "Geigy"), that is, folic acid probably does not affect acetylcholine already formed. Hence the work is taken to support the view that folic acid interferes with the metabolism of glutamic acid in the central nervous system by affecting the formation of acetylcholine.—W. M. Deans.

3295

MEISTER, A. **Metabolism of glutamine.** *Physiol. Rev.*, 1956, **36**, 103–127. [Lab. Biochem., Nat. Cancer Inst., Nat. Inst. Health, Bethesda, Md.]

3296

HARPER, A. E. and BENTON, D. A. **Observations on some nutritional factors that influence the lipotropic activity of methionine.** *Biochem. J.*, 1956, **62**, 440–448. [Dept. Biochem., Univ. Wisconsin, Madison.]

Studies were made on 64 groups each of 6 male weanling rats. Diets were given to appetite; all changes in the basal diet were compensated by adjusting the percentage of sucrose. The basal diet consisted of casein 9, sucrose 82, maize oil 5 and salts 4 per cent., with supplements of vitamins of the B group, halibut liver oil fortified to provide vitamins A, D, E and K, and vitamin C. Other supplements were added in different experiments. The experiments lasted for 2, 3 or 5 weeks; at the end each rat was killed and the liver was removed for estimation of fat.

In experiments which lasted for less than 4 weeks fatty infiltration of the liver occurred when the choline in diets which allowed a satisfactory rate of growth was replaced by methionine. The extent of the fatty infiltration was greater when the diet contained 9 per cent. casein and 12 per cent. gelatine than when it contained 18 per cent. casein or more; this was attributed to the low threonine content and the high arginine and glycine content of gelatine. No abnormal accumulation of liver fat was found in rats given either diet for more than 4 weeks; it is suggested that this is due to an increase in the capacity of the young rat to synthesise choline as it matures and that the effect of gelatine is of significance only during early growth, when the animals received diets relatively high in protein and containing additional methionine in place of choline.

G. F. Garton.

3297

KAUFMAN, N., KLAVINS, J. V. and KINNEY, T. D. **Testicular damage following ethionine administration.** *Amer. J. Pathol.*, 1956, **32**, 105–115. [Dept. Pathol., Cleveland City Hosp., Ohio.]

Groups of rats weighing about 220 g. were fed to appetite on a basal diet of glucose 67, vitamin-free casein 18, maize oil 11 (containing 0·001 ml. haliver oil) and salt mixture 4 per cent., with, per 100 g. diet, thiamine chloride 400, pyridoxine hydrochloride 400, riboflavin 800 μg., nicotinic acid 2·5 and calcium pantothenate 1·5 mg., or the same with 0·5 per cent. DL-ethionine, or were given the basal diet restricted so as to match the weight changes in the group given ethionine. After 28 days some of the rats on ethionine stopped getting it. Rats were killed after 10, 28 and 63 days and changes in the testes were graded histologically; photomicrographs are reproduced.

Rats given ethionine lost weight at first and their subsequent gains were trifling. They showed progressive testicular degeneration, which is described in detail; in rats which stopped getting ethionine, regeneration took place. The results for the rats on restricted food intake clearly showed that it was the ethionine and not the associated reduction of food intake that was to blame. It is suggested that methionine is essential for spermatogenesis.

W. M. Deans.

3298

VEIS, P., SHOSH, I., GATI, T., KHARMOSH, D. and RIGO, YA. Vliyanie diety s nedostatochnym soderzhaniem metionina i lizina na uslovno-reflektornuyu deyatel'nost belykh krys. [**The influence of diets deficient in methionine and lysine on conditioned reflex activity in the white rat.**] *Vop. Pitan.*, 1956, **15**, No. 1, 15–21. [Inst. Patol. Fiziol., Univ. Budapest.]

3299

HAGGAR, R., KINNEY, T. D. and KAUFMAN, N. **Bone healing in lysine-deficient rats.** *J. Nutrition*, 1955, **57**, 305–317. [Dept. Pathol., Cleveland City Hosp., Ohio.]

One hundred and four young adult male rats were divided into 4 equal groups. One group was given a basal, lysine-free diet of zein 22·3, L-arginine 1, DL-valine 1, DL-histidine HCl 0·5, DL-tryptophan 0·2, salt mixture 4, dilute halibut oil 0·5, vitamins of the B group 0·0056, maize oil 10·5 and glucose 60 per cent.; the second group received the basal diet containing 1 per cent. lysine and the third group the basal diet containing 3 per cent. lysine; these 3 groups were fed to appetite. The fourth group was given the basal diet plus 1 per cent. lysine in restricted amount so that their weight loss was equal to that of the lysine-free group. After 21 days the animals were anaesthetised and a surgical lesion was made in each tibia. Two animals from each of the 4 groups were killed at 1½-day intervals up to 9 days, at 3-day intervals up to 24 days and at 32 and 40 days, and the extent of healing of the lesions was examined histologically.

Lysine deficiency and starvation retarded epiphyseal growth but did not retard the healing of the bone lesions. Other effects of lysine deficiency were similar to those produced by restricted food intake and included loss of weight, retarded skeletal and visceral growth and atrophy of subcutaneous fat and muscles. When the lysine was increased from 1 to 3 per cent. there was no effect on growth or the healing of bone lesions.—G. F. Garton.

3300

AWAPARA, J. **The taurine concentration of organs from fed and fasted rats.** *J. Biol. Chem.*, 1956, **218**, 571–576. [Univ. Texas, Houston.]

The average concentration of taurine in μmoles per g. fresh tissue from 6 male and 6 female rats was heart 27·6, spleen 12·2, small intestine 11·4, muscle 10·1, kidney 7·8, uterus 7·2, brain 5·5 and testis 2·2. The concentration in the liver was 5·3 for females and 1·6 for males. In general the tissues of the rat had a higher taurine concentration than those of the guineapig and rabbit. In rabbits taurine was not detected in the liver. Ox and sheep hearts contained much less taurine than pig and rodent hearts.

After fasts of 7 days taurine had increased in the skeletal muscle and liver of male rats and decreased in the liver of females. Other tissues were not affected. Hypophysectomy, and to a slighter extent adrenalectomy, increased the taurine concentration in the skeletal muscle, spleen and kidney of male rats. Adrenalectomy or ovariectomy decreased the concentration in the liver in the female rat. The average taurine excretion in the urine was greatly increased by intake of cysteine, but represented only 20 per cent. of the total cysteine. It was concluded that taurine is utilised for purposes other than the formation of bile salts.—A. Hepburn.

3301

MCCANCE, R. A. and WIDDOWSON, E. M. **Protein catabolism and renal function in the first two days of life in premature infants and multiple births.** *Arch. Dis. Childhood*, 1955, **30**, 405–409. [Med. Res. Counc. Dept. Exp. Med., Univ. Cambridge.]

Two premature babies weighing 2 kg. at birth, 4 pairs of twins weighing between 2 and 3 kg. and 1 set of triplets weighing 1 kg. were studied. Data on concentration of urea in serum and volume and composition of urine in the first 48 hr. of life are tabulated. Only in the triplets was there evidence of abnormally high protein catabolism and impaired renal function.—F. C. Aitken.

See also Absts. 2764, 2797, 2810, 2885, 2995, 3046, 3073–75, 3117, 3162, 3163, 3239, 3375, 3386, 3396, 3435, 3462, 3470, 3477, 3527, 3538, 3622, 3657, 3781, 3890, 3891, 3900, 3927.

FATS AND OTHER LIPIDS

3302

GOLDNER, M. G. **Fat metabolism, obesity and hypercholesterolemia.** *Med. Clins. N. Amer.*, 1955, **39**, 845–862. [Dept. Med., State Univ. New York Coll. Med., Brooklyn.]

An article with 40 references.

3303

MATTEUCCI, G. B. and ABBATANTUONO, N. La curva lipemica alimentare nel lattante normale. **[The curve of alimentary lipaemia in the normal infant.]** *Arch. ital. Pediat. Puericolt.*, 1956, **18**, 65–80. [Inst. Clin. Paediat., Univ. Rome.] French, English and German summaries.

Blood lipids were studied in 54 normal infants aged from 6 days to 7 months, half of them breast-fed and half fed on dried milk. The infants received water only for 12 hr. before fasting values for blood lipids were estimated, and further estimates were made 1, 3, 5 and 7 hr. after a meal, and also after 9 hr. in the artificially fed infants. The latter received milk with 3·5 per cent. fat.

The results are given in tables. Fasting blood lipids ranged in the breast-fed infants from 428 to 585 mg. per 100 ml., mean 513, and in the artificially fed infants from 434 to 580, mean 511. In 18 of the 27 breast-fed infants the peak value was at the third hour after the meal; the greatest increase was 34 and the mean 14·7 mg. per 100 ml. After 5 hr. 5 infants had shown a further increase, but the mean was only 4·4 mg. above the fasting value, and after 7 hr. it was below the fasting value. In the artificially fed group the increase of blood lipids was much greater and more persistent; the mean increase above the fasting value was 48·6 mg. at 3 hr., 54·8 at 5 hr. and 26·6 at 7 hr.; only after 9 hr. was the fasting value regained.

D. Duncan.

3304

DROESE, W. and STOLLEY, H. Untersuchungen über den Fettstoffwechsel im Säuglingsalter. 1. Gesamtfett-, Fettsäuren und Phosphatidbilanzen bei Säuglingen mit parenteralen Infektionen, ein Beitrag zur Pathogenese der parenteral bedingten Ernährungsstörung im Säuglingsalter. **[Metabolism of fat in infancy. 1. Balance of total fat, fatty acids and phosphatides in infants with parenteral infections, a contribution to the pathogenesis of parenterally induced disturbances of nutrition in infancy.]** *Ztschr. Kinderheilk.*, 1956, **77**, 532–543. [Kinderklin., Univ. Kiel.]

Balances of total fat, saturated and unsaturated fatty acids and phosphatides were studied in 15 artificially fed infants aged from 1 to 9 months. Some were convalescent, others had slight respiratory infections without digestive disturbance, or bacterial infections of the skin.

Even slight respiratory infections interfered with the utilisation of dietary fat, but skin infections had little or no ill effect on it. Utilisation of saturated fatty acids and phosphatides was most affected.

Some experiments are described in full.

D. Duncan.

3305

KEYS, A. **The claim of "Lack of effect of high fat intake on serum lipid levels" by Mann, G. V.,** *Amer. J. Clin. Nutrit.*, 1955, **3**, 230. *Amer. J. Clin. Nutrit.*, 1956, **4**, 74–76. [Lab. Physiol. Hyg., Sch. Pub. Health, Univ. Minnesota, Minneapolis.]

A rise in serum lipid levels in response to a high fat intake was reported by Mann (Abst. 5272, Vol. 25) but dismissed by him as statistically unimportant. Keys points out a fallacy in Mann's statistical procedure and indicates that Mann's conclusion was not supported by the data. Mann accepts the statistical implications of Keys's criticism but remains doubtful of the practical importance of the rise in serum lipid.

F. C. Aitken.

3306

MARINA FIOL, C., JIMÉNEZ DÍAZ, C. and ROMEO ORBEGOZO, J. M. Estudios experimentales sobre la esteatorrea de origen pancreatico. **[Experimental studies on steatorrhoea of pancreatic origin.]** *Rev. clín. española*, 1955, **59**, 294–300. [Clín. Méd., Fac. Med., Madrid.] English, German and French summaries.

Fatty acids, neutral fat and total lipids were estimated after diets providing 20 and 70 g. fat daily in normal dogs, dogs with all or part of the pancreas removed and dogs with selective destruction of the acinar cells produced by *dl*-ethionine.

Dogs with the pancreas removed or damaged utilised dietary fat at both intakes as well as did normal dogs, but there was an increase in the percentage of faecal fat because of a decrease in total faecal output.

It is considered that in pancreatic disorders there is no loss of ability to break down fats, but an increased excretion of fat into the intestine and increased deposition of fat in liver and kidneys.

D. Duncan.

3307

MOELLER, H. C., BERNSTEIN, L. M., PALM, L. and GROSSMAN, M. I. **The effect of protamine on**

lipemia. *J. Lab. Clin. Med.*, 1956, **47**, 270–278. [U.S. Army Med. Nutrit. Lab., Fitzsimons Army Hosp., Denver, Colo.]

Ten fasting normal men were given 2 separate intravenous infusions of 500 ml. of a fat emulsion 1 week apart; one infusion was given with and one without protamine sulphate. The fat emulsion contained refined cottonseed oil 15, glucose 4, soya bean phospholipins 1·2 and Pluronic F-68 0·3 per cent. Venous blood samples were taken at intervals up to 300 min. after the infusions and examined for optical density and free and total fatty acid content of the serum.

It was concluded that the simultaneous infusion of protamine with fat emulsion delayed the rate of removal of lipids from the blood. In further experiments in which alimentary lipaemia was induced by giving the fat emulsion by stomach tube the intravenous infusion of protamine brought about a moderate rise of blood lipids above values in the absence of protamine.

Similar studies with rats showed that protamine given by vein increased alimentary lipaemia. When protamine was injected immediately before injection of the fat emulsion the removal of lipids from the blood was delayed; but when the injection of protamine preceded that of the fat emulsion by 15 min. the delay was considerable.

G. A. Garton.

3308

HERTING, D. C., AMES, S. R., KOUKIDES, M. and HARRIS, P. L. **The digestion of acetylated monoglycerides and of triglycerides.** *J. Nutrition*, 1955, **57**, 369–387. [Res. Labs., Distillation Products Indust., Div. Eastman Kodak Company, Rochester, N.Y.]

Lipids were recovered from the stomach, small intestine, caecum and colon and faeces of adult male rats fed for at least 5 days on diets containing about 21·5 per cent. cottonseed oil, lard, hydrogenated lard or distilled acetylated glycerides. The lipids were analysed for free fatty acids, fatty acids from soaps, monoglycerides, di- and triglycerides and, where appropriate, mono-acetylated monoglycerides.

With partly unsaturated triglycerides from lard and cottonseed oil little breakdown of fat occurred in the stomach, though extensive intestinal digestion was accompanied by rapid absorption. The digestion of hydrogenated lard was similar, except that more digestion occurred in the stomach; intestinal absorption was poor in spite of considerable intestinal digestion. Similar findings are reported for the digestion of distilled acetylated saturated monoglycerides. The digestion of distilled, acetylated mixed saturated and unsaturated monoglycerides was intermediate between that for the saturated and unsaturated triglycerides.

G. A. Garton.

3309

KRITCHEVSKY, D., MCCANDLESS, R. F. J. and NORTON, T. W. **The distribution of radioactivity in monkey serum lipids following feeding of triolein-^{3}H.** *Biochim. biophys. Acta*, 1956, **19**, 557–558. [Viral and Rickettsial Res., Res. Div., American Cyanamid Co., Lederle Labs., Pearl River, N.Y.]

Tritium-labelled triolein was given by stomach tube to 2 male Java monkeys and blood samples were taken 2 hr. later and at intervals for 3 or 7 days. Lipids were extracted from the serum and separated into steryl esters, neutral fat, free sterols, phospholipins and fatty acids by chromatography on silicic acid (Abst. 61, Vol. 24); each fraction was assayed for radio-activity.

Most of the radio-activity was found in the neutral fat and fatty acid fractions of the serum lipids between 2 and 6 hr. after the labelled fat was administered.—G. A. Garton.

3310

AMBROSE, A. M. and ROBBINS, D. J. **Studies on comparative absorption and digestibility of acetoglycerides.** *J. Nutrition*, 1956, **58**, 113–124. [Pharmacol. Sect., W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany, Calif.]

The extent of intestinal absorption of several "synthetic" triglycerides was studied in rats. Groups of 10 rats, fasted for 48 hr., were given a meal containing 20 per cent. of the fat under investigation and the amount of fat eaten in 30 min. was calculated. Four hours later the rats were killed for estimation of the fat content of the digestive tract; similar studies on rats starved for 48 hr. gave the amount of endogenous fat. Digestibility coefficients were calculated for each fat according to the procedure of Augur *et al.* (Abst. 2138, Vol. 17). The fats examined included "acetostearins" and "aceto-oleins", defined as acetylated monoglycerides derived from highly hydrogenated lard or vegetable oils and those derived from cottonseed oil or edible lard; similar studies were made with Crisco, a partly hydrogenated vegetable oil.

The aceto-oleins were absorbed to the extent of 76 to 77 per cent., the acetostearins to about the same extent as Crisco, 67 per cent. The acetoglycerides were digested in much the same way as natural fats. The coefficients of digestibility were about 99 per cent. for the aceto-oleins, 80 and 80·8 per cent. for acetostearins melting at 30·7° and 57° C. and 85 per cent. for acetostearin melting at 32·5° C.; for mixtures of 15 per cent. acetostearin and 5 per cent. aceto-olein and for 10 per cent. acetostearin plus 10 per cent. aceto-olein the digestibilities were 85·1 and 93·7 per cent.

The lower digestibility of acetostearins may be due to the formation of calcium stearate in the intestinal tract.—G. A. Garton.

3311

BENTON, D. A., HARPER, A. E. and ELVEHJEM, C. A. **The effect of different dietary fats on liver fat deposition.** *J. Biol. Chem.*, 1956, **218**, 693–700. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Groups of male weanling rats were fed to appetite for 2 weeks on diets containing 20 per cent. maize oil, butterfat, margarine or lard and 9 per cent. casein. The livers were then removed for estimation of ether-extractable fat.

Liver fat values were higher after diets containing butterfat or lard than after margarine or maize oil. This effect was more pronounced when the casein was reduced to 7 per cent. and even greater when choline was omitted from the diet.

In similar experiments it was found that the solid fatty acids, especially stearic acid, of butterfat occasioned a greater deposition of liver fat than did the liquid fatty acids; the unsaponifiable matter of butterfat had no effect.—G. A. Garton.

3312

CONIGLIO, J. G., DARBY, W. J., EFNER, J. A., FLEMING, J. and HUDSON, G. W. **Effect of total body X-irradiation on fat balance and liver lipids in the rhesus monkey.** *Amer. J. Physiol.*, 1956, **184**, 113–118. [Dept. Biochem., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

Adult female rhesus monkeys, initially fed on a stock monkey diet supplemented with 50 mg. ascorbic acid and later given a purified diet containing 5 per cent. cottonseed oil, were exposed to X-rays at 325, 400 and 650 r over the whole body. Faeces were collected before and after treatment and total fat was estimated. Liver lipids of monkeys exposed to 650 r were studied also.

Fat absorption did not appear to be affected by exposure and the increased excretion of fat after exposure was found also in untreated pair-fed animals. Liver lipids of exposed monkeys were similar to those of pair-fed controls.

Some haematological observations are included.

A. K. Lough.

3313

AAES-JØRGENSEN, E., FUNCH, J. P., ENGEL, P. F. and DAM, H. **The role of fat in the diet of rats. 8. Influence on growth of shortening products, 'emulsifier PT 006' and polymerized linseed oil.** *Brit. J. Nutrition*, 1956, **10**, 32–39. [Dept. Biochem. Nutrit., Polytech. Inst., Copenhagen.]

For part 7 see Abst. 3832, Vol. 25.

8. Groups of male rats were reared for 36 weeks from weaning on diets containing 30 per cent. of different shortenings (cooking fats for cakes and pastries), supplying 20 per cent. fat, or 30 per cent. of a 2 : 1 mixture of PT 006 (partial polyglycerol ester of polymerised soya bean oil) and soya bean oil, or a 2 : 1 mixture of PT 006 plus polymerisation distillate and soya bean oil, or a 2 : 1 mixture of polymerised linseed oil and soya bean oil. Control animals were given a diet containing 30 per cent. soya bean oil. Growth rates were recorded and at the end the rats were killed for examination of the carcase and kidneys, liver and small intestine were removed for histological study.

Rats given the diets containing shortenings grew satisfactorily and no pathological change was found in liver or small intestine. All the rats given polymerised linseed oil died during the first half of the experiment. The animals given diets containing PT 006, with or without its polymerisation distillate, grew more slowly than the control group. Histological examination of the tissues showed pathological changes in the kidneys, liver and small intestine.—G. A. Garton.

3314

DOLE, V. P. **A relation between non-esterified fatty acids in plasma and the metabolism of glucose.** *J. Clin. Invest.*, 1956, **35**, 150–154. [Rockefeller Inst. Med. Res., New York.]

"Non-esterified fatty acids" is the term used to define the acids of plasma which are liberated from protein combination by shaking 1 ml. plasma with 5 ml. of a mixture of 40 parts *iso*propanol, 10 parts heptane and 1 part N H_2SO_4; the extracted acids are then estimated titrimetrically.

In studies on human subjects non-esterified fatty acids fell after a mixed meal and remained below fasting values for 2 hr. or more. When a fat meal was given in amount sufficient to cause pronounced lipaemia no effect on non-esterified fatty acids was found. Falls of non-esterified fatty acid values comparable to those after a mixed meal were found after oral administration of 50 g. glucose and after subcutaneous injection of insulin. Very high levels were produced by injection of 0·5 mg. adrenaline.

Normal fasting values for non-esterified fatty acids were recorded for 3 men, each of whom had abnormally high total plasma lipids, neutral fat, cholesterol and phospholipins.

The effects of glucose, insulin, adrenaline and fasting on these fatty acids resembled their effects on ketosis, and it is suggested that both these fatty acids and ketone bodies participate in a metabolic process common to fat and carbohydrate.

G. A. Garton.

3315

GORDON, R. S. (Jr.) and CHERKES, A. **Unesterified fatty acid in human blood plasma.** *J. Clin. Invest.*, 1956, **35**, 206–212. [Lab. Metabol., Nat. Heart Inst., Bethesda, Md.]

In studies similar to those reported in the preceding abstract, unesterified fatty acids in the plasma of several hospital patients were estimated by the method of Davis (Abst. 73, Vol. 18).

Large fluctuations in unesterified fatty acids were found from time to time in normal subjects. Values tended to rise after a fatty meal with eggs, cream, bacon or margarine, but similar increases were found also in fasting subjects. Carbohydrate digestion was accompanied by a fall in unesterified fatty acids, and the intravenous infusion of adrenaline brought about higher values. It is suggested that unesterified fatty acids are the fraction of blood lipids concerned with the supply of fatty acids to the tissues for oxidation.

G. A. Garton.

3316

LIPSKY, S. R., MCGUIRE, J. S. (Jr.), BONDY, P. K. and MAN, E. B. **The rates of synthesis and the transport of plasma fatty acid fractions in man.** *J. Clin. Invest.*, 1955, **34**, 1760–1765. [Dept. Int. Med., Sch. Med., Yale Univ., New Haven, Conn.]

Acetate-1-^{14}C was given by mouth to hospital patients with limited expectancy of life. Blood samples were taken at intervals for up to 48 hr. and the radio-activity of the fatty acids of plasma phospholipins and non-phospholipins was measured.

The formation and turnover of fatty acids in the non-phospholipin fraction was much more rapid than in the phospholipin fatty acids. It is suggested that the non-phospholipins of the plasma may be the major means of transport of fatty acids.

A similar study was made in which large quantities of squalene were given to patients who were also given labelled acetate. The administration of squalene, which depressed utilisation of acetate for cholesterol synthesis, did not affect the incorporation of acetate into plasma fatty acids.

G. A. Garton.

3317

MEAD, J. F., SLATON, W. H. (Jr.) and DECKER, A. B. **Metabolism of the essential fatty acids. 2. The metabolism of stearate, oleate, and linoleate by fat-deficient and normal mice.** *J. Biol. Chem.*, 1956, **218**, 401–407. [Atomic Energy Project, Sch. Med., Univ. California, Los Angeles.]

Methyl stearate, methyl oleate or methyl linoleate, each labelled with ^{14}C in the carboxyl group, was given by mouth to fat-deficient and normal mice. The mice were housed individually in glass metabolism cages and the respired CO_2 was collected hourly for 8 hr. and then 2 and 16 hr. later. The mice were then killed for extraction and analysis of carcase lipids.

As judged by the output of $^{14}CO_2$, the fat-deficient mice metabolised stearate and linoleate at a significantly higher rate and oleate at a lower rate than did normal mice. The extent of incorporation of ^{14}C into cholesterol appeared to be less the more ^{14}C was respired as $^{14}CO_2$. No evidence was obtained to suggest conversion of oleate to linoleate.—G. A. Garton.

3318

TOVE, S. B., ANDREWS, J. S. (Jr.) and LUCAS, H. L. **Turnover of palmitic, stearic, and unsaturated fatty acids in rat liver.** *J. Biol. Chem.*, 1956, **218**, 275–281. [Nutrit. Sect., Dept. Animal Indust., N. Carolina State Coll., Raleigh.]

Weanling male rats on a fat-free purified diet were given an intraperitoneal injection of ^{14}C-carboxyl-labelled acetate. Rats were killed every 4 hr. for 44 hr., beginning 2 hr. after the acetate injections. Fatty acids were prepared from the neutral fat and phospholipin fractions of liver lipids and chromatographed to yield palmitic and stearic acids and unsaturated acids, the specific radio-activity of each of which was studied; specific activity-time curves were then prepared.

Two distinct peaks were found in the specific activity-time curves for the individual fatty acids of the phospholipin and neutral fat fractions; no difference was found in the rates of metabolism of the phospholipin fatty acids and the palmitic acid and unsaturated acids of the neutral fat; the rate of metabolism of the stearic acid of the neutral fat did appear to be slower than that of the other fatty acids. The specific activity of the stearic acid of the phospholipins was about 8 times that of the stearic acid of neutral fat.

G. A. Garton.

3319

KLENK, E. Über die Biogenese der C_{20}- und C_{22}-Polyenfettsäuren. [**Biogenesis of the C_{20} and C_{22} polyene fatty acids.**] *Hoppe-Seyler's Ztschr.*, 1955, **302**, 268–277. [Physiol. Chem. Inst., Univ. Cologne.] English summary.

Adult rats were fed on bread, oats and carrots. One rat received a single dose of labelled acetate, $CH_3{}^{14}COONa$, providing 0·13 mC., and 2 others had a single dose of 0·18 mC.; all 3 were killed 2 hr. later. Three rats received a total of 0·60 mC. in 3 doses in the course of 24 hr. and were killed 6 hr. after the last dose. Livers were prepared as quickly as possible for extraction of fatty acids. In a fourth experiment the liver of 1 rat

was incubated for 6 hr. at 37° C. in Ringer's solution with labelled acetate.

The ^{14}C was found among the dicarboxylic acids mainly in succinic and glutaric acid. It was present also in higher dicarboxylic acids, but malonic acid was only slightly labelled. It was concluded that C_{20} and C_{22} polyene acids in rat liver are formed from linoleic and linolenic acids by addition of acetate at the carboxyl end.

D. Duncan.

3320

OGATA, K., OHTAKE, S., KAWANO, H., KITAGAWA, K., TOMINAGA, H. and AKIYAMA, T. **Experimental study on the toxicity of highly unsaturated fatty acids. Histopathologic reactions induced by this material obtained from cuttle-fish.** *Tokushima J. Exp. Med.*, 1955, **2**, 150–155. [Dept. Pathol., Sch. Med., Tokushima Univ.]

The ethyl esters of the mixed fatty acids of cuttlefish oil were distilled *in vacuo* to yield a fraction of saponification value 163·5, iodine value 344·1 and peroxide value 0. The esters were allowed to oxidise in air at room temperature for 2, 3, 5 and 7 days. The oxidised esters, 0·2 ml., were then given by mouth weekly to white rats which each received 10 g. daily of diet consisting of rice flour 79, casein 10, McCollum salt mixture 3, yeast 3 and water 5 per cent. Animals which died during the 76th to 81st days of the experiment were examined histologically.

In addition to depilation round the mouth and of the legs, decreasing bodyweight and paralysis, the experimental animals showed extensive degenerative changes in the liver, spleen and kidney.

In further experiments 0·05 ml. of another fraction of oxidised ethyl esters was given daily to white rats. The esters, which initially had a peroxide value of 1753, were allowed to oxidise further for 10, 30 and 60 days. [The period during which the esters were given to the rats is not stated, neither is the composition of the basal diet which the animals presumably received.] Histopathological changes are described in liver, spleen, kidney, thyroid, heart, lung, lymph nodes and stomach. The degenerative changes were not as marked after the administration of esters which had continued to oxidise for 60 days, presumably because of reduction in the peroxide value.

G. A. Garton.

3321

MÜLLER, W. A. Stoffwechsel und Wirkungsweise lipotroper Faktoren. [**Metabolism and mode of action of lipotropic substances.**] *Deutsch. med. Wochenschr.*, 1956, **81**, 127–131. [Max Planck Inst. Biochem., Univ. Tübingen.]

A review.

3322

MALINDOW, M. R., HOJMAN, D. and PELLEGRINO, A. A. **Spontaneous atherosclerosis in the rat.** *Arch. Pathol.*, 1956, **61**, 11–19. [Hosp. Ramos Mejía, Buenos Aires.]

A detailed study was made of more than 10,000 arterial sections obtained from 30 male rats of a stock colony of the William strain.

Fifty sections, from 17 of the animals, showed atheromatous or atherosclerotic lesions. It is suggested that such lesions have not been detected in the past in rats because of their rarity and that they are probably not a peculiar feature of the strain examined in this study.—G. A. Garton.

3323

STEINER, A. and DAYTON, S. **Production of hyperlipemia and early atherosclerosis in rabbits by a high vegetable fat diet.** *Circulation Res.*, 1956, **4**, 62–66. [Res. Serv., First (Columbia Univ.) Div., Goldwater Mem. Hosp., New York.] Interlingua summary.

Cholesterol, phospholipin and total fat concentrations were increased, as was the cholesterol : phospholipin ratio, in the serum of rabbits given a diet rich in vegetable fat. Microscopic examination showed lipid infiltration of the ascending and thoracic aorta in 10 of 35 rabbits at the end of 5 to 12 months. Small areas of gross aortic atherosclerosis were found in 2 rabbits.—A. K. Lough.

3324

CHAKRAVARTI, R. N., DE, U. N. and MUKERJI, B. **Studies in experimental atherosclerosis. 1. Effect of feeding different vegetable fats on the pathogenesis of atherosclerosis in animals (rabbit).** *Indian J. Med. Res.*, 1956, **44**, 49–57. [Central Drug Res. Inst., Lucknow.]

Four groups of 6 young Indian inbred rabbits were fed for 28 weeks on a diet of gram, bran and green vegetables, supplemented in 3 of the groups with 5 ml. cottonseed oil, coconut oil or groundnut oil daily. Blood samples were taken at intervals for estimation of total and ester cholesterol, urea N, total protein, albumin and globulin ; the fat content of faeces collected from each animal during 24 hr. was estimated. At the end the animals were killed and the blood vessels and organs were examined visually and histologically for lesions.

The blood cholesterol did not vary much between the 4 groups ; the group fed on coconut oil showed the lowest values. At autopsy, fatty infiltration of the lungs and heart was found in some animals from each group given extra fat ; fatty livers were found in 2 of the rabbits which had had coconut oil. The aortic intima of 2 of those given groundnut oil showed reticular proliferation with deposition of collagen.—G. A. Garton.

3325

FRIEDMAN, M. and BYERS, S. **Role of hyperlipemia in the genesis of hypercholesteremia.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 496–499. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

Sustained elevation of blood lipids was induced in male rats by rapid intravenous injection of 3 ml. of an emulsion containing 10 per cent. sesame oil or coconut oil and 1 per cent. soya bean lecithin, followed by continuous intravenous injection of the same emulsion at the rate of 0·9 to 1·2 ml. per hr. for 12 hr. The rats had each received 3 ml. olive oil by stomach tube 72, 48 and 24 hr. before the experiment. Plasma samples obtained before and immediately after injection of the 3 ml. emulsion and also 12 hr. later were analysed for cholesterol and phospholipins.

Compared with control animals which were given 5 per cent. glucose solution instead of fat emulsion, the experimental animals had high plasma cholesterol values, especially after the fat emulsions had been given for 12 hr. High plasma cholesterol was not found in partly hepatectomised rats which were similarly injected with fat emulsions. High blood fat induced in fasting rats by the injection of protamine was not accompanied by high plasma cholesterol, though high plasma cholesterol was found in rats given olive oil by mouth and injections of protamine.

It is suggested that high plasma cholesterol values associated with high blood fat may be associated with a primary derangement of the metabolism of plasma lipids other than cholesterol.

G. A. Garton.

3326

JONES, R. J. **Serum cholesterol reduction in patients by the oral administration of a brain extract.** *J. Lab. Clin. Med.*, 1956, **47,** 261–269. [Div. Biol. Sci., Dept. Med., Univ. Chicago, Ill.]

Nine patients with coronary artery disease and with high values for blood cholesterol ate about 30 g. daily of ox brain cerebrosides for 3 to 8 weeks. In every patient there was a fall in serum cholesterol, and a significant, though smaller, reduction in the serum phospholipins, neutral fat and β-lipoproteins; α-lipoproteins were not significantly affected.—G. A. Garton.

3327

KRITCHEVSKY, D., MOYER, A. W., LOGAN, J. B. and MCCANDLESS, R. F. J. **Effect of state of administered cholesterol in experimental atherosclerosis.** *Arch. Biochem. Biophys.*, 1955, **59,** 526–527. [Viral and Rickettsial Sect., Res. Div., American Cyanamid Company, Pearl River, N.Y.]

Five groups of 8 to 10 rabbits were fed for 8 weeks on chow with 2 per cent. cholesterol applied in a volatile solvent, chow with 2 per cent. cholesterol applied in a non-volatile solvent, chow with 2 per cent. cholesterol suspended or dissolved in 6 per cent. maize oil, pellets containing 2 per cent. cholesterol and the same pellets mixed with 6 per cent. maize oil. The animals were killed and the thoracic aorta and aortic arch were examined visually for atherosclerotic plaques; serum cholesterol was estimated.

The extent of plaque formation was greatest in the rabbits given chow with cholesterol in a volatile solvent; differences in the extent of plaque formation in the other groups suggested that the form in which cholesterol is administered may be of importance in determining the degree of severity of the resulting atheromatous lesions. Serum cholesterol showed a wide range of values in all the groups.—G. A. Garton.

3328

KRITCHEVSKY, D., MOYER, A. W., TESAR, W. C., LOGAN, J. B., MCCANDLESS, R. F. J. and DAVIES, M. C. **Effect of injected choline citrate in experimental atherosclerosis.** *Amer. J. Physiol.*, 1955, **183,** 535–537. [Viral and Rickettsial Sect., Res. Div., American Cyanamid Company, Pearl River, N.Y.]

Choline citrate injected intraperitoneally at 50 or 250 mg. daily into rabbits on a diet containing 2 per cent. cholesterol in maize oil produced lower serum cholesterol and fewer and smaller atheromata in the arch and thoracic portion of the aorta than were found in rabbits on the same diet without injection. Sodium citrate injected had the same effect on blood cholesterol, but did not affect the extent of the atheromata. Choline chloride injected had no effect on either. None of the salts had any effect when given by mouth.

J. S. Thomson.

3329

ROTH, M. and FAVARGER, P. La digestibilité des graisses en présence de certains stérols. [**The digestibility of fats in the presence of certain sterols.**] *Helv. physiol. pharm. Acta*, 1955, **13,** 249–256. [Inst. Chim. Physiol., Univ. Geneva.]

The addition of cholesterol, sitosterol or ergosterol to olive oil or beef fat in the diet of groups of rats did not significantly alter the digestibility of the fats.

Deuterium-labelled cholesterol, sitosterol or cholestanol was added to the diet of rats which were receiving tripalmitin labelled with deuterium. About 66 per cent. of the tripalmitin was absorbed, and the percentage absorption of cholesterol, sitosterol and cholestanol was 46·6, 27·8 and 27·4. The sterol content of the intestinal wall was

greater when cholesterol was being absorbed than when sitosterol was being absorbed.

It is suggested that the selectivity in the intestinal absorption of the different sterols is not compatible with their being absorbed in the "particulate" state and that a much more finely divided state may be necessary for selective absorption.—G. A. Garton.

3330

COOK, R. P., EDWARDS, D. C. and RIDDELL, C. **Cholesterol metabolism. 7. Cholesterol absorption and excretion in man.** *Biochem. J.*, 1956, **62,** 225–234. [Dept. Biochem., Queen's Coll. (Univ. St. Andrews), Dundee.]

7. The intestinal excretion of unsaponifiable matter was studied in a man aged 45, after ingestion of crystalline cholesterol in olive oil and after cholesterol taken in eggs.

The apparent absorption of crystalline cholesterol in 3 days was about 15 per cent., that of egg cholesterol about 60 per cent. in 4 days. With egg the plasma concentration of esterified cholesterol showed a transitory increase. The composition of the neutral fraction in faecal extract before and after ingestion of cholesterol appears to be similar to that of the rat (Abst. 2043, Vol. 26).

A. K. Lough.

3331

FAVARGER, P., GERLACH, J. and ROTH, M. Étude de la digestibilité du cholesterol chez le rat. [**The digestibility of cholesterol by the rat.**] *Helv. physiol. pharm. Acta*, 1955, **13,** 245–248. [Inst. Chim. Physiol., Univ. Geneva.]

Groups of rats were fed on a diet containing 15 per cent. beef fat in which was 1, 2, 5, 10 or 20 per cent. cholesterol labelled with deuterium. The coefficient of digestibility of the cholesterol was usually 40 to 45 per cent., but only 20 to 30 per cent. when it was administered as 20 per cent. of the beef fat. The coefficient of digestibility of the fat was constant.—G. A. Garton.

3332

FRIEDMAN, M., BYERS, S. O. and ST. GEORGE, S. **Detection of dietary cholesterol-4-C^{14} in the hepatic reticulo-endothelial cell of the rat.** *Amer. J. Physiol.*, 1956, **184,** 141–144. [Harold Brunn Inst. Cardiovascular Res., Mount Zion Hosp., San Francisco, Calif.]

Male rats were injected intravenously with a saline suspension of starch-iron powder daily for 3 days. Before the last injection cholesterol-4-^{14}C in olive oil was given by stomach tube, and the animals were killed within 24 hr. Hepatic reticulo-endothelial cells were separated from parenchymal cells by centrifuging and electromagnetic manipulation. Radio-activity was studied in liver cell fractions and in sterol digitonide extracts of these fractions.

Both reticulo-endothelial and parenchymal cells showed radio-activity 6 and 24 hr. after ingestion of cholesterol.—A. K. Lough.

3333

SCHWENK, E., ALEXANDER, G. J. and FISH, C. A. **Studies on the biosynthesis of cholesterol. 8. Tissue distribution of cholesterol and presence of precursors in intact animals.** *Arch. Biochem. Biophys.*, 1955, **58,** 37–51. [Worcester Found. Exp. Biol., Shrewsbury, Mass.]

The distribution in different tissues of radio-active cholesterol and radio-active substances accompanying it in the nonsaponifiable lipids (HCC) was studied after intraperitoneal injection of acetate-1-^{14}C into rats, guineapigs, dogfish and a rainbow trout.

The main formation of labelled cholesterol in guineapigs and rats occurred in the liver and digestive tract in the period 30 to 60 min. after injection of the radio-active acetate. No HCC were detected in the liver cholesterol of rats except in the first 3 min. of the experiment, though HCC were found in the digestive tract during the first hour after injection; after 4 hr. they were no longer detected. In guineapigs HCC were present with labelled cholesterol in both liver and digestive tract for a considerable time, indicating that these animals do not synthesise cholesterol as readily as rats do. The experiments with fish showed very slow formation of cholesterol, though HCC were found in all tissues examined.

The HCC isolated from rats and guineapigs were given by mouth to rats and shown to give rise to labelled cholesterol.—G. A. Garton.

3334

CURRAN, G. L. and COSTELLO, R. L. **Effect of dihydrocholesterol and soybean sterols on cholesterol metabolism in rabbit and rat.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 52–56. [Dept. Med., Univ. Kansas Sch. Med., Kansas City, Mo.]

Male rabbits were given 3 g. dihydrocholesterol or 3 g. mixed soya bean sterols 3 times a week for 4 weeks; blood and tissue samples were then removed for examination. Groups of rats were fed on diets containing 1 per cent. dihydrocholesterol or 3 per cent. mixed soya bean sterols; 3 animals from each group were killed weekly for 5 weeks and the livers were removed for examination of their sterol content. Liver cell preparations from rabbits and rats were incubated with ^{14}C-carboxyl-labelled acetate and its incorporation into cholesterol was studied.

Soya bean sterols in rabbits produced atherosclerosis, but dihydrocholesterol did not. Liver

tissue from rats and rabbits which had been fed on diets containing dihydrocholesterol and soya bean sterols showed impaired ability to incorporate acetate into cholesterol. Rats given the diet containing 3 per cent. soya bean sterols did not absorb significant amounts of these compounds and no fall in liver sterol values was found.

G. A. Garton.

3335

ROSENMAN, R. H. and SMITH, M. K. **The effect of certain chelating substances (EDTA) upon cholesterol metabolism in the rat.** *J. Clin. Invest.*, 1956., **35,** 11–19. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

The high concentration of plasma cholesterol in rats on a diet rich in cholesterol was much increased when salts of ethylenediamine tetra-acetic acid (EDTA) were included. The effect was greater with disodium EDTA than with tetra-sodium EDTA or disodium calcium EDTA. The plasma cholesterol of rats on a diet with added disodium EDTA but no added cholesterol showed no change in concentration.

Oral administration of disodium EDTA to rats increased the absorption of dietary cholesterol, but did not appear to alter the rate of formation of cholesterol in the liver or the rate of disappearance of cholesterol from the plasma.

A. K. Lough.

See also Absts. 2722, 2869, 2894, 2938, 3118, 3205, 3219, 3223, 3269, 3274, 3296, 3420, 3422, 3423, 3428, 3429, 3512.

MINERALS

GENERAL

3336

SHKOL'NIK, M. YA. Vzaimodeistvie mineral'nykh elementov v obmene veshchestv. [**Interaction of mineral elements in metabolism.**] *Zh. Obshchei Biol.*, 1955, **16,** No. 2, 119–140.

A review.

3337

DAVIS, G. K. Os micro-elementos na alimentação dos animais. [**Trace elements in the nutrition of animals.**] *Bol. Ofic. sanit. panamer.*, 1955, **39,** 381–391. [Agric. Exp. Stat., Florida, U.S.A.] English summary.

A review.

3338

KEYES, P. H. **Dental caries in the Syrian hamster. 7. Increased dental caries activity in animals fed whole-wheat ash diets during the odontogenic period.** *J. Dent. Res.*, 1956, **35,** 95–101. [Harvard Sch. Dent. Med., Boston, Mass.]

For part 6 see Abst. 4017, Vol. 25.

7. Caries was produced in 3-week-old male and female Syrian hamsters given mineral-deficient diets for 100 days. The principal source of mineral was 2 per cent. whole wheat ash and 7 per cent. whole dried milk, or 4 per cent. whole wheat ash alone. The nature of the mineral deficiency has not been specifically defined.—G. F. Garton.

See also Absts. 3267, 3269.

CALCIUM AND PHOSPHORUS AND STRONTIUM

3339

PLIMPTON, C. A. **Calcium metabolism in health and disease.** *Med. Clins. N. Amer.*, 1955, **39,** 881–898. [Coll. Phys. Surg., Columbia Univ., New York.]

3340

HARRISON, H. E. **The interrelation of citrate and calcium metabolism.** *Amer. J. Med.*, 1956, **20,** 1–3. [Baltimore City Hosps., Md.]

3341

GLIDDEN, M. A., MORRISON, R. I. and MOSCHETTE, D. S. **Metabolic studies with pre-adolescent girls. 4. Utilization of calcium.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 29–35. [Dept. Home Econ., Louisiana Agric. Exp. Stat., Baton Rouge.]

The daily Ca intake, excretion and retention were estimated in 6 healthy pre-adolescent girls, 8-year-old twins, two 9-year-old girls and 2 sisters aged 8 and 11, during a 56-day experiment. The experiment consisted of 9 collection periods: periods 1 to 3 formed the first basal period, 4 and 5 the first experimental period, 6 and 7 the second basal period and 8 and 9 the second experimental period. The first period was used for adjustment and analytical values were not included. During the first basal period the subjects received a milk-free diet devoid of vitamin A and carotene which met the U.S. National Research Council recommendations (Abst. 3538, Vol. 24) for energy, protein, Fe, nicotinic acid and ascorbic acid; supplements of vitamin B_1 hydrochloride, riboflavin and Ca in the form of calcium lactate were given to meet the recommended allowances. As the study was designed to investigate the utilisation of carotene from sweet potatoes by girls on diets with and without fat-free milk, the sources of fat were controlled and no carotene or vitamins A or D were included. In the first experimental period 3600 μg. carotene as sweet potato was added to the basal diet. For these 2 periods 3 subjects received reconstituted non-fat dried milk as a daily source of 1 g.

Ca and the other 3 subjects received calcium lactate. The plan for the second basal and experimental periods was identical with the first, but the groups of 3 subjects were reversed. During the basal period 3 menus were rotated; 2 were modified by adding sweet potatoes and non-fat dried milk solids and given alternately during the experimental periods. The menus were isocaloric and equal in N content and in fat content. Weighed amounts of fondant were allowed to appetite; the 11-year-old girl was allowed extra meat.

The daily mean intake of Ca was 0·85 g.; 5 of the 6 subjects were in negative Ca balance. More Ca was excreted when Ca was supplied as lactate than when it was provided by dried milk. The daily mean urinary Ca excretion ranged from 0·078 to 0·163 g. and accounted for 9·2 to 19·2 per cent. of the intake. The urinary excretion was relatively constant for each subject. The daily mean faecal Ca excretion ranged from 0·726 to 0·848 g., representing from 85·8 to 99·9 per cent. of the intake. This resulted in a daily mean loss of 0·068 g. Ca for 5 of the subjects, with loss ranging from 0·110 to 0·033 g. The 11-year-old subject retained 0·020 g. The retention of all the subjects appeared to increase when dried milk was added to the diet. This addition also increased the calculated P intake from a mean of 0·49 g. to 1·12. The increase in the P intake to a 1 : 1 ratio with Ca was stated to be the main cause of the apparent improvement in Ca retention.—G. F. Garton.

3342

BRINE, C. L. and JOHNSTON, F. A. **Endogenous calcium in the feces of adult man and the amount of calcium absorbed from food.** *Amer. J. Clin. Nutrit.*, 1955, **3**, 418–420. [New York State Coll. Home Econ., Cornell Univ., Ithaca.]

Faecal excretion of Ca was plotted against Ca intake and the curve was extrapolated to zero to give an estimate of endogenous Ca. On the basis of data from 51 published reports the estimate of endogenous Ca was 75 mg. daily. The data on Ca intake less Ca excretion were then corrected for endogenous Ca to give the amounts of Ca absorbed. At intakes of 400 to 599 mg. daily the percentage absorbed was 43, at intakes of 600 to 999 mg. 34 to 35 and at intakes of 1000 to 1199 mg. 28.—F. C. Aitken.

3343

BRONNER, F., HARRIS, R. S., MALETSKOS, C. J. and BENDA, C. E. **Studies in calcium metabolism. The fate of intravenously injected radiocalcium in human beings.** *J. Clin. Invest.*, 1956, **35**, 78–88. [Dept. Food Technol., Massachusetts Inst. Technol., Cambridge, Mass.]

Nine adolescent boys were studied for 5 days and one young man was studied for 60 days after an injection of ^{45}Ca. The estimated rate of disappearance for serum Ca in the boys was about 19 per cent. per min. The average percentage of injected ^{45}Ca excreted in urine and faeces in 5 days did not exceed 8 in the boys and was 20 in the young adult. At the end of 60 days the young man had excreted 40 per cent. of the injected ^{45}Ca. The amounts excreted in urine were 1·5 to 2 times the amounts excreted in faeces.

F. C. Aitken.

3344

MACDONALD, W. B. and STAPLETON, T. **Idiopathic hypercalcaemia of infancy. Studies of the mineral balance.** *Acta paediat.*, 1955, **44**, 559–578. [Paediat. Unit, St. Mary's Hosp. Med. Sch., London.] French, German and Spanish summaries.

Three cases of idiopathic hypercalcaemia are reported. In 2, Ca, P and Mg balances were studied while the diet was cow's milk or dried cow's milk without added vitamin D, a therapeutic diet of Ca-free milk followed by a therapeutic diet of Ca-free milk and Ca-free cereal rich in phytic acid and finally a mixed diet with cow's milk. In the third child balance studies were not made; this patient refused the cereal of the second therapeutic diet. In all 3, estimations were made of serum Ca, P, Mg, proteins, cholesterol, blood urea and alkaline phosphatase. Each patient was treated with cortisone for 2 to 4 weeks during the study. Ca-free milk, and to a greater extent Ca-free milk with Ca-free cereal, converted positive Ca balances to negative balances, and both diets reduced serum Ca. Cortisone also reduced serum Ca and caused negative Ca balances. No significant change was observed in Mg and P balances during treatment. Treatment which reduced serum Ca also brought down serum P and blood urea.

F. C. Aitken.

3345

SCHLESINGER, B. E., BUTLER, N. R. and BLACK, J. A. **Severe type of infantile hypercalcaemia.** *Brit. Med. J.*, 1956, i, 127–134. [Hosp. Sick Child, Gt. Ormond St., London.]

The findings in 3 more children with severe infantile hypercalcaemia, 2 of whom died, and the information supplied by groups of physicians who together have had 7 others in their care are summarised and discussed. In addition to the high blood Ca the amounts of urea and cholesterol in the blood were often above normal, and an abnormal facies, retardation of both physical and mental growth and osteosclerosis were the common physical signs. The cause remains unknown. Treatment suggested is by diet free from vitamin D and including low-calcium milk, which is now available in Britain.—D. Harvey.

3346

SPENCER, H., BROTHERS, M., BERGER, E., HART, H. E. and LASZLO, D. **Strontium^{85} metabolism in man and effect of calcium on strontium excretion.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 155–157. [Div. Neoplastic Dis., Montefiore Hosp., New York.]

^{85}Sr was injected intravenously into 4 human subjects at 0·1 to 0·4 μC. per kg. bodyweight, and the rates of excretion in urine and faeces were studied.

In a 72-year-old woman the study continued for 16 days, by which time 34·5 per cent. of the dose had been excreted in urine and 16·3 per cent. in faeces.

When a second injection was given at the mid-point of a 2-hr. infusion of calcium gluconate the renal clearance of Sr increased; 5 to 15 times as much Sr was found in the hour after injection as in the absence of treatment.—R. Hill.

3347

HARRISON, G. E., RAYMOND, W. H. A. and TRETHEWAY, H. C. **The metabolism of strontium in man.** *Clin. Sci.*, 1955, **14,** 681–695. [Med. Res. Counc. Radiobiol. Res. Unit, Atomic Energy Res. Establishment, Harwell, Berks.]

3348

BAUER, G. C. H., CARLSSON, A. and LINDQUIST, B. **A comparative study on the metabolism of Sr^{90} and Ca^{15}.** *Acta physiol. scand.*, 1955, **35,** 56–66. [Dept. Pharmacol., Univ. Lund.]

Two-month-old rats, fed on a stock diet, were killed at intervals ranging from 15 min. to 48 hr. after an intraperitoneal injection containing 15 μC. ^{45}Ca and 0·25 μC. ^{90}Sr. Retention in the body and uptake by the skeleton of radio-active Ca and Sr were studied.

The losses of ^{90}Sr were greater in faeces and urine than those of ^{45}Ca, and the retention of Sr was less than the retention of Ca. But the accretion and exchange of ^{90}Sr in the skeleton were similar, relative to the dose given, to the accretion and exchange of ^{45}Ca.—R. Hill.

3349

BAUER, G. C. H., CARLSSON, A. and LINDQUIST, B. **Some properties of the exchangeable bone calcium.** *Acta physiol. scand.*, 1955, **35,** 67–72. [Dept. Pharmacol., Univ. Lund.]

The specific activities of serum Ca and the exchangeable fraction of bone Ca after an injection of ^{45}Ca (see preceding Abst.) indicated that the exchangeable fraction of bone Ca is not uniform. It is suggested that there are probably a large number of fractions which exchange Ca at different rates, attaining the specific activity of blood at intervals up to about 8 hr. after injection.—R. Hill.

3350

ALEXANDER, G. V., NUSBAUM, R. E. and MACDONALD, N. S. **The relative retention of strontium and calcium in bone tissue.** *J. Biol. Chem.*, 1956, **218,** 911–919. [Atomic Energy Project, Sch. Med., Univ. California, Los Angeles.]

The femurs of rabbits, rats and mice of different ages which had been fed on stock diets were ashed and Ca and Sr were estimated in the ash. The ratio of Sr to Ca in animals given the same diet was relatively constant for a particular species over a wide age range.

Sr and Ca were estimated in the diets and the ratios in diet and bone were compared. They indicated preferential utilisation of Ca in bone metabolism. In animals allowed to reach equilibrium on a particular diet the Sr : Ca ratio of the bone ash would apparently be between 0·15 and 0·40 of the ratio in its diet.

There were species differences in retention of Sr, but it is suggested that for a given species it may be possible to predict retention in the skeleton from a knowledge of the Sr : Ca ratio of the diet.

R. Hill.

3351

MACDONALD, N. S., SPAIN, P. C., EZMIRLIAN, F. and ROUNDS, D. E. **The effects of calcium and phosphate in foods on radiostrontium accumulation.** *J. Nutrition*, 1955, **57,** 555–563. [Atomic Energy Project, Sch. Med., Univ. California, Los Angeles.]

The incorporation of ^{90}Sr in equilibrium with ^{90}Y into the femurs of rats after it was given by mouth was reduced when the diet contained much Ca. This reduction was even more pronounced when the P intake was also high. It is suggested that the inhibitory effect of Ca is related to the metabolic dilution of ^{90}Sr with total alkaline earth ions, and that the effect of phosphate is probably due to precipitation of ^{90}Sr ions in the intestine. Anomalous results were obtained with dried milk powder, which did not significantly reduce accumulation of ^{90}Sr. In preliminary experiments ethylenediamine tetra-acetic acid given by mouth increased the accumulation of ^{90}Sr in the femur.

C. F. Mills.

3352

RAOUL, Y. Problèmes de la calcification. [**Problems of calcification.**] *Ann. Nutrit. Alimentation*, 1955, **9,** 219–249. [Fac. Pharm., Paris.]

A review.

3353

KUMAMOTO, Y. and LEBLOND, C. P. **Radioautographic study of mineralization of growing teeth with labeled calcium.** *J. Dent. Res.*, 1956, **35,** 147–156. [Dept. Anat., McGill Univ., Montreal.]

Young rats were given an injection containing 1 μC. radio-active Ca either on the day of birth or 3 days later. Two animals which received this injection 3 days after birth were given another injection 6 days after birth. Rats were killed at intervals up to 9 days after birth, sections were cut or ground and radio-autographs were prepared.

There was no great difference between the results from rats injected at birth and those injected 3 days after birth. The dentine of sections from rats killed 1 hr. after injection was radio-active in the region adjacent to the predentine, and in rats killed later this radio-active band was further from the predentine owing to the secretion of new non-radio-active dentine. The rate of formation of dentine, measured on sections of animals given 2 injections, was about 18 μ. daily.

No similar pattern of deposition of radio-active Ca was found in enamel, where radio-activity was more diffuse than in dentine. Ca appeared to be deposited as readily in enamel formed before the injection was given as in enamel formed just after the injection.—R. Hill.

3354

TROITSKII, N. A. Dermografizm i elektrochustivitelnost pri mineralnoi nedostatochnosti v organizmakh sviniei. [**Dermographism and sensitivity to electrical stimuli of pigs with mineral deficiency.**] *Veterinariya*, 1955, **32**, No. 10, 62–64. [Smolensk. Vet. Inst.]

Early stages of mineral deficiency are said to be characterised by delayed reflexes, low muscle tone, increased action of the sympathetic and diminished action of the parasympathetic nervous system. Dermographism and changes of sensitivity to electrical stimuli were tried as methods of early diagnosis.

Normal dermographism was studied on 32 healthy pigs 3 to 8 months old. A dermograph, spring-loaded to ensure constant pressure, was drawn over the chest. In 15 animals, with a latent period of 0·5 to 3·5 min. after drawing there appeared a faint red line visible for 0·4 to 3 min. In the other 17 pigs the red line was preceded by a faint white line. Clinical and biochemical tests of Ca and P status showed no deviation from normal. To study sensitivity to electrical stimuli galvanic current was used. The anode was in contact with the breastbone, and the cathode, in the form of a metal tube filled with damp cotton-wool, was in contact with the ulna. The current was increased by steps until there was a quick flexion of the wrist. In healthy pigs this threshold was 8 to 9 milliamps. Another 156 pigs were kept on a potato diet deficient in vitamin D and containing an excess of P. In winter, after 2 to $2\frac{1}{2}$ months, a change in dermographism was found in 85 out of 156 pigs; the latent period was shorter, 10 to 40 sec., and instead of the faint red line a very distinct white line appeared for 5 to 20 sec. and changed to a bluish-red line vanishing after 3 to 5 min. X-rays showed no bone disorder, but serum Ca was only 6 to 8 mg. per 100 ml. and P as high as 10 or 12 mg. In 82 per cent. of the pigs the sensitivity to electrical stimuli increased proportionally with changes in the blood. With Ca at 7 to 8 mg. per 100 ml. and below, the galvanic threshold was reduced to 4 to 5 milliamps. or less.

Large doses of vitamin D, 300,000 to 400,000 I.U., and change of diet arrested the development of mineral deficiency. Dermographism and electrical sensitivity returned to normal.

It is concluded that a white changing to bluish-red dermographism and increased sensitivity to electrical stimuli indicate a change of balance between Ca and P in the blood and thus help early diagnosis of mineral deficiency.—F. Billewicz.

3355

VALETTE, G. and CALDERON, C. E. Effet de la teneur du régime alimentaire en calcium sur la sensibilité du cobaye à l'histamine. [**Effect of the calcium content of the ration on histamine sensitivity in the guineapig.**] *C.R. Acad. Sci.*, 1956, **242**, 1228–1230.

For previous work see Abst. 2067, Vol. 26.

Groups of 5, 8 and 7 guineapigs were given a normal diet alone or with 100 mg. calcium gluconate, or a diet poor in Ca, during the 8 days before the start of experiment. The animals were anaesthetised and given, by jugular vein, 0·2 mg. per ml. histamine hydrochloride at the rate of 0·5 ml. per min. The injection was continued until the animal died and the volume of solution injected into the animal at the moment of cardiac failure was noted. In a similar experiment on 7 groups, each of 10 guineapigs, the histamine hydrochloride solution was administered by stomach tube; the same quantity per kg. bodyweight was given to all the animals of each group, the percentage of animals which died being noted. Three groups received the normal diet, 2 the high-Ca and 2 the low-Ca diet.

In both experiments animals which received the high-Ca diet acquired resistance to the toxic effects of histamine and those on low-Ca diets were more sensitive to histamine toxicity.—G. F. Garton.

3356

WRIGHT, E. **The uptake of phosphorus by the sheep. 1. The excretion of injected radio-phosphorus. 2. The availability of the phosphorus of a diet of hay and concentrates.** *N.Z. J. Sci. Technol.* [*A*], 1955, **37**, 332–348. [Animal Res. Stat., Dept. Agric., Wallaceville.]

1. Romney ewes and one crossbred Romney wether were fed once daily on 1 kg. chaffed ryegrass and clovery hay and 250 g. "sheepnuts".

Urine and faeces were collected separately. Orthophosphate labelled with ^{32}P was given intravenously, the 4 sheep receiving, respectively, 1, 2, 10 and 10 mC. Excretion of ^{32}P is shown in tables and graphs.

Faecal output of ^{32}P showed a diurnal rhythm in all 4 sheep, with greater excretion by day than by night. The diurnal rhythm sometimes appeared also in urine, but in one sheep the nocturnal excretion exceeded the diurnal for 3 consecutive days. There was a variable time lag between peaks of excretion in urine and in faeces, and the specific activity of the urine could be used in the estimation of endogenous faecal P.

2. By similar methods it was found that in 2 sheep the percentage of dietary P absorbed varied widely from day to day, with extremes of 32 to 78 in one sheep and 63 to 100 in the other. There was a significant positive correlation between the amount of P absorbed on a given day and the P balance; hence under the experimental conditions balance was thought to be determined by absorption and not by excretion.—D. Duncan.

3357

SCHREIER, K. and NÖLLER, H. G. Stoffwechselversuche mit verschiedenen markierten Polyphosphaten. [**Metabolism experiments with some labelled polyphosphates.**] *Arch. exp. Pathol. Pharmakol.*, 1955, **227**, 199–209. [Kinderklin., Univ. Heidelberg.]

The 4 sodium polyphosphates which were labelled with ^{32}P were pyrophosphate, $Na_4P_2O_7$; tripolyphosphate, $Na_5P_3O_{10} . 6H_2O$; a polyphosphate with 62 per cent. P_2O_5, called polyphosphate 62; and hexametaphosphate or Graham salt. Each was given to rats in a dose of 30 mg. in 1 g. skimmed milk cheese and 3 ml. skimmed milk by stomach tube. After 12 to 24 hr. the rats were killed by bleeding and ^{32}P was estimated in liver, digestive tract, brain and the long bones of the right hind leg, and also in blood fractions.

All the salts were absorbed and utilised, Graham salt least. It appeared that the other 3 salts were mostly hydrolysed in the intestine and absorbed as orthophosphate. Bacteria from rat intestine incorporated the labelled polyphosphates and also broke them down to orthophosphate.—D. Duncan.

See also Absts. 2963–65, 3037, 3137, 3256, 3264, 3471, 3539, 3627.

MAGNESIUM

See Absts. 3138, 3344.

SODIUM, POTASSIUM, AND SODIUM CHLORIDE

3358

CORSA, L. (Jr.), GRIBETZ, D., COOK, C. D. and TALBOT, N. B. **Total body exchangeable water, sodium and potassium in "hospital normal" infants and children.** *Pediatrics*, 1956, **17**, 184–191. [Dept. Paediat., Harvard Med. Sch., Boston, Mass.] Spanish and Interlingua summaries.

New data, obtained in a study of 18 children, are tabulated. Graphical presentation of these observations, together with data from the literature, shows high levels of exchangeable water and Na in young infants, decreasing towards adult level during the first 2 years of life, and a fairly uniform level of exchangeable K at all ages. Estimations of cell K concentration show little change with age.—F. C. Aitken.

3359

STAPLETON, T. **The pattern of the electrolyte excretion in the urine of babies born to diabetic mothers.** *Arch. Dis. Childhood*, 1956, **31**, 42–43. [Paediat. Unit, St. Mary's Hosp. Med. Sch., London.]

Urinary excretion of Na, K and Cl during the first 3 days of life, expressed as m. equiv. per kg. of the lowest weight during the first 3 days, was within normal limits in 5 babies born to diabetic mothers.—F. C. Aitken.

3360

DENTON, D. A. **The effect of Na^+ depletion on the $Na^+ : K^+$ ratio of the parotid saliva of the sheep.** *J. Physiol.*, 1956, **131**, 516–525. [Dept. Physiol., Univ. Melbourne.]

The volume of saliva secreted from one parotid gland of the sheep changed with the feed even though the Na intake was constant. This may be related to the length of time spent in rumination. The volume and composition of saliva were sensitive to sodium depletion. If the Na lost in the saliva was not replaced the volume secreted rapidly decreased and its Na content was reduced and partly replaced by K. The P content of the saliva also increased. Increasing the Na intake above normal by giving $NaHCO_3$ caused a decrease in the volume of saliva and an increased concentration of Na.—A. T. Phillipson.

3361

HARRISON, K. **A review of the metabolism of potassium.** *Med. J. Austral.*, 1954, i, 285–290. [Royal Prince Alfred Hosp., Sydney.]

3362

HOLLAND, W. C. and AUDITORE, G. V. **Distribution of potassium in liver, kidney and brain of the rat and guinea pig.** *Amer. J. Physiol.*, 1955, **183**, 309–313. [Dept. Pharmacol., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

The distribution of K in liver, kidney and brain of young adult guineapigs and albino rats was

studied by flame photometry. About 65 to 80 per cent. of the tissue K was in solution in the cytoplasm and 12 to 13 per cent. was in the mitochondria, except that in the brain 30 per cent. or more of the total K was in the mitochondrial fraction. No K was detected in the microsomal fraction.

It is suggested that the K present in the mitochondria may be the slowly exchanging or non-exchangeable fraction found in studies on the uptake of radio-active K by the brain and kidney.

G. F. Garton.

3363

WESTERINK, D., OFFERIJNS, F. G. J. and WILLEBRANDS, A. F. De invloed van kaliumdeficiëntie op het gehalte aan water en electrolyten in serum en spierweefsel bij de rat. [**Effect of deficiency of potassium on the water and electrolyte content of serum and muscle in the rat.**] *Nederland. Tijdschr. Geneesk.*, 1955, **99,** 3342–3348. [2 Klin. Inw. Ziekten, Wilhelmina Gasthuis, Amsterdam.] English summary.

The experimental diet contained, in g. per kg., sugar 725, vitamin-free casein 180, oil 50, minerals 40 and cod liver oil 5. The mineral mixture contained no K. A mixture of vitamins of the B complex was given. One group of rats weighing 60 to 90 g. received this diet alone, the other group had 3·35 g. K_2HPO_4 per kg. diet. The low-K diet contained less than 0·1 m. equiv. K per 100 g. After 21 or more days on these diets the rats were decapitated and blood was collected and samples of muscle were obtained. Water and electrolytes were estimated.

The rats deprived of K had in comparison with those given K significantly less serum K and Cl, 3·95 and 94 m. equiv. per kg. water compared with 7·15 and 118 m. equiv. The water content of muscle was not significantly increased, but the proportion of extracellular water was increased. Muscle Na was increased from 22·5 to 50 m. equiv. per kg. fat-free muscle, extracellular Na from 19·5 to 26·5 and intracellular from 3 to 24·5. Muscle K had fallen from 104·5 to 68 m. equiv. per kg.; almost all of it was intracellular in both groups. Muscle chloride was unchanged. Intracellular fluid was estimated to contain 41·5 m. equiv. Na and 112·5 m. equiv. K per kg. water in the deprived rats and 5 and 163 m. equiv. in those given K.

D. Duncan.

3364

TALEISNIK, S. Régénération hépatique chez les rats soumis à des diètes sans potassium. [**Liver regeneration in the rat on potassium-free diets.**] *C.R. Soc. Biol.*, 1955, **149,** 1659–1660. [Inst. Recherches Méd., Mercedes et Martin Ferreyra, Cordoba.]

After removal of two-thirds of the liver 15 rats received a diet deficient in K and 18 rats received the same diet plus KCl for 10 days. Both groups regenerated liver equally well and the lipid and water contents of the liver were the same. The rats not receiving K gained less bodyweight and had less protein in the liver than the others.

A. Hepburn.

See also Absts. 3207, 3208, 3268, 3393.

HALOGENS

3365

SCHLESINGER, E. R., OVERTON, D. E. and CHASE, H. C. **Study of children drinking fluoridated and nonfluoridated water : quantitative urinary excretion of albumin and formed products.** *J. Amer. Med. Assoc.*, 1956, **160,** 21–24. [New York State Dept. Health, Albany.]

Ten years after the start of fluoridation in Newburgh, overnight urine specimens were collected from a hundred 12-year-old boys from Newburgh and a hundred from Kingston, the control town. The urines did not differ significantly in sp. gr., *p*H, or content of albumin, red blood cells or casts.—A. M. Thomson.

3366

MUHLER, J. C. and WEDDLE, D. A. (with STEWART, J. O.) **Fluorine storage in rats receiving different fluorides in the drinking water at varying pH.** *J. Dent. Res.*, 1955, **34,** 895–899. [Dept. Chem., Indiana Univ., Bloomington.]

In continuation of earlier work (Abst. 3899, Vol. 25), 4 groups of Sprague Dawley rats, over 220 in all, given a cariogenic maize diet (Abst. 5468, Vol. 20) from 30 days of age, had 20 μg. F per ml. drinking water as stannous fluoride, stannous chlorofluoride or sodium fluoride, or none, and sub-groups had the *p*H of the water adjusted to 2, 4 or 6 by addition of HCl or NaOH. Drinking water was restricted in amount to that taken by the least thirsty group. After 140 days the rats were killed, caries was evaluated and F was estimated in femurs.

There was some difficulty in distinguishing between caries and erosion by acid at *p*H 2, but all 3 fluorides were considered to reduce caries by at least 50 per cent. At *p*H 4 or 6 the tin fluorides were only about half as effective as at *p*H 2, and NaF was only half as effective as they were. It is stated that under the conditions of this experiment NaF and SnF_2 gave the same amount of F in the femur [Table 1, p. 897, seems to be faulty; some items omitted, others duplicated].

When rats in groups of 4 were given 2 mg. F daily for 14 days as a solution of NaF, sodium monofluorophosphate, SnF_2 or stannous chlorofluoride by stomach tube, the total amounts found

in the femurs and in the whole body did not greatly differ but the whole body contained less F when the monofluorophosphate or chlorofluoride was used. Only about half the F given was retained.—W. M. Deans.

3367

WEDDLE, D. A. and MUHLER, J. C. **Metabolism of small concentrations of fluorine in the albino rat.** *J. Dent. Res.*, 1955, **34,** 900–909. [Dept. Chem., Indiana Univ., Bloomington.]

Of groups of Sprague Dawley rats [number not stated], housed individually in stainless steel cages and given a stock diet of maize, F content 0·56 μg. per g., one had distilled water, F content 0·06 μg. per g., to 28 days of age and the other 50 μg. F per ml. drinking water as NaF from 14 to 28 days of age. Thereafter half of each group had distilled water and the other half 5 μg. F per ml. as NaF for 80 days, during which F in urine and faeces was estimated every 3 days by titration with thorium nitrate. The results are shown graphically.

Rats without F supplement (controls) retained $1{\cdot}5 \pm 0{\cdot}5$ μg. F daily. Those given F from 14 to 28 days, but not subsequently, lost F for 3 or 4 weeks, mainly in the urine, after F was stopped but then retained it at about the same rate as controls. Rate of storage of F relative to body-weight by rats given 5 μg. F per ml. decreased steadily with time whether they had had F earlier or not. The rate was higher for females than for males. Total F retained by those given 5 μg. F per ml. was a linear function of time, except at first for those who had had F earlier. The results for total F in the femur were consistent with those of the metabolic studies. About 35 per cent. of the F occurring naturally in the diet was retained; of that given as NaF, nearly twice as much.

W. M. Deans.

3368

WEDDLE, D. A. and MUHLER, J. C. **Frequency of fluoride administration in relation to skeletal storage.** *J. Dent. Res.*, 1956, **35,** 65–68. [Dept. Chem., Indiana Univ., Bloomington.]

Comparable groups of rats were given drinking water containing NaF; one group had the water to appetite, and the others had the same amount as the first group by stomach tube, in one dose or in 3 equal parts daily. The first experiment lasted 20 and the second 40 days. At the end the rats were killed and F was estimated in teeth, bones and whole carcase. The F retained was calculated as a percentage of that ingested.

Most F was retained when it was given once a day, least when it was given 3 times a day. The results are discussed in relation to the problem of dental caries.—T. D. Bell.

3369

JARRETT, I. G. and PACKHAM, A. **Response of the sheep to sublethal doses of fluoroacetate.** *Nature*, 1956, **177,** 580–581. [Div. Biochem. Gen. Nutrit., C.S.I.R.O., Univ. Adelaide.]

The concentration of citrate in the blood of sheep fed on chaffed wheat hay, or chaffed lucerne hay, or wheat hay with gluten was studied when sodium fluoroacetate, 2 mg. daily, was administered as a drench, by subcutaneous injection, as a drip into the abomasum or into the peritoneal cavity or the jugular vein. Sheep fed on wheat hay developed clinical signs of poisoning after all methods of administration. Death occurred after a few days in some and after 3 weeks in others. Substitution of lucerne for wheat hay towards the end of the 3 weeks resulted in recovery despite continued administration of fluoroacetate.

Sheep fed on lucerne hay showed no sign of poisoning in 45 days when fluoroacetate was given by drench or subcutaneous injection. Death occurred in 10 to 20 days without the characteristic syndrome seen in animals fed on wheat hay when fluoroacetate was given intravenously or directly into the abomasum. Sheep fed on wheat hay and gluten and drenched with or given subcutaneous injections of fluoroacetate showed no sign of poisoning in 45 days. No close correlation was found between clinical signs and citrate concentration in the blood. The effects of lucerne or a gluten supplement suggest that protein may protect the ruminant against sublethal doses of fluoroacetate.—J. C. Gill.

3370

MACAULAY, D. **Total body chloride and urinary chloride excretion in infants and children.** *Clin. Sci.*, 1955, **14,** 615–623. [Dept. Child Health, Univ. Manchester.]

Of the 46 children aged from 2 months to 13 years who were the subjects of study, 21 were normal and the others had some disease likely to affect salt and water metabolism. Sodium thiocyanate and T 1824 were given intravenously and thiocyanate space and dye space were estimated. Serum Cl and 24-hr. output of Cl in urine were estimated also. Total body Cl and total plasma Cl were computed, respectively, by multiplying thiocyanate space and dye space by serum Cl concentration.

In normal children total body Cl per kg. body-weight was greater for infants under 6 months than for children over 2 years, but the fraction of total body Cl excreted in a day in urine was the same for both age groups. Dye space and thiocyanate space were highly correlated in normal but not in abnormal children, and it is suggested that total plasma Cl is not always a good measure of total body Cl. Variation from normal in the

ratio of urinary Cl to total body Cl in children with obesity, diabetes, nephrosis and tuberculous meningitis and after surgery are discussed.

F. C. Aitken.

3371

GERBAULET, K. and FITTING, W. Über das Jod-Konzentrierungs- und -Sekretionsvermögen der Speicheldrüsen. (Untersucht mit Jod^{131} bei Patienten mit unterschiedlicher Schilddrüsenfunktion). [**Capacity of the salivary glands to concentrate and secrete iodine, investigated with ^{131}iodine in patients having different degrees of thyroid activity.**] *Klin. Wochenschr.*, 1956, **34**, 120–125. [Med. Klin., Univ. Cologne.]

The ^{131}I activity in serum, saliva and thyroid was estimated after a test dose of 150 μC. $Na^{131}I$ given intravenously to 5 patients with normal thyroid function, 2 with slight and 4 with severe hyperthyroidism, and one with myxoedema.

In the normal subjects the ^{131}I activity of the saliva fell from $3{\cdot}35 \times 10^{-1}$ per cent. of the test dose 4 min. after the injection to 6×10^{-4} per cent. 24 hr. later. The radio-activity of the serum fell on a curve similar to that of the saliva but at a lower level.

In the hyperthyroid patients the values in both saliva and serum immediately after the test dose were about the same as in normal patients, but the values then fell much more steeply; in the saliva the minimum value was reached in about 7 hr. and in the serum in 90 min., but the minimum in the serum was not as low as in normal subjects. Later the radio-activity of the serum rose above that of the saliva. Separate estimations of the radio-activity of the organic I in the serum showed that it rose steadily from a very low level to become almost equal to the total radio-activity in the serum about 8 hr. after the test dose.

In the patient with myxoedema the curves for radio-activity in saliva and serum were like those of the normal subjects but flatter.

The ratio salivary ^{131}I per ml. : serum ^{131}I per ml. was estimated at intervals from immediately after the test dose when the values were maximum, to 24 hr. after it, when the minimum values occurred. The maximum and minimum values of the ratio for normal, hyperthyroid and hypothyroid patients were, respectively, 40 and 8, 141 and 0·5, and 63 and 55. The maximum value was taken as an index of the capacity of the salivary glands to concentrate iodine. The uptake of ^{131}I by the thyroid rose in the normal subjects to about 40 per cent. of the amount given in about 8 hr., and continued to rise very slowly during the next 16 hr., but in the hyperthyroid patients the rise was steeper and reached 75 per cent. of the amount given in about 3 hr. The radio-activity of the gland then fell gradually to about 50 per cent. of the amount given, 21 hr. later.

Electrophoretic studies showed that only about from 10 to 15 per cent. of the total ^{131}I activity in the saliva was organically bound even after 19 hr. In the serum, on the other hand, the percentage organically bound immediately after the injection was only 5, but after 19 hr. it was more than 99.

L. Wills.

3372

VAN MIDDLESWORTH, L. **A method for iodide balance studies in animals on low iodide diets.** *Endocrinology*, 1956, **58**, 235–242. [Dept. Physiol., Univ. Tennessee, Memphis.]

Adult male rats were maintained for 4 to 6 months on a goitrogenic diet containing 0·015 μg. I per g. The rats utilised so little iodide that chemical methods for estimation of faecal and urinary iodide and plasma protein-bound iodine (PBI) were unsatisfactory. The rats were therefore given a diet made by adding a solution of ^{131}I to each rat's measured daily ration until the rats were excreting the same amount of ^{131}I as they were ingesting. About 80 per cent. of the intake was excreted in faeces and 10 per cent. in urine and this happened whether the ^{131}I was given orally or intraperitoneally. In 5 experiments it was found that invariably most of the ^{131}I was excreted in faeces unless thyroid metabolism was disturbed, and then most of the ^{131}I was excreted in urine; thyroidectomised rats excreted 60 to 80 per cent. of the daily dose in urine and only 10 per cent. in faeces. The addition of thyroxine to the diet also increased output of ^{131}I in urine and diminished that in faeces. The addition of triiodothyronine brought the rats into positive balance; within 2 days faecal ^{131}I was less than that in urine and the positive balance persisted until 5 days after the triiodothyronine was discontinued. When 8 mg. propylthiouracil was added to the diet, ^{131}I in urine during the next 2 days was enormously increased and that in faeces was reduced to about 10 per cent. The ^{131}I balance became negative and did not become positive until 14 days after withdrawal of the drug.

It is claimed that by this method I balance, re-used iodide, functional total pool of thyroid and body I, plasma PBI and plasma iodide can be studied.—B. W. Simpson.

3373

BROWN, J. **Extra-thyroidal iodide metabolism in the rat.** *Endocrinology*, 1956, **58**, 68–78. [Ziskind Res. Labs., New England Centre Hosp., Boston, Mass.]

Adult male rats fed on Purina chow were used for all the experiments. For studies on distribution of iodide, administration of propylthiouracil was followed by injection of 10 μC. of ^{131}I. Thereafter tail blood samples were taken at intervals for estimation of radio-activity. For salivary and

gastric studies, propylthiouracil was administered and a catheter was sutured to the duodenum in such a way that the contents of the stomach could be collected. ^{131}I was injected subcutaneously. Urine and tail blood were collected and analysed. To identify the chemical state of the ^{131}I secreted in the stomach, thyroids were removed, thyroxine and ^{131}I were injected and the gastric contents were collected by catheter as before and analysed. Only iodides were found in the gastric juices. In studies on the kidney, thyroids were removed, thyroxine and ^{131}I were administered and urine and tail blood samples were examined. One week later the study was repeated on the same animals in the same way after injection of propylthiouracil.

The space of distribution of ^{131}I was 50 per cent. of the bodyweight. Treatment with KCNS reduced the space to 40 per cent. of the bodyweight by reducing the secretion of iodide into the digestive tract from 71 to 56 per cent. of the dose administered. Treatment with propylthiouracil did not alter the space of distribution, but the loss of ^{131}I from the blood was accelerated and clearance of iodide by the kidneys was substantially increased. Thyrotropin did not stimulate secretion of iodide in the saliva or by gastric glands. When chloride was given there was a significantly greater iodide clearance rate. Combined salivary and gastric secretion of ^{131}I contained 71 per cent. of the injected tracer. The combined salivary and gastric clearance rate was 4 to 5 times the renal clearance rate. Removal of the salivary glands reduced the total ^{131}I collected from 71 to 61 per cent., *i.e.*, saliva contributed one-fifth to the stomach contents.

The results of this study confirm those of previous workers. The implications of the increase of renal clearance rate by propylthiouracil are discussed.—B. W. Simpson.

3374

VERZÁR, F. and FREYDBERG, V. **Changes of thyroid activity in the rat in old age.** *J. Gerontol.*, 1956, **11,** 53–57. [Physiol. Lab., Univ. Basle.]

Rats, 32 aged 20 to 29 months and 30 aged 7 to 9 months, were injected intraperitoneally with 25 μC. of ^{131}I without carrier, dissolved in 0·25 ml. physiological saline. The thyroids were tested for radioactivity 18 to 24 hr. later and thereafter at $2\frac{1}{2}$, $5\frac{1}{2}$ and $7\frac{1}{2}$ days. The rats were anaesthetised during the measurements of radio-activity. In a number of both old and young rats excretion of ^{131}I in the urine was measured.

Uptakes of ^{131}I were higher in 84 per cent. of the old animals on the 5th and 7th days than in the young. The release of ^{131}I was slower in the old than in the young. The renal excretion of ^{131}I on the first day after injection was on the average 29·2 per cent. of the dose in the old rats and 48·4 per cent. in the young. The slow release of ^{131}I from the thyroids of the older rats may have caused the low excretion of ^{131}I in urine.

B. W. Simpson.

3375

VAN MIDDLESWORTH, L. **Effect of casein on iodide metabolism.** *Endocrinology,* 1956, **58,** 109–113. [Dept. Physiol., Univ. Tennessee, Memphis.]

Rats were fed from weaning on a goitrogenic diet labelled with ^{131}I. They were kept in metabolism cages and their excreta were collected and analysed daily. After these rats reached I equilibrium, a purified casein, free from inorganic iodide and with only a trace of organic iodide, was incorporated in the diet. Faecal iodide decreased and a positive I balance resulted. Twenty days after the removal of the purified casein from the diet of another group which had been fed on the purified casein from weaning, urinary and faecal ^{131}I were the same as in the first group before the purified casein was added. It is suggested that digestion of the purified casein produced a compound which effectively inhibited thyroid hypertrophy.—B. W. Simpson.

See also Absts. 3425, 3751.

IRON AND COPPER

3376

GUBLER, C. J. **Absorption and metabolism of iron.** *Science,* 1956, **123,** 87–90. [Dept. Med., Coll. Med., Univ. Utah, Salt Lake City.]

A review.

3377

JENSEN, W. N., BUSH, J. A., ASHENBRUCKER, H., CARTWRIGHT, G. E. and WINTROBE, M. M. **The kinetics of iron metabolism in normal growing swine.**

BUSH, J. A., JENSEN, W. N., ASHENBRUCKER, H., CARTWRIGHT, G. E. and WINTROBE, M. M. **The kinetics of iron metabolism in swine with various experimentally induced anemias.** *J. Exp. Med.*, 1956, **103,** 145–159; 161–171. [Dept. Med., Coll. Med., Univ. Utah, Salt Lake City.]

(a) Growing pigs were given injections of ^{59}Fe, and blood samples were taken at intervals after injection. The maximum incorporation of radioactive Fe into red cells, found about 5 days after injection, was 92 per cent. of the amount injected. The rate of incorporation was 1·01 mg. per kg. daily, but it was estimated that of this 0·42 mg. per kg. was due to growth, giving a red cell turnover rate of 0·59 mg. per kg. daily. The average "apparent" life span of red cells was 63 days.

(b) Pigs were made anaemic either by phenylhydrazine in the diet, or by deprivation of pyridoxine or folic acid, and Fe metabolism was studied.

Phenylhydrazine reduced the survival time of red cells to 5 days, but this was partly compensated by increased rate of formation, as indicated by increased incorporation of ^{59}Fe into red cells, which reached about 4 times the normal rate.

Pyridoxine deficiency did not affect the survival time of red cells, but formation was reduced to about one-quarter of the normal rate.

Folic acid deficiency reduced the survival time of red cells to 17 days, and although rate of formation increased, the increase was not enough to compensate completely for the reduced life of the cells.—R. Hill.

3378

STURZENEGGER, E. Enterale Eisenaufnahme bei Ratten mit experimenteller cholostatischer Lebercirrhose. [**Intestinal absorption of iron by rats with experimental liver cirrhosis with retention of bile.**] *Ztschr. ges. exp. Med.*, 1955, **126,** 460–470. [Pathol. Inst., Univ. Zürich.]

Of 18 survivors of 50 rats of both sexes in which the bile duct was ligated, 10 received a normal diet and 8 the same with an admixture of 2 per cent. powdered ferric citrate. They were killed at intervals between the 20th and 60th days and the presence of Fe in organs was tested by the Turnbull's blue method.

The results were inconclusive, but since after 48 days traces of Fe were found in some liver cells of both groups, it was thought that the experiment was too short. Attempts will be made to combat the high mortality of the rats and speed up the deposition of Fe by using ferric Fe and a maize diet (cf. Abst. 892, Vol. 25).—W. M. Deans.

3379

BERGSTRÖM, I., MAGNUSSON, G., ODEBLAD, E. and ZILIOTTO, D. **A study of the uptake of injected radioiron in the mouse kidney.** *Acta physiol. scand.*, 1955, **35,** 36–39. [Dept. Gynaecol., Sabbatsberg Hosp., Stockholm.]

3380

KASANEN, A. and VIITANEN, I. **On the copper content of the thyroid tissue and serum in thyrotoxicosis.** *Acta med. scand.*, 1956, **153,** 467–472. [Dept. Hyg., Univ. Turku.]

Estimation of the Cu content of thyroids was made in 30 toxic goitres, 8 non-toxic goitres, 19 healthy glands from children and 43 healthy glands from adults. Samples of serum from thyrotoxic patients and from healthy subjects were analysed at the same time.

The Cu content of the normal adult thyroids was $1{\cdot}775 \pm 0{\cdot}139$ mg. per 100 g. The toxic goitres contained $2{\cdot}226 \pm 0{\cdot}191$, the non-toxic goitres $2{\cdot}611 \pm 0{\cdot}480$ and the infantile thyroids $3{\cdot}055 \pm 0{\cdot}132$ mg. per 100 g. The serum Cu of 25 thyrotoxic patients was 0·130 and of 25 healthy subjects 0·133 mg. per cent.; there was no significant difference.

Serum Cu and thyroid function were not interdependent, a finding contrary to that of Narasaka (Abst. 4997, Vol. 8). No correlation between the Cu content of the thyroid and that of the liver nor between serum I and serum Cu was found, and treatment with Lugol's solution did not affect the Cu content of serum.—B. W. Simpson.

3381

BUSH, J. A., MAHONEY, J. P., MARKOWITZ, H., GUBLER, C. J., CARTWRIGHT, G. E. and WINTROBE, M. M. **Studies on copper metabolism. 16. Radioactive copper studies in normal subjects and in patients with hepatolenticular degeneration.** *J. Clin. Invest.*, 1955, **34,** 1766–1778. [Dept. Med., Coll. Med., Univ. Utah, Salt Lake City.]

For previous parts see Absts. 2095, 2096, Vol. 26.

One mg. Cu, in the form of radio-active cupric acetate of specific activity 0·8 to 1·2 mC. per mg. Cu, was given by mouth to 4 normal subjects and 4 patients with Wilson's disease and was injected intravenously into 4 normal subjects, 3 patients with Wilson's disease and 2 with alcoholic cirrhosis of the liver; the proportion of the ^{64}Cu excreted in the urine and faeces was estimated and the uptake of ^{64}Cu into the albumin and globulin fractions of plasma was studied. In 3 normal subjects, 4 patients with Wilson's disease and 2 patients with alcoholic cirrhosis of the liver the curve of disappearance of ^{64}Cu from the plasma after administration of 50 μg. ^{64}Cu was estimated. The uptake of ^{64}Cu by the liver was estimated in 2 normal subjects, 4 patients with hepatolenticular degeneration and 2 with alcoholic cirrhosis of the liver.

After administration of ^{64}Cu by mouth to normal subjects, on the average 0·1 per cent. was recovered in the urine and 72·4 per cent. in the faeces; in the patients with Wilson's disease, corresponding values were 2·5 and 52 per cent. The administration of K_2S with ^{64}Cu to 2 of the patients with hepatolenticular degeneration resulted in an increase in the amount of activity recovered in the faeces. After intravenous injection of ^{64}Cu in normal subjects, on the average 0·2 per cent. of the activity was recovered in the urine and 12·4 per cent. in the faeces; in the patients with Wilson's disease, 5·4 and 2·5 per cent., and in those with alcoholic cirrhosis 0·8 and 8·5 per cent.

The uptake of ^{64}Cu into plasma protein was impaired in patients with hepatolenticular degeneration, but not in patients with alcoholic cirrhosis. The uptake of ^{64}Cu by the liver was depressed in 3 of the 4 patients with hepatolenticular degeneration and in one with alcoholic cirrhosis. The uptake of ^{64}Cu by the red cells of patients with hepatolenticular degeneration was not different from the normal.—G. F. Garton.

3382

CARTWRIGHT, G. E., GUBLER, C. J., BUSH, J. A. and WINTROBE, M. M. **Studies on copper metabolism. 17. Further observations on the anemia of copper deficiency in swine.** *Blood, J. Hematol.*, 1956, **11**, 143–153. [Dept. Med., Coll. Med., Univ. Utah, Salt Lake City.]

Previous studies in this series showed that in pigs made Cu-deficient on a diet of milk supplemented with Fe the alterations in red cell and bone marrow morphology were indistinguishable from those in pigs deprived of Fe. This resemblance between the anaemias of Cu deficiency and Fe deficiency was not found by other workers who used dogs and a diet of milk supplemented with minerals and vitamins. The experiments with pigs were extended to include animals given supplements of minerals other than Cu and vitamins. Such supplements did not prevent, delay or modify the morphology of Cu-deficiency anaemia in pigs. An intravenous injection of Fe before the development of Cu deficiency did not prevent or delay the onset of anaemia.—F. C. Aitken.

3383

FOLLIS, R. H. (Jr.), BUSH, J. A., CARTWRIGHT, G. E. and WINTROBE, M. M. **Studies on copper metabolism. 18. Skeletal changes associated with copper deficiency in swine.** *Bull. Johns Hopkins Hosp.*, 1955, **97**, 405–414. [Dept. Pathol., Coll. Med., Univ. Utah, Salt Lake City.]

Two pigs receiving a Cu-deficient liquid milk diet supplemented with minerals, B vitamins and choline developed gross deformities of the legs. No skeletal defect was seen in 2 pigs receiving by mouth 0·5 mg. Cu per kg. bodyweight daily. Histological examination of the bones of Cu-deficient animals showed little osteoblastic activity and poor development of the bone cortex. The activity of chondroblasts appeared to be unaffected.

The similarity of these findings and those of earlier studies on Cu-deficient dogs (Abst. 852, Vol. 24) to the skeletal changes of ascorbic acid deficiency is emphasised.—C. F. Mills.

See also Absts. 3150, 3177, 3199, 3384, 3765.

OTHER MINERALS

3384

HARTMAN, R. H., MATRONE, G. and WISE, G. H. **Effect of high dietary manganese on hemoglobin formation.** *J. Nutrition*, 1955, **57**, 429–439. [Animal Nutrit. Sect., Dept. Animal Indust., N. Carolina Agric. Exp. Stat., Raleigh.]

In 2 experiments young growing lambs were depleted of Fe either by a deficient diet or by a combination of the diet and periodic bleeding. In the first experiment 8 ewe and 8 wether lambs were given a diet of whole milk fortified with 50 p.p.m. Fe, 5 p.p.m. Cu and 0·1 p.p.m. Co on a dry matter basis, and vitamins A and D. In 4 experimental periods 3 groups, each of 2 ewe and 2 wether lambs, were given supplements of Mn of up to 5000 p.p.m. ; the supplements were increased gradually in successive periods. A level of 45 p.p.m. Mn reduced blood Hb and serum Fe ; higher levels of Mn gave lower Fe content of liver, spleen and kidney.

In the second experiment 8 anaemic lambs were given a basal diet of chopped soya bean hay 60, glucose 32, casein 4 and cottonseed oil 4 per cent. Three of the lambs received the basal diet alone, 3 the basal diet supplemented with 1000 p.p.m. Mn and 2 the basal diet with 2000 p.p.m. Mn. Hb regeneration was slow and serum Fe was low in both groups given Mn.

It is suggested that excess Mn either converts Fe to a form physiologically unavailable or in some manner antagonises the enzyme systems which oxidise or reduce Fe at the site of absorption.

G. F. Garton.

3385

NEHER, G. M., DOYLE, L. P., THRASHER, D. M. and PLUMLEE, M. P. **Radiographic and histopathological findings in the bones of swine deficient in manganese.** *Amer. J. Vet. Res.*, 1956, **17**, 121–128. [Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Three-week-old pigs were divided into 2 groups, one receiving a purified diet containing 0·5 p.p.m. of manganese and the other the same diet with manganese sulphate added to give 40 p.p.m. Mn.

There was no difference between groups in liveweight increase or efficiency of feed conversion, but Mn-deficient pigs had shorter and broader legs, and they appeared fatter than control pigs. The front legs of most Mn-deficient animals became bowed, causing lameness, owing apparently to early cessation of endochrondral ossification of the radius but normal ossification of the ulna. These signs of Mn deficiency, as well as generalised rarefaction of bones of the legs, were well developed 125 days after experimental feeding began, the stage at which some animals were killed. When

the experiment ceased after 335 days the Mn-deficient animals were no longer lame and the rarefied areas of bone observed radiologically and histologically at 125 days were no longer apparent, though other effects such as bowed front legs, short thick leg bones and increased deposits of fat persisted.—R. Hill.

3386

GERSHOFF, S. N. **Biological effects of methionine sulfoximine. 2. Comparative sulfur metabolism studies in rats and rabbits.** *Amer. J. Physiol.*, 1956, **184,** 43–46. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

2. Rabbits excreted per unit bodyweight the same amount of sulphur as rats but 4 times as much of administered methionine. Rats had a greater concentration of S in liver, muscle and brain, but not spinal cord, than had rabbits. Rabbits were more prone to convulsions when given methionine sulphoximine. Methionine sulphoximine labelled with ^{35}S gave only small amounts of ^{35}S in the brains and spinal cords of both species after injection. Methionine sulphoximine given 1 hr. before injection of ^{35}S-methionine inhibited the uptake of ^{35}S in fed, but not in fasted, animals. Fasting partly protected rabbits against the toxicity of methionine sulphoximine.

A. Hepburn.

3387

CREMER, H. D. and DITTMANN, G. Einbau von organischem (Eiweiss-) und anorganischem (Sulfat-) Schwefel in Knorpel, Knochen und Zähnen. **[Incorporation of organic (protein) and inorganic (sulphate) sulphur into cartilage, bone and teeth.]** *Biochem. Ztschr.*, 1956, **327,** 377–382. [Physiol. Chem. Inst., Johannes Gutenberg Univ., Mainz.]

The method described in Abst. 2724, Vol. 26 was used to estimate chondroitin sulphate after paper electrophoresis of extracts of cartilage, bones and teeth; it was possible to detect, but not to estimate, protein and sulphate simultaneously with chondroitin sulphate. The technique was used in the following experiment.

A group of 5 young female rats weighing from 100 to 120 g. were each given an intraperitoneal injection of $Na_2{}^{35}SO_4$, 1 mC. in 0·5 ml., and a second group of 5 had 1 mC. of ^{35}S incorporated into yeast, mainly in the proteins and amino acids in their food. Three days later they were killed. Examination of the faeces in the interval showed that both groups retained roughly the same proportion, over half, of the radio-activity. Cartilage was extracted with 2 per cent. NaOH, bones and teeth with 10 per cent. Trilon (disodium ethylenediaminetetra-acetate). Protein, chondroitin sulphate and sulphate of cartilage, bone and teeth were all found to contain ^{35}S, even when it was given as inorganic sulphate. The activity of the protein was shown by paper chromatography to be associated with the sulphur amino acids cystine and methionine.

Incorporation of inorganic S is contrary to results in the literature. Reasons for the discrepancy are to be studied.—W. M. Deans.

3388

BINET, L. and WELLERS, G. La valeur physiologique des sulfates minéraux. **[Physiological value of mineral sulphates.]** *J. Physiol., Paris*, 1955, **47,** 883–892. [Lab. Physiol., Fac. Méd., Paris.]

The rate of growth was studied of young rats on a basal synthetic diet of casein, sugar, starch and lard with vitamins and a salt mixture without S, to which $Na_2SO_4 . 10H_2O$ was added at 0·06, 0·125, 0·25, 0·5, 1·0 and 2·5 per cent.; a control group had the diet without sulphate. Growth was best in the groups with 0·25 to 1·0 per cent.; at the 2 lowest levels the rate of growth differed little from that in the control group; at the highest level growth was considerably depressed after 9 days.

It is suggested that with the diet described, of which casein formed about 6 per cent., the mineral sulphate participated in the synthesis of mucopolysaccharides and, as a result, the organism could make more economical use of the sulphur amino acids which were likely to be deficient.

D. Harvey.

3389

KENT, P. W., JOWSEY, J., STEDDON, L. M., OLIVER, R. and VAUGHAN, J. **The deposition of ^{35}S in cortical bone.** *Biochem. J.*, 1956, **62,** 470–476. [Dept. Biochem., Nuffield Dept. Med., Univ. Oxford.]

Rabbits were given injections of $Na_2{}^{35}SO_4$. The site and form of deposition of ^{35}S were studied by measuring, by difference, the amount of ^{35}S removed during decalcification with ethylenediaminetetra-acetic acid, by analysis of the sulphated muco-substance extracted by KOH from the decalcified bone and by autoradiographic examination of thin sections. It was found in a labile form distributed throughout the bone and in a non-labile form concentrated in areas of active growth. There was evidence that the sulphur compound extracted from the decalcified bone was chondroitin or a substance closely related to it.

D. Harvey.

3390

SANZ SANCHEZ, F. and ASTUDILLO, M. D. Estudio de la distribución del azufre en aves seguido por medio del radioazufre S-35, administrado en forma del sulfato sódico. **[Distribution of sulphur in birds studied with radio-active sulphur ^{35}S, given as sodium sulphate.]** *An.*

Inst. Invest. Vet., Madrid, 1954, **6**, 61–77. [Fac. Vet., Madrid.] English and German summaries.

Three groups of 6 chickens 8 to 9 months old were fed on a standard ration. In one group an artificial anus permitted separate collection of urine and faeces. These and a second group were kept in metabolism cages, the third group were at liberty and were laying pullets used to study elimination of S in the eggs. The ^{35}S was given by stomach tube or by intramuscular injection.

The birds with artificial anus, given ^{35}S by mouth, excreted 45 per cent. on the first day, 9·5 per cent. on the second, and on the sixth day 0·3 per cent. was recovered in the urine. When the S was given parenterally 49 to 50 per cent. was excreted on the first day, otherwise the pattern was similar. In 6 days the amounts recovered in the urine were 60 and 66 per cent. The amounts in the faeces on the first day were 13 and 7 per cent., according to the route of administration. The unoperated birds excreted less of the ^{35}S, 55 per cent. of the dose in 6 days.

In laying pullets the peak of radio-activity in the white of the eggs occurred on the first day after the injection, but in the yolk the activity increased to a peak on the fourth day. In the course of 7 days 3·0 and 3·2 per cent. of the injected dose was recovered from the whites and yolks, respectively.

The distribution of ^{35}S in tissues is tabulated.

D. Duncan.

See also Absts. 2724, 3188.

ACID BASE EQUILIBRIUM

3391

De Langen, C. D. De zuur-basehuishouding bij de agastricus. [**Acid base metabolism after gastrectomy.**] *Nederland. Tijdschr. Geneesk.*, 1956, **100**, 246–247. [Utrecht.] English summary.

Part of the difficulties of subjects whose stomachs have been removed arise from disturbance of acid base metabolism. The normal cycle of Na from stomach via blood bicarbonate to digestive glands and the small intestine is broken. Regulation may be by temporary adsorption of Cl by collagen tissues. Since collagen decreases with age, this possible mechanism will function less efficiently and disturbances will increase.—I. Leitch.

METABOLISM OF WATER

3392

Bass, D. E. and Henschel, A. **Responses of body fluid compartments to heat and cold.** *Physiol. Rev.*, 1956, **36**, 128–144. [Environmental Protection Div., Quartermaster Res. and Development Centre, Natick, Mass.]

3393

Weil, W. B. and Wallace, W. M. **Hypertonic dehydration in infancy.** *Pediatrics*, 1956, **17**, 171–183. [Dept. Paediat., Sch. Med., Western Reserve Univ., Cleveland, Ohio.] Spanish and Interlingua summaries.

Clinical observations and the electrolyte content of serum and urine are tabulated for 26 infants with serum Na levels of 160 m. equiv. or more per litre. Serum Cl was raised to a greater extent than was serum Na. Total CO_2 and *p*H were depressed. Na, K and Cl balance data were obtained in one patient during the development of hypertonic dehydration. Water loss was in excess of Na loss and Cl retention was considerable. In 4 patients balance data were obtained during recovery. In these, water balances were positive and Cl balances were negative. Na balance was slightly positive in 2.

Administration, at the rate of approximately 180 ml. per kg. bodyweight per 24 hr. of a solution containing 50 to 65 m. equiv. Na and 35 to 45 m. equiv. Cl per litre is the treatment recommended.

F. C. Aitken.

3394

Talso, P. J., Strub, I. H. and Kirsner, J. B. **The metabolism of water and electrolytes in patients with cirrhosis of the liver.** *J. Lab. Clin. Med.*, 1956, **47**, 210 – 226. [Dept. Med., Univ. Chicago, Ill.]

Balance studies were made during 4 periods in one normal subject and in 4 with liver cirrhosis with ascites and oedema. The only variation in diet was a reduction in salt intake, from 3·0 to 1·5 g. after the end of the second period. In the second and third periods 45 g. cation-exchange resin was given daily and in the fourth period a mercurial diuretic was given on alternate days.

The balance data were used to calculate shifts in body fluids. Bodyweight loss as a result of treatment of liver cirrhosis corresponded closely to loss of extracellular fluid. In patients with liver cirrhosis, biopsy samples of gastrocnemius muscle and deltoid muscle obtained before treatment contained more than the normal volume of

extracellular fluid. In gastronemius, which contained more fluid than deltoid muscle, extracellular fluid was reduced by treatment but remained above normal. There was no reduction of extracellular fluid in deltoid muscle.

It is concluded that oedema and ascites in liver cirrhosis represent isotonic expansion of extracellular fluid.—F. C. Aitken.

3395

MONTEMURRO, D. G. and STEVENSON, J. A. F. **The localization of hypothalamic structures in the rat influencing water consumption.** *Yale J. Biol. Med.*, 1955–56, **28**, 396–403. [Dept. Physiol., Univ. Western Ontario, London.]

Rats were maintained on a diet in which about 70 per cent. of the energy value was provided by sucrose, 10 per cent. by fat and the rest by casein. Mineral and vitamin requirements were met. Lesions were made in the hypothalamus with a stereotaxic instrument.

The greatest increase in food intake and the greatest obesity were produced by lesions in the ventromedial nuclei, and in these rats there was no increase in water intake. Rats with lesions in the lateral hypothalamic areas showed no increase in food intake, but drank less. They failed to increase their water intake when transferred to an environmental temperature of 35° C.—D. Duncan.

3396

HAIGH, C. P. and SCHNIEDEN, H. **Virtual deuterium oxide space (total body water) in normal and protein-deficient rats.** *J. Physiol.*, 1956, **131**, 377–382. [Res. Dept., Barrow Hosp., Bristol.]

The senior author's method of measuring deuterium (*Radioisotope Conference*, 1954, Vol. 2, p. 101, Butterworths Scientific Publications, London) was used for measurement under anaesthesia of total body water in 2 groups of rats, one on a normal diet and the other on a diet with 0·5 g. protein and providing 300 Cal. per 100 g. (Schnieden and Blackmore, *Brit. J. Nutrition*, 1956, in press). In some of the control animals both renal pedicles were ligated immediately before the injection of the D_2O.

In normal animals equilibrium was reached about 60 min. after injection and estimations made at that interval gave mean values, as percentage of bodyweight, of $70{\cdot}2 \pm 1{\cdot}7$ for 8 normal rats, $69{\cdot}9 \pm 1{\cdot}9$ for 6 " nephrectomised " and $80{\cdot}1 \pm 1{\cdot}2$ for 9 on the deficient diet. Oedema under such conditions of deficient feeding is concluded not to be the result of transference of fluid from intracellular to extracellular space.—D. Harvey.

3397

BURNS, T. W. (with BALEKJIAN, A.) **Endocrine factors in the water metabolism of the desert mammal, *G. gerbillus*.** *Endocrinology*, 1956, **58**, 243–254. [U.S. Naval Med. Res. Unit No. 3, Cairo.]

Gerbillus gerbillus, small desert rodents, were trapped near Cairo in summer and autumn. Adult males weighing from 17 to 25 g. were selected and housed at 21·8° C. and relative humidity 50 per cent. No water was given. The 4 diets used were pearled barley alone, or with carrots, or with salt, or soya beans alone. The water content of the cereals as given was 9 to 11 per cent. Droplets of urine were collected by pipette after spontaneous micturition had been produced by teasing the animals. Adrenals were removed from some animals under sodium pentobarbital anaesthesia.

In animals killed within 24 hr. after capture and in others fed on carrots and barley the urea concentration in urine was 1·32 and 1·12 *M*, and that of total electrolytes, expressed as NaCl, 0·617 and 0·476 equiv. per litre. Adrenals weighed 7·2 and 10·4 mg.

On salted barley the mean loss of bodyweight in 4 days was 37 per cent. and the mortality 10 out of 12; on soya beans the weight loss was 20 per cent. and mortality 4 out of 12. On the second day of soya bean diet the mean urine urea concentration went up to 2·84 *M*, with a maximum value of 3·41 *M*; the highest total electrolyte concentration was on the second day of salted barley diet, mean 1·098 and maximum 1·36 equiv. per litre. With carrot and barley diet or salted barley, injection of vasopressin tannate did not increase the concentration of urine, nor did aqueous posterior pituitary extract.

Cortisone prolonged the survival of animals given salted barley after removal of their adrenals. Adrenalectomised animals were able to maintain the concentration of electrolytes in the urine and to increase it in response to salted barley.—D. Duncan.

See also Absts. 3268, 3358.

METABOLISM OF OTHER SUBSTANCES

3398

HALLIDAY, J. W. and ANDERSON, L. **The synthesis of *myo*-inositol in the rat.** *J. Biol. Chem.*, 1955, **217**, 797–802. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Radio-active *myo*-inositol (formerly *meso*-inositol) was isolated from 3 rat carcases after injections of glucose-1-^{14}C. The percentage of label incorporated was not changed when the intestinal contents were removed from the carcase of one rat and

increased slightly in the third rat when the numbers of intestinal organisms were greatly reduced by antibiotics and the intestinal contents were later removed. This showed that inositol was synthesised in the tissues. The rate of synthesis was low and the specific activity of the isolated inositol was only 3 per cent. of that of the liver glycogen.—A. Hepburn.

3399

WILSON, R. H. L., NEWMAN, E. J. and NEWMAN, H. W. **Diurnal variation in rate of alcohol metabolism.** *J. Appl. Physiol.*, 1956, **8,** 556–558. [Dept. Med., Stanford Univ. Sch. Med., San Francisco, Calif.]

Studies were made in 6 subjects of the level of alcohol in blood while they were taking whiskey in small but fixed amounts at hourly intervals for at least 36 hr. To allow rest during the night 3 doses were given as one at midnight and at 3 a.m. A representative curve for 1 subject and a curve of the means for the changes in 5 of them are reproduced and show that the level of alcohol in the blood rose between 8 p.m. and 10 a.m. and fell between 10 a.m. and 8 p.m. In the sixth subject, a nurse on night duty, the rhythm was reversed even although the study took place during her period off work when she slept during the night.

The variation in rate of metabolism appeared to depend on the pattern of activity, but its relation to meal times requires further study.—D. Harvey.

3400

OWENS, A. H. (Jr.) and MARSHALL, E. K. (Jr.) **The metabolism of ethyl alcohol in the rat.** *J. Pharmacol. Exp. Therap.*, 1955, **115,** 360–370. [Dept. Pharmacol., Johns Hopkins Univ., Baltimore, Md.]

Rats received doses of 1 or 2·5 g. ethanol per kg. bodyweight and the rate of clearance of ethanol from the blood was studied. The rate of oxidation of ethanol was constant and independent of the amount present (see Abst. 2160, Vol. 24). On a diet free from protein or after fasting the rate of oxidation decreased. Injections of sodium pyruvate, diphosphopyridine nucleotide or NaCl increased the rate of oxidation.—A. Hepburn.

3401

MALLOV, S. and BLOCH, J. L. **Role of hypophysis and adrenals in fatty infiltration of liver resulting from acute ethanol intoxication.** *Amer. J. Physiol.*, 1956, **184,** 29–34. [Dept. Pharmacol., State Univ. New York Upstate Med. Centre, Syracuse.]

3402

LE VEEN, H. H. **Parenteral calories from a synthetic water soluble fat.** *Surg. Gynecol. Obstet.*, 1956, **102,** 154–160. [Dept. Surg., Chicago Med. Sch., Ill.]

Theoretical considerations on the structure of fatty acid derivatives and their physiological action are discussed. Aleuritic acid, a 16-C acid with —OH at the 9th, 10th and 16th atoms and a major constituent of shellac, was the starting point from which glucose monoaleuritate was prepared. It is a waxy substance miscible with water in any proportion, and has R.Q. 0·815 and energy value 6·24 Cal. per g., each value midway between those for fat and carbohydrate. In 13 per cent. solution it is isotonic with 5 per cent. glucose solution.

Experiments with rats already described [reference not given] are summarised. Given parenterally the substance is utilised to the same extent as is fat given by mouth. Neither in these animals nor in human red cells incubated *in vitro* was there evidence that it caused haemolysis, and no more than a trace of it or of the free acid could be detected in urine.—D. Harvey.

3403

SETO, T. A. and SCHULTZE, M. O. **Metabolism of trichloroethylene in the bovine.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 314–316. [Dept. Agric. Biochem., Inst. Agric., Univ. Minnesota, St. Paul.]

When 4 Holstein calves received 3 to 12 g. trichloroethylene 1 per cent. of the dose appeared in the urine as trichloroacetic acid and 13 to 25 per cent. as trichloroethanol.—T. R. Preston.

METABOLISM OF CELLS, TISSUES, ETC.

GENERAL PHYSIOLOGY

3404

FISHER, R. B. **The absorption of water and of some small solute molecules from the isolated small intestine of the rat.** *J. Physiol.*, 1955, **130,** 655–664. [Dept. Biochem., Univ. Oxford.]

For earlier publications see Absts. 4446, Vol. 19; 3077, 3177, Vol. 23; Title 4936, Vol. 24. See also Smyth and Taylor, Title 2096, Vol. 25.

Absorption of water from the surviving small intestine of the rat depends on the presence in and absorption from the lumen of glucose. The intestine being distended so that all mucosal folds were separated, *i.e.*, at a minimum pressure of 20 cm. H_2O, greater distension had little or no effect. Rate of absorption was independent of osmotic pressure and of the concentration of glucose in the lumen down to 100 mg. per 100 ml. water, the lowest used.

Urea, creatine and sorbitol were absorbed only with water and the rates of absorption were inversely as their molecular weights.—I. Leitch.

3405

WEISS, J. M. (with FLEISCH, D.) **The role of the Golgi complex in fat absorption as studied with the electron microscope with observations on the cytology of duodenal absorptive cells.** *J. Exp. Med.*, 1955, **102,** 775–782. [Dept. Anat., Sch. Med., Washington Univ., St. Louis, Mo.]

3406

WEISS, J. M. (with FLEISCH, D.) **Mitochondrial changes induced by potassium and sodium in the duodenal absorptive cell as studied with the electron microscope.** *J. Exp. Med.*, 1955, **102,** 783–788. [Dept. Anat., Sch. Med., Washington Univ., St. Louis, Mo.]

3407

SMITH, T. C. **The respiration and composition of the mammary gland of the guinea pig during pregnancy and lactation.** *Arch. Biochem. Biophys.*, 1956, **60,** 485–495. [Dept. Pharmacol., Sch. Med., Boston Univ., Mass.]

Metabolic behaviour of slices of mammary gland tissue *in vitro* was compared for guineapigs in late pregnancy and after 2, 10 and 20 days of lactation. Respiration increased to a highly significant extent after parturition, but declined between the tenth and twentieth days of lactation. Either fresh weight or defatted dry weight was a more reliable criterion of metabolic activity than dry weight.

Glucose, ketoglutarate, fumarate and citrate failed to stimulate respiration in slices from pregnant or lactating animals. Succinate was effective, and acetate caused some stimulation during pregnancy and 10 days *post partum*, but pyruvate was effective only 10 or 20 days *post partum*.

Total N and protein content of the gland increased at parturition and declined later. Deoxyribonucleic acid remained fairly constant; so did water content. Fat fell after parturition. The selection of a stable indicator of metabolic activity for the mammary gland is discussed.—D. Duncan.

3408

GLOCK, G. E., MCLEAN, P. and WHITEHEAD, J. K. **Pathways of glucose utilization in the mammary gland of the rat.** *Biochem. biophys. Acta*, 1956, **19,** 546–547. [Courtauld Inst. Biochem., Middlesex Hosp., London.]

When slices of mammary gland from rats were incubated with glucose-6-^{14}C or glucose-1-^{14}C the production of $^{14}CO_2$ from the latter was much the greater and increased to a maximum during lactation. The ratio between them was 1 : 1 at the end of pregnancy, 15·7 : 1 between the 10th and 18th days of lactation and 2 : 1 at the beginning of involution. This indicated that some oxidation of glucose occurred by a non-glycolytic route.

A. Hepburn.

3409

SCHMIDT, G. and DAVIDSON, H. M. **On the *in vitro* incorporation of ^{32}P-phosphate into phosphoproteins by lactating mammary gland.** *Biochem. biophys. Acta*, 1956, **19,** 116–120. [Res. Lab., Boston Dispensary, Mass.] French and German summaries.

A washed particulate fraction was prepared from homogenates of lactating mammary gland of rabbits by the method of Lehninger and Kennedy (Title 1998, Vol. 18). The fraction was capable of incorporating ^{32}P from phosphate into phosphoprotein; the amount incorporated was not affected by addition of bovine serum albumin, but was doubled by addition of serum from a lactating rabbit and increased eightfold by addition of casein.—D. Duncan.

3410

BOGGIO GILOT, G. and DE MARTIIS, M. Influenza del potassio sul metabolismo ossidativo del miocardio e del fegato in vitro. [**Influence of potassium on the oxidative metabolism of myocardium and liver *in vitro*.**] *Arch. ital. Malat. Appar. diger.*, 1955, **21,** 455–459. [Ist. Idrol. Med., Univ. Rome.]

3411

CALKINS, E., SOODAK, M. and BAUER, W. **Metabolism and clinical significance of the carbohydrate components of connective tissue.** *New Engl. J. Med.*, 1955, **253,** 865–872. [Med. Clin., Massachusetts Gen. Hosp., Boston.]

A review with 85 references.

3412

SCHWARZ, V., GOLBERG, L., KOMROWER, G. M. and HOLZEL, A. **Some disturbances of erythrocyte metabolism in galactosaemia.** *Biochem. J.*, 1956, **62,** 34–40. [Dept. Pathol., Univ. Manchester.]

Human red cells from 6 normal subjects always consumed some oxygen when galactose was provided as substrate, but only 5 or 6 per cent. of the amount consumed with glucose. Red cells from a patient with galactosaemia respired in glucose, but not at all in galactose. When glucose and galactose were present together, galactose always caused a slight increase of oxygen consumption by normal red cells, but a small decrease with the patient's cells.

Chromatography of phosphate esters from red cells showed that in 2 galactosaemic patients a

change from milkless to milk-containing diet was followed within a few days by accumulation of galactose-1-phosphate in the red cells. This was not found in 6 healthy infants. Accumulation of galactose-1-phosphate also occurred in galactosaemic red cells incubated in galactose-containing media. The phosphate ester content was reduced both *in vivo* and *in vitro* and the inorganic P content fell by nearly 70 per cent.—D. Duncan.

3413

D'Abramo, F., Ruffo, A., Tomasos, E. and Paladini, A. Alcune reazioni metaboliche dell'α-glicerofosfato. [**Metabolic reactions of α-glycerophosphate.**] *Arch. Sci. biol., Bologna*, 1955, **39,** 612–630. [Lab. Biochim., Ist. Tumori "Fond. Pascale", Naples.]

Liver homogenates were prepared from rats fasted for 24 hr. and were incubated with ^{32}P and different proportions of succinate or pyruvate, glycerol and diphosphopyridine nucleotide (DPN), and with NaF and adenosine triphosphate (ATP).

Addition of glycerol to homogenates always led to increased formation of glycogen, but less extra glycogen was formed in the presence of succinate than without it, and with succinate some pyruvic acid was formed instead. The addition of glycerol to homogenates containing pyruvate always led to formation of extra glycogen, and sometimes to accumulation of pyruvic acid. The intermediate products in the transformation of α-glycerophosphate to glycogen, identified after chromatographic separation, were phosphoglycerate, fructose-1 : 6-diphosphate, glucose-6-phosphate and glucose-1-phosphate. It is concluded that according to the experimental conditions α-glycerophosphate may be transformed either into glycogen or into pyruvic acid.—D. Duncan.

3414

Pasieka, A. E., Morton, H. J. and Morgan, J. F. **The metabolism of animal tissues cultivated *in vitro*. 1. Amino acid metabolism of chick embryonic-heart fibroblasts cultivated in synthetic medium M 150.** *J. Nat. Cancer Inst.*, 1956, **16,** 995–1009. [Lab. Hyg., Dept. Nat. Health Welfare, Ottawa.]

The uptake of amino acids from the synthetic medium M 150 described previously (Abst. 2115, Vol. 26) by heart muscle of 11-day-old chick embryos was studied by one-dimensional paper chromatography.

Changes were slight during the first 7 days but rose to a maximum between the 14th and 25th days of cultivation. Almost all the cystine, lysine, histidine and arginine were removed from the medium, and considerable amounts of valine, phenylalanine, tryptophan, *iso*leucine and leucine. The amounts of glutamine, serine, glycine, threonine, alanine and methionine in the medium increased. Quantitative chemical studies (to be published) indicate that disappearance of amino acids was really due to uptake by the cells and not to enzymic breakdown.—W. M. Deans.

3415

Vann, L. S. **Possible function of serum proteins in tissue culture.** *Science*, 1956, **123,** 326–327. [2217 Blake St., Berkeley, Calif.]

Eagle (see Absts. 808, 2116, Vol. 26) found that dialysed serum was necessary in an otherwise chemically defined medium for growing mammalian cells. It is suggested that the essential substance or substances provided by the serum might be protein, perhaps some of the serum proteins themselves.—D. Duncan.

3416

Eagle, H., Oyama, V. I., Levy, M., Horton, C. L. and Fleischman, R. **The growth response of mammalian cells in tissue culture to L-glutamine and L-glutamic acid.** *J. Biol. Chem.*, 1956, **218,** 607–616. [Sect. Exp. Therap., Lab. Infect. Dis., Nat. Microbiol. Inst., Nat. Insts. Health, Bethesda, Md.]

Under the experimental conditions both mouse fibroblasts and human carcinoma cells (see Absts. 808, 834, Vol. 26) required L-glutamine for survival and growth. D-Glutamine, ornithine, proline and α-ketoglutaric acid could not replace L-glutamine. The full complement of amino acids reduced the glutamine requirement. L-Glutamic acid at a much greater concentration could replace glutamine for the carcinoma cell, but not for the mouse fibroblast. NH_4Cl with glutamic acid often further increased growth of carcinoma cells and occasionally permitted slight growth of mouse fibroblasts.
A. Hepburn.

3417

Steinberg, D., and Vaughan, M. **Intracellular protein degradation *in vitro*.** *Biochim. biophys. Acta*, 1956, **19,** 584–585. [Lab. Cellular Physiol. Metabol., Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

Liver and kidney slices from rats injected with radio-active amino acids released N.P.N. on incubation. This release was inhibited by lack of oxygen, dinitrophenol and *o*- and *p*-fluorophenylalanine. The net increment of N.P.N. during 4 hours' incubation, expressed as a percentage of total protein, was on the average $2{\cdot}7 \pm 1$. Dinitrophenol and *o*-fluorophenylalanine did not inhibit the breakdown of protein in liver homogenates. The results suggested that mammalian intracellular protein was continually being degraded and re-synthesised.—A. Hepburn.

3418

SHAPIRO, B. and WERTHEIMER, E. **The metabolic activity of adipose tissue—a review.** *Metabolism*, 1956, **5**, 79–86. [Dept. Biochem., Hebrew Univ.-Hadassah Med. Sch., Jerusalem.]

3419

LYON, I., GEYER, R. P. and MARSHALL, L. D. **Further studies in fatty acid metabolism and hepatic lipogenesis.** *J. Biol. Chem.*, 1955, **217**, 757–764. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

See also Abst. 5397, Vol. 25.

Octanoate-1-^{14}C was incubated with liver slices from fasted rats and from rats fed on a stock diet and its conversion to CO_2, acetoacetate, glycogen, fatty acids and cholesterol was studied. The incubation was in phosphate or bicarbonate buffer or in buffer-free media of different ionic strengths with or without glucose, pyruvate or succinate.

Whatever the incubation medium, the synthesis of fatty acids and cholesterol was depressed in liver slices from fasted animals. Synthesis of long-chain fatty acids in a bicarbonate buffer by liver slices from non-fasting animals was 7 or 8 times greater than in phosphate buffer. In a high-K medium synthesis of cholesterol was enhanced by the presence of phosphate. When supplemented with pyruvate, a high-phosphate medium promoted synthesis of increased amounts of long-chain fatty acids from octanoate.—G. A. Garton.

3420

TEPPERMAN, J., TEPPERMAN, H. M. and SCHULMAN, M. P. (with DEWITT, J. M.) **Oxidation of palmitic acid-1-C^{14} by tissues of carbohydrate and fat diet-adapted rats.** *Amer. J. Physiol.*, 1956, **184**, 80–82. [Dept. Pharmacol., State Univ. New York Upstate Med. Centre, Syracuse.]

Adult male rats were given isocaloric diets high in choline and fat or high in carbohydrate for 4 to 6 weeks. Tissue slices from liver and diaphragm were incubated with palmitic acid-1-^{14}C and the specific activity of respiratory CO_2 was estimated.

The oxidation of palmitic acid was greater in tissues from rats on the high-choline, high-fat diet and the rate of utilisation of glucose from the medium was significantly lower.

A. K. Lough.

3421

TIETZ, A. and SHAPIRO, B. **The synthesis of glycerides in liver homogenates.** *Biochem. biophys. Acta*, 1956, **19**, 374–375. [Dept. Biochem., Hebrew Univ., Hadassah Med. Sch., Jerusalem.]

Homogenates of rat liver were centrifuged to yield a fraction composed mainly of mitochondria. This preparation was incubated for 1·5 hr. at 37° C. with potassium palmitate-1-^{14}C and adenosine triphosphate (ATP) in a medium buffered at *p*H 7·5 with phosphate and containing $MgCl_2$. Glycerides were then isolated and the amount of ^{14}C present was estimated.

Palmitic acid was incorporated into glyceride combination to the same extent whether air or nitrogen was used as the gas phase; when ATP was omitted glyceride synthesis in nitrogen almost ceased and it dropped when air was the gas phase. The maximum incorporation of ^{14}C into triglycerides was 25 per cent. of that initially added.

The mitochondrial preparation was separated into sediment and supernatant fluid by high-speed centrifuge; neither fraction synthesed glyceride when tested on its own, but they did when recombined. A considerable part of the activating capacity of the supernatant fluid was retained after heating to 100° C. for 1 min. This, with the finding that NaF did not abolish synthesis of glyceride, suggests that the enzyme system responsible is probably not of the lipase type.

G. A. Garton.

3422

PERRY, W. F. and BOWEN, H. F. **Effect of adrenalectomy on the incorporation of acetate into fatty acids, cholesterol and acetoacetic acid by rat liver slices.** *Amer. J. Physiol.*, 1956, **184**, 59–62. [Dept. Physiol. Med. Res., Univ. Manitoba, Winnipeg.]

Liver slices from adrenalectomised rats fed to appetite, from pair-fed normal rats and from 2 similar groups which were also forcibly fed with glucose were incubated with acetate-2-^{14}C in phosphate and bicarbonate buffers.

Adrenalectomy reduced the amount of ^{14}C incorporated into fatty acids and cholesterol, but not into acetoacetate. Bicarbonate was the best buffer for the formation of fatty acids and phosphate buffer was best for cholesterol. Forcible feeding increased the incorporation of ^{14}C into fatty acids and cholesterol in all rats, but in the adrenalectomised rats the amount incorporated was still less than in the normal rats. Liver slices from adrenalectomised rats produced more, in the forcibly fed rats significantly more, $^{14}CO_2$ in bicarbonate buffer than liver slices from intact rats.—A. Hepburn.

3423

HAROLD, F. M., FELTS, J. M. and CHAIKOFF, I. L. **Fate of cholesterol-4-C^{14} and -26-C^{14} in the perfused liver.** *Amer. J. Physiol.*, 1955, **183**, 459–462. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Bile components were examined for radioactivity after perfusion of isolated rat liver with blood to which was added cholesterol-4-^{14}C or

cholesterol-26-^{14}C. The latter was readily oxidised to $^{14}CO_2$, though smaller amounts of ^{14}C were found in the neutral and acid fractions of the bile. By contrast, cholesterol-4-^{14}C was not oxidised to CO_2; about 10 to 20 per cent. of the ^{14}C was found in the neutral fraction of the bile and the remainder in the bile acids. By paper chromatography taurochenodeoxycholic acid, taurocholic acid and an unidentified compound were shown to be labelled. In a time study it was found that taurochenodeoxycholic acid and the unidentified metabolite became labelled with ^{14}C 1 to 2 hr. before ^{14}C was detected in taurocholic acid; the latter did not appear to be the major product of cholesterol metabolism, as it is in intact animals.

G. A. Garton.

3424

MOLNAR, G. D., ALBERT, A., KEATING, F. R. (Jr.) and ORVIS, A. L. **Iodine metabolism in surviving human and canine thyroid slices.** *Endocrinology*, 1956, **58**, 381–386. [Mayo Clin., Rochester, Minn.]

3425

FREINKEL, N. and INGBAR, S. H. **The metabolism of I^{131} by surviving slices of rat mammary tissue.** *Endocrinology*, 1956, **58**, 51–56. [Thorndike Mem. Lab., Second and Fourth Med. Serv. (Harvard), Boston City Hosp., Mass.]

Slices of mammary tissue were obtained from lactating and non-lactating rats. Thyroids, kidney and diaphragm slices from the same rats were studied under the same experimental conditions.

Both lactating and non-lactating mammary tissue collected and bound ^{131}I in organic form in the same way as thyroid, but less. Kidney and diaphragm slices did not. Lactating mammary tissue had a greater capacity for binding ^{131}I organically than mammary tissue from pregnant or non-pregnant rats. When the tissues were treated with 1-methyl-2-mercaptoimidazole they lost the power to bind I organically, but could still concentrate I as iodide. This property was depressed by thiocyanate, perchlorate or 2 : 4-dinitrophenol.—B. W. Simpson.

3426

CARTIER, P. and PICARD, J. La minéralisation du cartilage ossifiable. [**Mineralisation of ossifiable cartilage.**] 3. Le mécanisme de la reaction ATPasique du cartilage. [**3. Mechanism of the ATP reaction of cartilage.**] 4. La signification de la réaction ATPasique. [**4. Significance of ATP reaction.**] *Bull. Soc. Chim. biol.*, 1955, **37**, 1159–1168; 1169–1176. [Lab. Étude de l'Os, Fac. Méd., Paris.]

For parts 1 and 2 see Abst. 827, Vol. 26.

3. Study of mineralisation of cartilage *in vitro* by chromatography of trichloroacetic acid extracts showed that although the Ca : P ratio was identical with that of dicalcium phosphate, this was not the form in which the minerals were deposited. Calcium pyrophosphate was identified chromatographically and by X-ray diffraction, and the depot is thought to contain about 80 per cent. pyrophosphates and 20 per cent. orthophosphates. The pyrophosphate is formed by splitting off the terminal pyrophosphate group of adenosine triphosphate (ATP). Chromatography of mineralising solutions on ion-exchange resins before and after incubation with cartilage showed that ATP is degraded to monophosphate and that the pyrophosphate group is simultaneously fixed in the cartilage; this explains the specific effect of ATP described in part 1.

4. A perchloric acid extract of cartilage from sheep embryo was shown spectrophotometrically to contain ATP. The concentration was highest in metaphyseal regions about to calcify. Bone showed stronger pyrophosphatase activity than cartilage, but less than 1 per cent. of total bone P was pyrophosphate. It is concluded that ATP takes part in the initial stages of mineralisation in the presence of orthophosphates. Ossifiable cartilage can form ATP in the presence of orthophosphates and 5-adenylic acid.—D. Duncan.

See also Absts. 3225, 3319.

GROWTH AND METABOLISM OF TUMOUR CELLS

3427

ENGELBRETH-HOLM, J. and IVERSEN, S. **Is vegetable Annatto butter colour cancrogenic?** *Acta pathol. microbiol. scand.*, 1955, **37**, 483–491. [Fibiger Lab., Pathol. Anat. Inst., Univ. Copenhagen.]

One hundred female rats of a uniform but not inbred strain, weighing at the outset about 75 g., were given daily by dropper 26 mg. Annatto (the Danish vegetable colour bixin; see Title 285, Vol. 24) in soya oil for 26 months. They did not differ significantly in bodyweight or in number and kind of tumours present at natural death from a control group of 100 untreated female rats.

A group of 50 male and 50 female mice, littermates of the inbred ST/EL strain, daily had 1 drop of 10 per cent. Annatto in soya oil by dropper from 6 weeks of age until death. Again there was no significant difference between them and an untreated group in bodyweight or tumour incidence; in particular, there was no liver degeneration, cirrhosis or liver tumour in the treated mice. Injection of Annatto into mice or painting their skin with it was likewise not effective. There was a hint that pulmonary tumours were slightly more frequent in treated females and liver tumours slightly less frequent in treated male mice.

W. M. Deans.

3428

JARDETZKY, O., VISSCHER, M. B. and KING, J. T. **Development of spontaneous hepatoma in mice in relation to composition of dietary fat.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 648–650. [Dept. Physiol., Med. Sch., Univ. Minnesota, Minneapolis.]

A hydrogenated vegetable fat, Crisco, was separated into 5 fractions by crystallisation from ether at low temperatures; the fractions differed in melting-point, mean molecular weight of component fatty acids and degree of unsaturation. Lard, unfractionated Crisco or these fractions were incorporated as 17·5 per cent. of a diet which also contained casein 29, glucose 34, yeast 8·2, salt mixture 4·1, alfalfa leaf 4·1, cod liver oil 2·1 and wheat germ oil 1·0 per cent.; these diets were given to appetite to groups of weanling mice for 54 weeks.

At autopsy a high proportion of hepatomas was found in mice which had been given the fat fractions of low melting-point, containing mostly unsaturated and shorter-chain fatty acids; fractions of high melting-point gave rise to few hepatomas. It remains to be established whether the differences are due to the composition or the amounts of fat absorbed.—G. A. Garton.

3429

BENSON, J., LEV, M. and GRAND, C. G. **Enhancement of mammary fibroadenomas in the female rat by a high fat diet.** *Cancer Res.*, 1956, **16,** 135–137. [Res. Labs., Mount Sinai Hosp., Miami Beach, Fla.]

Fibroadenomas developed in the mammary glands of 34 out of 81 female rats over 18 months old after they had been fed for 10 months on a stock diet to which 20 per cent. olive oil had been added; similar tumours developed in only 3 out of 12 animals on the stock diet supplemented with lettuce and carrot. No tumour developed in younger rats. Serum lipid values were higher in fat-fed rats, and this may be related to the genesis of such tumours. A variety of treatments failed to prevent the tumours.—G.A.Garton.

3430

MULAY, A. S. and EYESTONE, W. H. **Transplantable adrenocortical adenocarcinomas in Osborne-Mendel rats fed a carcinogenic diet.** *J. Nat. Cancer Inst.*, 1955, **16,** 723–729. [Nat. Cancer Inst., Nat. Insts. Health, Pub. Health Serv., Bethesda, Md.]

Two groups of 30 female rats were given semi-synthetic diets containing either 6 or 8 per cent. casein and 0·06 per cent. *p*-dimethylaminoazobenzene for 286 days; they were then given a diet of Purina chow pellets. Of 42 rats which survived to the age of 18 months or more, 27 developed adrenocortical adenoma and 4 adrenocortical adenocarcinoma. The adenocarcinoma was accompanied by metastases in lung and liver. The adrenal tumours were successfully transplanted to male and female rats and grew to an average weight of 15 to 20 g. in 3 to 4 months; there were metastases in liver and lungs of the host.—G. F. Garton.

3431

MARCHANT, J. **Influence of pregnancy and lactation on the incidence of mammary carcinoma induced with methylcholanthrene in female mice of the "*IF*" strain.** *J. Pathol. Bacteriol.*, 1955, **70,** 415–418. [Cancer Res. Labs., Med. Sch., Birmingham.]

Twelve out of 16 virgin mice of the *IF* strain, which has a very low incidence of spontaneous mammary tumours, developed mammary tumours after application of methylcholanthrene. No tumour appeared in 11 mice of this strain which were suckling their first litter when treatment with methylcholanthrene was begun, and only 2 tumours in 7 mice in which treatment began at mating.

It is concluded that lactation protects mice of this strain against this type of mammary tumour.
D. Duncan.

3432

CAMPBELL, P. N., JONES, H. E. H. and STONE, N. E. **Plasma protein as a precursor of rat liver and hepatoma protein.** *Nature*, 1956, **177,** 138–139. [Courtauld Inst. Biochem., Middlesex Hosp. Med. Sch., London, W.1.]

One rat was given an intraperitoneal injection of 50μC. of L-^{14}C-lysine and was killed after 6 hr.; the plasma was fractionated to give a purified preparation of radio-active albumin. A second rat which had several hepatomas produced by dietary 4-dimethylaminoazobenzene was injected intravenously with 150 mg. of the ^{14}C-lysine-albumin in 3 ml. of saline, with 20μC. of L^{14}C-alanine; after 95 min. the rat was killed and the hepatoma tissue and liver tissue were separated and amino acids were estimated by ion-exchange chromatography. The specific radio-activity of the lysine and alanine from each protein fraction was estimated.

The ratio of the specific radio-activity of alanine to that of lysine from the hepatoma protein was 9·8 and from the liver 10·3. These results suggest that amino acids derived from serum albumin are not incorporated into the soluble proteins of hepatoma tissue to a greater extent than into those of liver tissue. Estimation of the amounts of albumin in extracts from the 2 tissues by precipitation with an anti-serum for serum albumin showed that 8·4 per cent. of the soluble protein from hepatoma and 4 per cent. of that from the liver consisted of serum albumin.—G. F. Garton.

3433

INGLE, D. J., FLORES, V. and TORRALBA, G. **Effect of tumors on level of plasma amino acids of eviscerate rats.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 168–169. [Ben May Lab. Cancer Res., Univ. Chicago, Ill.]

The increase of plasma amino acids in rats after evisceration was much more rapid when tumours were present and was positively related to the weight of the tumour. Glucose infused with or without insulin did not prevent the increase in rats with tumours.—A. Hepburn.

3434

KIT, S. **The biosynthesis of free glycine and serine by tumours.** *Cancer Res.*, 1955, **15,** 715–718. [Dept. Biochem., Univ. Texas M.D. Anderson Hosp., Houston.]

Experiments in which Gardner tumour cells were incubated with radio-active glucose, acetate, ribose and formate suggest that glycine was formed from serine and that serine was formed from phosphoglycerate but not from pyruvate. Acetate apparently traversed the citric acid cycle. A hypothetical pathway is proposed.—A. Hepburn.

3435

DUNN, M. S. and MURPHY, E. A. **Effect of ethionine alone or with amino acids on tumor growth, carcass weight, and nonprotein amino acids in rat liver.** *Cancer Res.*, 1955, **15,** 760–672. [Chem. Lab., Univ. California, Los Angeles.]

Rats on a stock diet were inoculated subcutaneously with Sarcoma R-1 and 7 days later they were weighed and the area of tumours was measured. On the tenth day they were divided among 5 groups each of 15 animals and were given intraperitoneal injections daily of ethionine alone or with 50 mg. L-arginine, 125 mg. glycine or 50 mg. L-lysine; a control group had injections of physiological salt solution. Some were killed after one injection, the remainder after 7. The free and bound forms of non-protein amino acids were estimated in livers.

In the rats given 7 injections gains of bodyweight and growth in size of tumours were less in the ethionine groups than in the control group; the addition of an amino acid did not affect the change produced by ethionine. The 8 amino acids studied in liver were arginine, aspartic acid, glutamic acid, glycine, lysine, methionine, proline and serine. The amounts of both forms of all acids, except arginine, were greater in the ethionine groups than in the control group. For 5 acids the increase in total was greater than in the bound form; the exceptions were methionine, of which both forms increased to the same extent, and serine, for which the increase was greater in free than in total.

In the rats killed after one injection similar but less extensive changes were found.—D. Harvey.

3436

MEDES, G., FRIEDMANN, B. and WEINHOUSE, S. **Fatty acid metabolism. 8. Acetate metabolism *in vitro* during hepatocarcinogenesis by *p*-dimethylaminoazobenzene.** *Cancer Res.*, 1956, **16,** 57–62. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

Acetate-2-^{14}C was incubated for 4 hr. at 37·6° C. in oxygen with liver slices from normal rats, with "pre-neoplastic" liver slices from rats which had been fed for several months on a diet containing 0·06 per cent. *p*-dimethylaminoazobenzene, and with liver tumour tissue from rats which had received the carcinogen for longer periods. Respired CO_2 was collected and tested for ^{14}C and the extent of incorporation of ^{14}C into acetoacetate, fatty acids and cholesterol was estimated.

Conversion of ^{14}C-acetate to CO_2 and cholesterol was similar in all the tissues studied, but much less acetoacetate and fatty acid were formed in primary tumour tissues than in normal or pre-neoplastic liver. It appears, therefore, that disturbance of acetate metabolism occurs abruptly with the development of tumour tissue.

G. A. Garton.

3437

DAS GUPTA, N. N., BHATTACHARYA, K. L., DUTT CHOUDHURI, R., BOSE, A. and DE, P. K. **The uptake of radioactive phosphorus in normal breast and breast tumors.** *Acta radiol.*, 1956, **45,** 69–80. [Chittaranjan Cancer Hosp., Calcutta.] German and French summaries.

Of 48 breast tumours studied, 20 were histologically malignant. The patients each received a single dose of ^{32}P by vein, about 0·01 μC. per g. bodyweight. The β-activity was measured by Geiger counter on the skin over the normal breast and over the tumour 2, 6, 10, 24, 30, 36 and 48 hr. later. The mean ratio of radio-activity between tumour and normal breast was thought to be more significant than the ratio at any one time. Some tumours were subsequently removed and samples of malignant and non-malignant areas were ashed for study of radio-activity.

Of the 20 malignant tumours 17 had mean radio-activity 130 per cent. or more of that of the normal breast and 3 had less than 130 per cent. Of the 28 benign tumours, 23 had counts of less than 130 per cent. If a count of more than 130 per cent. was taken as suggestive of malignancy, the diagnosis was confirmed by the histological findings in 40 out of 48 cases.

Because of large statistical error, no appreciable difference in the rate of accumulation or release of ^{32}P between tumour and normal tissue could be established with certainty. In 10 samples of

malignant tissue the activity was from 124 to 1040 per cent. of that in the normal samples, mean 500 per cent.

The value of this method as a diagnostic procedure is discussed.—D. Duncan.

3438

ALLISON, J. B., WANNEMACHER, R. W. (Jr.), HILF, R. and CROSSLEY, M. L. **Diet and TEPA therapy in sarcoma-bearing rats.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 728–730. [Bur. Biol. Res., Rutgers Univ., New Brunswick, N.J.]

Earlier work is summarised (Title 4783, Vol. 24; Abst. 3946, Title 5406, Vol. 25). With the same techniques as before and a diet with 12 per cent. casein, the following supplements were tested for their possible effect on the actions of N, N′, N″ triethylene phosphoramide (TEPA): DL-methionine or DL-methionine with guanidoacetic acid, each 0·67 per cent.; glycine 1·28, alanine 1·53, ammonium citrate 1·95 and casein 1·5 per cent., each of these supplying N equivalent to that in 0·67 per cent. guanidoacetic acid.

In 3 weeks the tumour had reached lethal proportions, 36·7 g., in rats not given TEPA. As before, TEPA reduced tumour growth and also body growth and efficiency of use of food. Supplements of methionine or methionine with guanidoacetic acid improved use of food and growth of the body, a change associated with reduced excretion of urea, without increasing growth of the tumour.

I. Leitch.

See also Abst. 3645.

METABOLISM OF GROWTH, REPRODUCTION AND SENESCENCE

GROWTH

3439

BERGSTRÖM, A. L., GUNTHER, M. B., OLOW, I. and SÖDERLING, B. **Prematurity and pseudoprematurity. Studies of the developmental age in underweight newborns.** *Acta paediat.*, 1955, **44,** 519–526. [Paediat. Clin., Centrallasarettet, Borås, Sweden.] French, German and Spanish summaries.

A scheme which may be useful in the study of types of prematurity is described for the assessment of reflexes and reactions in young babies.

A. M. Thomson.

3440

CREAMER, B. **Toxaemia of pregnancy and the child.** *J. Obstet. Gynaecol. Brit. Empire*, 1955, **62,** 914–916. [Dept. Paediat., St. Thomas's Hosp., London, S.E.1.]

A follow-up investigation to 4½ years of age failed to show any difference in development or health between control children and children born to mothers who had had pre-eclamptic toxaemia.

A. M. Thomson.

3441

FERGUSON, A. D., CUTTER, F. F. and SCOTT, R. B. **Growth and development of Negro infants. 6. Relationship of certain environmental factors to neuromuscular development during the first year of life.** *J. Pediat.*, 1956, **48,** 308–313. [Dept. Paediat., Coll. Med., Howard Univ., Washington, D.C.]

For part 5 see Title 845, Vol. 26.

6. In negro infants bodyweight and age of walking alone were inversely correlated. Age of walking alone was not significantly related to measured intelligence, number of siblings, or educational status of mother.—F. C. Aitken.

3442

LELONG, M. La méthode anthropométrique en auxo-endocrinologie. [**The anthropometric approach in the endocrinology of growth.**] *Ann. paediat.*, 1956, **186,** 149–162. [Clin. Puéricult., Hôp. Saint-Vincent-de-Paul, Paris.] German and English summaries.

After a discussion of the advantages and disadvantages of the methods of Wetzel, De Toni and others for graphical representation of the growth of children, a device is described [but not illustrated] which, by the adjustment of 2 threads, gives the normal height, weight and other body measurements for a boy or girl of given age, or weight and other body measurements for a boy or girl of given height. Norms are from Wilkins's modification of Engelbach's tables. Nomograms devised by Scholler for boys and girls give the percentage deviations from normal. When these are plotted at different ages, the curve of development of an individual child is obtained, by means of which he can be compared with himself as well as with the average child of the same age (see also Abst. 961, Vol. 25).—W. M. Deans.

3443

BAYLEY, N. **Growth curves of height and weight by age for boys and girls, scaled according to physical maturity.** *J. Pediat.*, 1956, **48,** 187–194. [Nat. Inst. Mental Health, Nat. Insts. Health, Bethesda, Md.]

Growth curves of height and weight for age for boys and girls maturing at average, accelerated and retarded rates are presented as standards for the assessment of individual growth curves. Annual increment curves for the average child maturing at the average rate are given also.

Comparison of a child's increment curve with the standard increment curve will show with which standard growth curve his or her own growth curve should be compared.

The basic data used in the standard curves were obtained from repeated measurements from birth to 18 or 21 years of 300 healthy Californian children. These data are tabulated. Physical maturity was estimated from X-ray studies of hand and knee and from the percentage attained of each child's adult stature.—F. C. Aitken.

3444

MARKOWITZ, S. D. **Retardation in growth of children in Europe and Asia during World War II.** *Human Biol.*, 1955, **27**, 258–273. [Madison, Wis.]

The data available for comparison of war-time with pre-war rates of growth of children in Belgium, China, England, Finland, France, Germany, Greece, Holland, Italy and Japan and for birthweights of infants in Germany, Holland, Russia and Switzerland are assembled. Retardation of growth as a result of war-time conditions was demonstrable in all the populations, but its contributory causes were not separable as nutritional or psychological in origin, since mental strain was generally greatest where food was scarcest.—D. Harvey.

3445

SCOTT, J. A. **Report on the heights and weights of school pupils in the County of London in 1954.** London County Council, 1955, pp. 28.

Schools were chosen at random within the 9 health divisions of the County of London so as to obtain a sample geographically and socially representative. In all, 10,904 boys and 10,099 girls were weighed and measured.

As in earlier years, boys were on the average taller and heavier than girls up to the age of 11 years; the positions were reversed from 11 to 14 and thereafter boys resumed their superiority, first for height and later for weight. Differences between children in different parts of the County found in earlier years have almost disappeared. Between 1949 and 1954 the average height and weight of boys increased by about 1·5 cm. (0·59 in.) and about 1·5 kg. (3·3 lb.). The average gains for girls were 1 cm. (0·39 in.) and 1 kg. (2·2 lb.). It is pointed out that these results do not preclude the attainment of the same adult stature at an earlier age rather than a general increase in stature of succeeding generations; also that the general increase in measurements at an interval of time may mask an intervening peak and the beginning of a fall. The ratios of weight : height were slightly greater in 1954 than in 1949 and are summarised as having remained substantially unaltered.

The age of onset of puberty, estimated approximately by asking boys if breaking of the voice had occurred and girls if menstruation had begun, was between 9·9 and 16·6 years in boys and between 10·3 and 15·8 years in girls.—F. C. Aitken.

3446

KEDDIE, J. A. G. **Heights and weights of Scottish schoolchildren.** *Brit. J. Prev. Social Med.*, 1956, **10**, 1–14. [Dept. Health for Scotland, Edinburgh.]

Children attending Scottish education authority schools have a systematic medical examination at 5, 9, 13 and 16 years of age. The data considered in this report were obtained at these examinations. For Edinburgh and Glasgow children aged 5, 9 and 13 years, measurements were available for the years 1913–14 to 1953–54. The average heights and weights in 1953–54 were significantly greater than in 1913–14. A few averages had increased significantly by 1931–32, but the chief increases occurred in steady annual increments in the next 20 years. The average heights and weights of the Edinburgh children were greater than those of Glasgow children in 1913–14. The differences were less in 1953–54, but many were still statistically significant. Average gains in Edinburgh were: at 5 years, boys 1·29 in., 2·07 lb., girls 1·04 in., 1·31 lb.; at 9 years, boys 2·92 in., 7·45 lb., girls 2·30 in., 7·19 lb.; at 13 years, boys 3·57 in., 14·37 lb., girls 0·85 in., 12·68 lb. Average gains in Glasgow were: at 5 years, boys 1·93 in., 4·35 lb., girls 1·64 in., 3·69 lb.; at 9 years, boys 4·00 in., 8·36 lb., girls 2·53 in., 6·98 lb.; at 13 years, boys 3·91 in., 14·53 lb., girls 3·18 in., 16·41 lb. The ratios of average weight to average height of Glasgow children were calculated for the years 1938 to 1954. The ratios are said to have varied only slightly throughout the period.

The changes in mean heights and weights of children aged 5, 9, 13 and 16 years in the 6 years 1948–49 to 1953–54 were studied from combined data of Edinburgh, Glasgow, Dundee and Ayrshire, representing the school population of the central industrial belt. Statistical analysis of the differences between 1953–54 and 1952–53 and between 1953–54 and 1948–49 confirmed the upward trend in average heights and weights of children of school age. For all the ages, heights and weights were significantly higher in 1953–54 than in 1948–49. In the comparison of 1953–54 with 1952–53 the differences in favour of 1953–54 which were not significant were height of 16-year-old boys, and of 9- and 16-year-old girls.

All-Scotland average heights and weights were computed for 1951–52 and 1952–53. Adjusted to the uniform ages $5\frac{4}{12}$, $9\frac{6}{12}$, $13\frac{6}{12}$, these were in 1952–53: boys, 43·00 in. and 43·12 lb. at 5 years, 51·93 in. and 64·27 lb. at 9 years, 59·52 in. and

93·52 lb. at 13 years; girls, 42·61 in. and 41·50 lb. at 5 years, 51·54 in. and 62·04 lb. at 9 years, 59·99 in. and 97·53 lb. at 13 years. These averages, compared with the 1951–52 averages, tended to confirm the upward trend in heights and weights of boys and girls in Scotland.

Regional analysis of the data for children aged 5, 9 and 13 in 1951–52 and 1952–53 showed that, almost invariably, the Highlands and Southern Counties had the highest and second highest average heights and weights, Glasgow the lowest, the region Edinburgh, Aberdeen and Dundee the second lowest, with the Eastern Counties and the Western-Central industrial region occupying intermediate positions. The average measurements of children in predominantly rural areas were above, and those of children in predominantly industrial regions below, the corresponding all-Scotland averages. A further study of children aged 5, 9, 13 and 16 in 4 highly industrial large burghs, and 4 less industrial large burghs, showed higher average heights and weights in the latter. Regional data for 16-year-old secondary school children are tabulated separately, since these are not considered representative of the children of that age in the community. The all-Scotland averages for 1952–53 were: boys, 67·70 in. and 134·91 lb.; girls, 63·66 in. and 123·57 lb. Averages were not significantly different from those of 1951–52.

[The all-Scotland mean height of boys aged 13 in 1951–52 is given in Table VII of the text as 59·97 in. and in Table C of the appendix as 59·57. Table IV of the text should read ratio of average weight (kg.) to average height (cm.) and not vice versa.]—F. C. Aitken.

3447

PROSPERI, P. Valori auxometrici del bambino toscano. [**Measurements of Tuscan children.**] Studio statistico sulle alterazioni dell'accrescimento del bambino toxano. [**Statistical study of the variations in growth of Tuscan children.**] *Riv. Clin. pediat.*, 1955, **56,** 26–48; 150–169. [Clin. Pediat., Univ. Florence.] English and French summaries.

(a) Measurements of height and weight were made in the years 1949–54 on 2954 boys and 2288 girls distributed over each month of age for the first 12, and over each year for the first 14. The children were those who came from the different parts of Tuscany to the out-patient clinic of the Ente Nazionale per l'Assistenza Statali; they were considered representative of the children of Tuscany. The mean values are tabulated and compared with those obtained by other workers and for other parts of Italy. They show that in weight and height the children of Tuscany are superior to all other Italian children at all ages examined, and that the children of Florence are similarly superior to the children of other Italian cities and to the children of Florence 30 years ago.

(b) The values obtained for 2747 of the children, those from 3 to 12 years old, were further analysed for the extent of their variation. The system chosen for assessing normality is that of G. de Toni [6 references are given, with no indication of which is the key reference]. On that basis the percentage of children whose growth was accepted as within the normal range was 65·425. A larger proportion of children showed growth within the normal range at 3 years old than at any other age. The largest proportion of abnormality was at 11 years old. The growth of more children was above the normal range than below it. Of those exceedingly abnormal, the largest proportion was obese, with a certain proportion of giants and a still smaller proportion of dwarfs. The general picture for Tuscan children was considered more favourable than for Ligurian or Neapolitan children or for Italian children in general.—E. M. Hume.

3448

WADDY, B. B. **Heights and weights of children in the Northern Territories of the Gold Coast.** *J. Trop. Med. Hyg.*, 1956, **59,** 1–4. [Ross Inst., London Sch. Hyg. Trop. Med.]

Children between the ages of 6 and 12 years were weighed and measured. They belonged to the eastern half of the Northern Territories and, in spite of the absence of dates of birth, their ages as calculated from their years of attendance at school were thought to be approximately right. The means at yearly intervals are tabulated for 2648 boys and 883 girls. Tables are given also for 1666 boys and 497 girls in one area where the staple food is grain and bilharziasis is common, and for 859 boys and 354 girls in another where yams are the staple food and the disease is absent. Between the areas there was no difference in heights or weights of boys or in heights of girls; weights of girls were greater in the second than in the first.

From comparison with the few data available for African and with those quoted by Clements (Abst. 4975, Vol. 24) for English children the view is advanced that inadequacy of nutrition prevents the former from attaining in general the degree of physical development of the latter.—D. Harvey.

3449

SAITO, K. and FUNAKAWA, H. **Recent status of physical growth of Japanese children from birth to 6 years and comparison with observations made ten years previously.** *Bull. Inst. Pub. Health, Tokyo,* 1954–55, **4,** No. 3, English part, 13–17. [Dept. Maternal Child Health, Tokyo.]

In 1940, measurements were made on 24,708 infants and pre-school children (Abst. 873, Vol. 20). In 1950 height, weight, chest girth and head girth were measured for 14,009 boys and 13,309 girls, including infants for every month of age from birth to 12, and pre-school children for every year from 1 to 6. They were selected to be representative of different parts of the country. The mean values are tabulated. At birth the mean height was slightly less and the mean weight slightly more in 1950 than in 1940. The physical growth in 1950 was in general superior to that in 1940, with the exception of height at pre-school age.

E. M. Hume.

3450

KURTH, G. Zwei nebeneinander wirksame Faktoren in der schwedischen Körperhöhenzunahme seit 1840. [**Two simultaneously acting causes of the increase in height in Sweden since 1840.**] *Acta med. scand.*, 1955–56, **153,** 159–171. [Göttingen.] English summary.

For a similar analysis see Boyne and Leitch, *Nutrition Abstracts and Reviews*, Vol. 24, p. 255.

I. Leitch.

3451

BANDY, P. J., COWAN, I. M., KITTS, W. D. and WOOD, A. J. **A method for the assessment of the nutritional status of wild ungulates.** *Canad. J. Zool.*, 1956, **34,** 48–52. [Dept. Zool., Univ. British Columbia, Vancouver.]

Groups of Columbian black-tailed deer, *Odocoileus hemionus columbianus*, were reared from birth on high and low planes of nutrition which will be described elsewhere. Ten animals on each plane were measured weekly. Growing animals over 2 years showed a linear relation between bodyweight and chest girth behind the axilla, called heart girth. There was another linear relation between bodyweight and length of the hind foot from the tip of the hoof to the tip of the calcaneus when the animal was standing. The first relation varies with the condition of the animal, the second is a skeletal ratio and depends only slightly on condition. The condition of the animal is then expressed by comparing the ideal weight as estimated from the length of the foot with the actual weight as estimated from heart girth. Of 2 deer with identical heart girths, one on each plane of nutrition, the animal on low plane was older and had greater skeletal growth and so its index of condition was 0·96, against 1·18 for the animal on high plane. Similarly, of 2 deer with the same hind foot length the high-plane animal was twice as heavy as the low-plane one, and the indices were 1·84 and 0·95, respectively.

D. Duncan.

3452

LOWRANCE, E. W. **Roentgenographic record of growth of the femur of the rabbit.** *Growth*, 1955, **19,** 247–255. [Dept. Anat., Univ. Missouri, Columbia.]

X-ray photographs were taken of the femurs of a large number of rabbits of ages from 15 to 204 days, and measurements were made on them of length and diameter.

The mean length increased from 32 to 88 mm. and the mean diameter from 3·2 to 7·3 mm. Ninety-seven per cent. of adult length and diameter (measurements at 204 days) were reached at about 130 days after birth. There was no significant difference between sexes in length or diameter of the femur.—R. Hill.

See also Absts. 3453, 3459, 3582.

REPRODUCTION AND LACTATION: MAMMALS

3453

SCOTLAND, W. H. D. **Length of gestation of East African women.** *J. Obstet. Gynaecol. Brit. Empire*, 1956, **63,** 120–123. [Dept. Obstet., Med. Sch., Makerere Coll., Kampala, Uganda.]

Mean birthweights for 2500 infants in Uganda, 60 per cent. Bantu, 20 per cent. Nilotic and the remainder mainly Hamitic in origin, were for the Bantu 6·44 and for the non-Bantu 6·38 lb. These are lower than the weights quoted for white and Bantu infants in South Africa (Abst. 3878, Vol. 21), for white infants in Britain (Abst. 2602, Vol. 22) and for white and negro infants in the United States (Taback, *J. Amer. Med. Assoc.*, 1951, **146,** 901). Head measurements were made within 12 hr. of birth and again on the fourth day in 402 infants born spontaneously and unselected except for the exclusion of any with excessively moulded heads. In 97 per cent. of them occipito-frontal circumference increased in that time by about 0·25 in. Information was obtained, with stringent precautions, from 366 mothers. The average length of gestation was 42 weeks ; it was 40 weeks or more in 80 per cent. of them.

The possible relation of disordered metabolism of oestrogens to these findings is discussed.

D. Harvey.

3454

CLEMETSON, C. A. B. **The difference in birth weight of human twins. Twin blood studies : 1. Oxygen analysis of umbilical cord blood. 2. Cord blood haemoglobin levels. 3. Placental transfer of amino-acids.** *J. Obstet. Gynaecol. Brit. Empire*, 1956, **63,** 1–8 ; 9–14 ; 15–18. [University Coll. Hosp., London.]

3455

YERUSHALMY, J., BIERMAN, J. M., KEMP, D. H., CONNOR, A. and FRENCH, F. E. **Longitudinal studies of pregnancy on the Island of Kauai, Territory of Hawaii. 1. Analysis of previous reproductive history.** *Amer. J. Obstet. Gynecol.*,

1956, **71,** 80–96. [Div. Biostatistics, Sch. Pub. Health, Univ. California, Berkeley.]

3456

BROWN, T. **Electrophoretic analysis of serum proteins in pregnancy. 2. Effect of labour and lactation.** *J. Obstet. Gynaecol. Brit. Empire*, 1956, **63,** 100–106. [Dept. Res., Royal Maternity Hosp., Glasgow.]

For part 1 see Abst. 3968, Vol. 25.

2. In 10 healthy pregnant women, the mean value of 6·427 g. total protein per 100 ml. serum within 12 hr. before labour was similar to the average for the last trimester of pregnancy, but the constituents had altered. Albumin continued to fall to a level of 2·61 g. per 100 ml. and the globulin, particularly the γ-fraction, rose, so that the albumin : globulin ratio was 0·69.

In the same women, within 24 hr. after labour, the mean level of albumin had fallen still further to 2·53 g. per 100 ml. and the globulin, particularly the γ-fraction, had risen ; the albumin : globulin ratio was 0·615 and total protein 6·645 g. per 100 ml. There was considerable individual variation and even the direction of the changes was not invariable.

On the fifth day *post partum* in 10 women with established lactation, average total protein was 6·62 g. per 100 ml. ; the mean level of albumin rose to 2·79 and mean total globulin fell from 4·12 after delivery to 3·828 g. per 100 ml. The fall in globulin was due to the β- and γ-fractions.

F. E. Hytten.

3457

COBLEY, J. F. C. C. and LANCASTER, H. O. **Carbohydrate tolerance in pregnancy.** *Med. J. Austral.*, 1955, i, 171–175. [Royal Hosp. Women, Paddington, N.S.W.]

Glucose tolerance tests were made monthly on 158 normal pregnant women aged from under 20 to over 35 years. Mean blood sugar for 7 samples for each month of pregnancy showed that carbohydrate tolerance remained constant during pregnancy, though in some women there was delay in reaching the peak of blood sugar and in the return to the fasting range. Such minor deviation is not regarded as pathological.—M. H. Pierce.

3458

THOMSEN, K. Über die Aktivität der alkalischen Phosphatase in der menschlichen Placenta. [**Activity of alkaline phosphatase in the human placenta.**] Histochemische Untersuchungen über die saure Phosphatase in der menschlichen Placenta. [**Histochemical studies of acid phosphatase in the human placenta.**] *Arch. Gynäkol.*, 1955–56, **187,** 1–19 ; 264–281. [Frauenklin., Univ. Hamburg, Eppendorf.]

(a) One hundred human placentae, of which 65 were normal ones obtained at different stages of pregnancy and 35 were obtained after abortion, intra-uterine death or toxaemia of late pregnancy, were examined for alkaline phosphatase by Gomori's method as modified by Goetsch *et al.* (*Proc. Soc. Exp. Biol. Med.*, 1952, **80,** 71).

In normal placentae alkaline phosphatase was found especially in the protoplasm of the syncytium. Activity was erratic in distribution up to the tenth week ; thereafter it became more uniform and gradually increased up to the 30th week ; in late pregnancy it declined. Increasing activity was found in maternal intervillous blood, but none was found in the blood of the foetus. The suggestion is made that alkaline phosphatase may have something to do with transfer of glycogen and fats to the foetal blood.

(b) In the same material, acid phosphatase activity was found to behave in almost the opposite way. In the syncytium activity was greatest about the third month and then fell steadily. Acid phosphatase was not found in maternal or foetal blood. It is thought to be concerned in the preparation of nutrients for the young foetus rather than in their transfer. In pathological material it was associated with regions of calcification.—W. M. Deans.

3459

MISCHEL, W. Die biogenen Amine der Placenta. 2. Der Kreatin- und Kreatiningehalt der menschlichen Placenta. [**The biogenic amines of the placenta. 2. Creatine and creatinine content of the human placenta.**] *Arch. Gynäkol.*, 1954 – 55, **185,** 713 – 725. [Frauenklin., Univ. Leipzig.]

Part 1 appeared in *Ztschr. Geburtshilfe*, 1954, **141,** 334.

Literature on the occurrence of choline, acetylcholine, arginine, histidine, lysine, tryptophan and histamine in the placenta is briefly reviewed.

In 68 immature and mature placentae (50 normal), creatine was estimated by conversion into creatinine by the method of Jipp and Menne (Abst. 1342, Vol. 20) and adsorption on fuller's earth (Abst. 2808, Vol. 7) ; the creatinine was eluted with picrate and estimated colorimetrically by the Jaffé reaction. Creatinine originally present was also estimated by the Jaffé reaction and creatine was found by difference.

The normal values found per 100 g. fresh tissue were : creatine 11·31, range 4·00 to 19·60, creatinine 5·5, range 3·50 to 9·00 mg. The much higher values in blood reported in the literature, *e.g.*, by Kessler and Albers (Title, p. 114, Vol. 4) are considered doubtful and should be re-investigated. Values in the placenta were unaffected by

sex of child and parity of mother; on the effect of prematurity there was insufficient evidence. In placentae from patients with toxicosis creatine was the same, creatinine about 15 per cent. higher.
W. M. Deans.

3460

JAFFÉ, W. G. Nota preliminar sobre la influencia de factores dietéticos en la fertilidad de ratones y ratas. [**Preliminary note on the effect of dietary components on fertility in mice and rats.**] *Arch. venezol. Nutricion*, 1955, **6**, 49–59. [Inst. Nac. Nutrición.] English and German summaries.

It was earlier shown that addition of vitamin B_{12} to a diet of maize and extracted soya bean meal with minerals and vitamins made it equal, for reproduction, to a commercial food with fishmeal and dried skimmed milk (Abst. 4962, Vol. 25). In the present series rats and mice were bred on diets of maize flour 46, extracted soya bean meal 46, sesame oil 5 and salts 2 with vitamins A, D, E and B complex. One group had 5 μg. vitamin B_{12} per kg. diet, one had 30 μg. vitamin B_{12} per kg. and 0·2 per cent. methionine, and another had 7·5 per cent. of the above diet replaced by fishmeal. The normal diet for comparison was a commercial rat diet. The numbers of experimental litters on each diet varied from 14 to 37 and of controls were 70 (rats) and 50 (mice). In both rats and mice control litters and litters from mice given fishmeal were larger, 9·5 and 8·3 against 7·4 and 7·5, and heavier, 6·1 and 1·4 and 1·43 g. as against 5·5 and 1·4 and 1·37 g. Litters were reduced to 6 and there was no difference between numbers reared.

In a later series, replacement of extracted by whole soya bean meal and reduction of sesame oil to 1 per cent. gave results even better than those of groups with fishmeal.—I. Leitch.

3461

CAHN, T. and HOUGET, J. Le transport des métabolites au cours de la gestation de la lapine. [**Transport of metabolites during pregnancy in the rabbit.**] *J. Physiol., Paris*, 1955, **47**, 835–848. [Lab. Physiol., Inst. Biol. Phys. Chim., Paris.]

Rabbits were killed on the 19th, 21st, 24th and 29th days of gestation. Blood and liver were obtained and the "foetal and maternal parts of the placenta" [*i.e.*, placenta and decidua] were separated.

Analyses of blood cells and plasma and of liver from non-pregnant rabbits gave a basis for comparison. The variations found during pregnancy are expressed as percentages of these basal values. From the 19th to the 29th day the plasma showed a slight fall in protein concentration to about 10 per cent. below normal; glycerides rose from 3 times normal to 5 times at the 21st day and then fell sharply to half normal on the 29th day. Fatty acids, lipoid P and free cholesterol all rose between the 19th and the 21st day and then fell very low before parturition. Ester cholesterol fell continuously to about a tenth of normal. The proportion of red cells in the blood was about 10 per cent. below normal throughout the second half of pregnancy. Their fatty acid content was 40 per cent. above normal on the 19th day, twice normal by the 24th day and almost back to normal by the end of pregnancy. Variations in the proteins, lipoid P and free cholesterol were slight.

On the 19th day the liver was enlarged by 35 per cent. above its normal size and after the 21st day it slowly regressed. The water content followed the same pattern. Liver glycogen was about twice normal on the 19th day and 2½ times on the 21st, then fell slowly to about twice normal before parturition. Total glycerides were extremely high, especially on the 24th day. Protein, cholesterol and lipoid P all fell during the period of study, but only P was below normal at the end.

The decidua reached its greatest weight, about 3 g., on the 21st day and remained at this weight until parturition. It had a high glycogen content, falling from 7·44 per cent. on the 19th day to 3·25 per cent. on the 29th. The water content rose from 79·8 to 83·2 per cent. and the amount of water per g. protein was nearly double that in the liver. The fatty acid content was about 1 per cent., but there was a fall in lipoid P and a large increase in glycerides, which rose from 22 to 67 per cent. of the total fatty acid. The placenta grew steadily from a mean weight of 0·73 g. on the 19th day to 2·93 on the 29th. The water content was steady at about 84 per cent. The glycogen content was very small and almost nil at the end of gestation, but the fatty acid content was twice that of the decidua; the glyceride content was already high on the 19th day and did not increase as much as that of the decidua. The content of cholesterol esters was as much as 20 times that in the decidua and often 5 times that in the liver. Free cholesterol was in much the same concentration in placenta, decidua and liver. The high concentration of glycogen in liver cannot be attributed to progesterone or the other sex hormones normally associated with gestation, and with the changes in transport of lipids they suggest participation of some other hormone, probably from the pituitary or adrenal. It seems likely that the placenta synthesises phospholipins. The ester cholesterol may serve to transport fatty acids from the placenta to the foetus. The glycerides of the embryo are mostly formed from fatty acids received in this way.—D. Duncan.

3462

BOURDEL, G. and JACQUOT, R. Rôle du placenta dans les facultés anabolisantes des rattes gestantes. [**Role of the placenta in the anabolising power of the pregnant rat.**] *C.R. Acad. Sci.*, 1956, **242**, 552–555.

For earlier work see Absts. 924, Vol. 24; 977, Vol. 25.

Female rats on a balanced diet were mated. On the 13th day of pregnancy they were divided into 4 groups and submitted to operative procedures as follows: in 1 group removal of several foetuses, but not all; in a second group removal of all foetuses, the placentae being left; in the third group removal of all foetuses and castration; and in the fourth, removal of the whole product of gestation. The N balance was studied from 16 days before mating until the rats were killed on the 21st day after mating.

Before mating the rats gained a little weight, 4 to 7 per cent. of the initial weight in 16 days. In the first 13 days of pregnancy the gain of weight was from 12 to 17 per cent., an illustration of the early stage at which bodyweight is increased. After operation the loss of weight depended on the character of the procedure and varied from 1·3 per cent. in group 1 to 3·5 per cent. in group 3. The first 3 groups then resumed their gains, so that their total gain by the 21st day was 23·5, 15·7 and 15·4 per cent. The rats in which pregnancy had been terminated had lost 6 per cent. of their weight between the 13th and 21st days.

The N balances were slightly positive before mating. During pregnancy N retention increased until operation in all groups and then fell for 48 hr. After this time there was again increased retention and the first 3 groups retained, respectively, averages of 568, 528 and 463 mg. N after operation. The mean retention in 6 days before mating was 312 mg. Thus neither removal of the foetuses nor of the ovaries prevented increased retention of N in the presence of the placentae. The mechanism is not yet known.—D. Duncan.

3463

BEATON, G. H., RYU, M. H. and MCHENRY, E. W. **Studies on the role of growth hormone in pregnancy.** *Endocrinology*, 1955, **57**, 748–754. [Dept. Pub. Health Nutrit., Univ. Toronto.]

In 3 experiments studies were made on female rats given a diet to appetite with 20 per cent. casein and 20 per cent. maize oil; in a fourth experiment studies were made on rats given unlimited amounts of fox chow and water. When growth hormone was injected intraperitoneally into non-pregnant female rats there were significant decreases in liver alanine-glutamic transaminase and *d*-aminoacid oxidase, resembling alterations found in pregnant rats (Abst. 2443, Vol. 25). The hormone treatment did not produce significant changes in bodyweight, liver weight or packed cell volume, but the trends were similar to those of pregnancy. In the second experiment when oestrogen, progesterone and growth hormone were administered simultaneously to non-pregnant rats many of the biological changes typical of pregnancy were produced, but when, in the third experiment, crude pituitary powder was administered metabolic changes characteristic of pregnancy were not produced. In the fourth experiment hypophysectomy of pregnant rats on the twelfth day of gestation did not terminate pregnancy but led to a decrease in liver weight, alanine-glutamic transaminase, packed cell volume and blood amino N. It is suggested that growth hormone may be responsible for some of the metabolic changes which occur in the rat during pregnancy.—G. F. Garton.

3464

TUCHMANN-DUPLESSIS, H. and MERCIER-PAROT, L. Hypophyse et développement prénatal. L'hormone somatotrope est-elle responsable du gigantisme foetal? [**The pituitary and prenatal development. Is the growth hormone responsible for foetal gigantism?**] *Presse méd.*, 1955, **63**, 1831–1834. [Lab. Embryol., Fac. Méd., Paris.]

Growth hormone (Choay), hereafter denoted by STH, 10 I.U. daily, was injected into rats [number not stated] from the third to the sixth day after mating. Some were allowed to go to term; from others the foetuses were removed on the 20th day.

Glycosuria was not found in treated rats. Parturition was delayed for from 3 to 6 days and was slow and painful. All the offspring were born dead and they were mostly very large, weighing up to 7 g.; the normal birthweight for the rats used was 4·5 to 5 g.

In contrast, 20-day foetuses were always below normal weight, the average for 68 being 1·22 g. compared with 2·18 g. for those from untreated rats, a diminution of [over] 40 per cent. They appeared normal but resembled 18-day or 19-day foetuses from untreated rats, and this was confirmed by sections of head and body (photographs reproduced). That is, the increased size of the foetuses of treated rats was due merely to the extra length of gestation, in agreement with the results of Frazer *et al.* (Title 2240, Vol. 19).

It was thought possible that STH increased protein anabolism in the mother and thereby deprived the foetus of nutrients; but when other rats were treated from the fourth, fifth, sixth, seventh or eighth day till the sixteenth it was found that foetal growth was not significantly retarded unless STH was injected before the fifth day after mating.

Two groups each of 10 rats had their pituitaries removed on the twelfth day; one group were allowed to go to term and the foetuses were removed from the others on the 20th day. A third group had sham operations and had their food restricted to that taken by the hypophysectomised rats. Twenty-day foetuses from hypophysectomised rats appeared normal and did not differ in weight from those from sham-operated rats, in agreement with the results of Campbell *et al.* (Abst. 3343, Vol. 23). Of rats allowed to go to term, some produced live offspring of normal weight, others gave birth with difficulty from 2 to 4 days late. The mean weight of 24-day foetuses was 5·6 g., 1 g. more than that of untreated rats.

The possibility that foetal growth is controlled by the pituitary of the foetus is then discussed.

W. M. Deans.

3465

Slagsvold, P. and Aamdal, J. Drektighetstidens lengde og kjønnsproporsjoner hos østlandsraukoller. [**Duration of pregnancy and sex ratio in Eastern Red Polls.**] *Tidsskr. norske Landbruk*, 1956, **63,** 10–20. [Norges Vet. Høgsk., Inst. Husdyrbruk.] English summary.

3466

Ghanem, Y. S., Abul-Fadl, A., Zaher, A. and Soliman, F. A. **Environmental causes of variation in the length of gestation of buffaloes.** *Indian J. Vet. Sci.*, 1955, **25,** 301–306. [Dept. Zool. Physiol., Fac. Vet. Med., Univ. Cairo.]

3467

Parry, H. B. and Taylor, W. H. **Renal function in sheep during normal and toxaemic pregnancies.** *J. Physiol.*, 1956, **131,** 383–392. [Nuffield Inst. Med. Res., Univ. Oxford.]

Studies were of 10 normal ewes, of 7 in which toxaemia was spontaneous and 5 in which it had been induced experimentally by the senior author's method of subjecting well fed and overweight ewes late in pregnancy to a sudden reduction of feed intake (Title 3133, Vol. 25). Renal function was examined by estimation of levels of urea and creatinine in plasma and urine and by measurements of blood pressure and of urea, creatinine and *p*-aminohippurate clearances. Anatomical and histological examinations also were made of kidneys.

The impairment of renal function was similar in the 2 groups of toxaemic ewes and was considerable in extent, but could not be related to blood pressure or dehydration. The condition is briefly compared with that found in women; the main difference is the absence of hypertension in the ewes.—D. Harvey.

3468

Perez y Perez, F. La fructuosa como material energético de la célula espermática en la conservación extraorgánica del esperma. [**Fructose as source of energy for the sperm cell in storage of semen.**] *An. Inst. Invest. Vet., Madrid*, 1954, **6,** 179–189. [Cat. Fac. Vet., León.] English and German summaries.

Fructose was found to produce more activity in semen than glucose; if the dilutions were buffered, fructose was the better source of energy, but in the absence of buffering glucose gave longer survival because toxic breakdown products were produced more slowly. [The English summary is misleading.]

D. Duncan.

3469

De Luca, R., Cutroneo, A. and Macchia, A. Il quadro proteinemico nelle nutrici. [**Blood proteins in nursing women.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 377–380. [Ist. Clin. Pediat., Univ. Messina.]

Total protein, fat and lactose were estimated in the milk and an electrophoretic analysis was made of the blood serum proteins of 25 lactating women with babies aged from 11 days to 12 months. In 10 the composition of the milk was normal, and the electrophoretic pattern of the serum proteins was normal also. In 15 total protein and lactose were less than normal. In their serum there was increase of α_2-globulin and in 5 of α_1-globulin also; in 1, γ-globulin was increased. Low lactose concentration of the milk is attributed to retention of milk in the mammary gland caused by incomplete emptying or by too great length of the intervals between feeds.—E. M. Hume.

3470

Black, A. L. and Kleiber, M. **The recovery of norleucine from casein after administering norleucine-3-C^{14} to intact cows.** *J. Amer. Chem. Soc.*, 1955, **77,** 6082–6083. [Sch. Vet. Med., Univ. California, Davis.]

Labelled DL-*nor*leucine, 3·6 and 3·3 mC., was injected intravenously into 2 cows. From the first, 30 per cent. of the ^{14}C was recovered in milk over 46 hr., about a third of it in the casein. In a sample of casein separated from milk drawn 3 hr. after the injection the essential amino acids, including leucine and *iso*leucine, were not significantly radio-active; the non-essential acids were rich in ^{14}C. Paper chromatography of a fraction eluted from a Dowex-50 column revealed a small amount of radio-active *nor*leucine. A sample of casein from milk collected 10 hr. after injection was found to contain *nor*leucine. Preliminary analysis of milk collected from the second animal 3 hr. after injection confirmed the finding, and experiments *in vitro* excluded the possibility of the *nor*leucine having been adsorbed by the casein.

It is concluded that *nor*leucine was incorporated in casein by peptide linkage.—D. Harvey.

3471

DAUWALDER, M. Untersuchungen über den Calciumstoffwechsel mit radioaktivem Calcium bei der Milchziege. [**Studies of calcium metabolism with radio-active calcium in the milk goat.**] *Ztschr. Tierzücht. Züchtungsbiol.*, 1955, **65,** 359–380. [Inst. Tierzucht Hyg., Univ. Berne.]

The subject was a 5-year-old lactating goat which was given in successive experiments $^{45}CaCl_2$ by mouth and ^{45}Ca as lactobionate intravenously. Milk, blood and urine were taken for estimation of ^{45}Ca.

In each of 2 experiments the goat received about 0·09 mC. ^{45}Ca every second day for 10 doses. Four hours after the first dose the radio-activity in 1 g. urine was 5 times and that in milk 40 to 50 times that in serum. In the 2 experiments together the mean urine activity on the days on which ^{45}Ca was given was twice and the mean milk activity 3 or 4 times that in serum ; on intermediate days the corresponding relative values were 3 times and 5 times those in serum. In the second experiment activity was not found in the serum more than 13 days after the last dose was given, but ^{45}Ca appeared in the milk for another 10 days.

In the other 2 experiments labelled lactobionate was injected every second day for 10 and for 8 doses, each again of 0·09 mC. At the beginning of each experiment blood samples were taken 1, 10 and 30 min. and 3 hr. after the injection. The serum radio-activity after 10 min. was little more than half the initial value, after 30 min. a third and after 3 hr. a tenth or less. The activity of milk was small until the following day, and then it varied much as in the experiments with $^{45}CaCl_2$ given by mouth. In the first of these experiments the serum radio-activity disappeared within 3 days after the last injection, urine activity in 10 days and milk activity in about 14 days.

After the last experiment the goat was killed. Tissues were fixed and ashed and the distribution of ^{45}Ca in the ash was studied. The greatest activity per g. was in the skeleton, and especially in the callus around a fracture sustained during the experiment. The most active soft tissue was the udder and then the large intestine and lungs ; no activity was found in the small intestine, spleen, lymph nodes, adrenals or hair.

The goat's milk was given to 7 guineapigs, which were also killed at the end of the experiment or examined when they died ; 3 died of a diplococcus infection. Four were born during the time when the mothers were receiving labelled milk, and they had at birth a higher concentration of ^{45}Ca in the skeleton than the adults.—D. Duncan.

3472

MANSON, W. **Acid-soluble nucleotides of lactating mammary gland.** *Biochim. biophys. Acta*, 1956, **19,** 398–399. [Dept. Biochem., Hannah Dairy Res. Inst., Ayr.]

Perchloric acid extracts of mammary tissue from a goat after 14 days of lactation and a cow after 200 days were analysed by anion-exchange chromatography for nucleotides. There was little qualitative differences between the 2 sources, although quantitatively there were wide variations. Tissue from the goat and cow contained 25 and 12 μmol. uridine diphosphate acetylglucosamine and 40 and 15 μmol. uridine diphosphate glucose per 100 g. The significance of the high concentrations of the latter in relation to synthesis of lactose is being investigated. Other nucleotides found were the mono- and diphosphates of uridine, cytidine and adenosine, uridine triphosphate, adenosine triphosphate, guanylic acid and di- and triphosphopyridine nucleotides.—A. Hepburn.

See also Absts. 2678, 2844, 2850, 2981, 2983, 2984, 3042, 3079, 3159, 3160, 3166, 3297, 3407, 3597, 3632, 3659, 3762, 3891.

REPRODUCTION: BIRDS

3473

PIANA, G. P-Ossipropiofenone, ormoni gonadotropi preipofisari, ACTH e produzione di uova. (Ricerche sperimentali e considerazioni.) [***p*-Oxypropiophenone, anterior pituitary gonadotropic hormones, ACTH and egg production : experimental study and discussion.**] *Riv. Zootec.*, 1956, **29,** 15–26.

Of 3 groups, comprising in all 75 White Leghorn hens, the first group was untreated ; the second received by mouth *p*-oxypropiophenone, 62 mg. per head daily for 10 days and then 125 mg. per head daily for 30 days ; the third received twice these amounts.

In 6 months before treatment began egg production had been almost the same in all 3 groups, with totals of 747, 750 and 753 eggs. During the period of treatment the treated groups produced, respectively, 21·8 and 16·7 per cent. more eggs than the untreated birds and in 20 days after the end of treatment, 23·8 and 21·6 per cent. more. Oxygen consumption, estimated before and towards the end of treatment, was slightly augmented in treated birds.

At the end, tissues were studied histologically. In the second group the anterior pituitary showed enlarged cells, often elongated and cylindrical, with clear, finely granular protoplasm, indicative of great activity. In the third group the cells were not enlarged, but the protoplasm was again clear and finely granular and in addition there appeared to be cellular hyperplasia, shown by more numerous

nuclei. The thyroids of treated birds showed only slight evidence of increased activity. The ovaries and oviducts showed the effects of stimulation.

A second similar experiment gave similar results, but 500 mg. *p*-oxypropiophenone daily for 20 days was less effective than the smaller amounts. Anterior pituitary gonadotropic hormone A had a slight stimulatory effect, placental gonadotropic hormone a larger one, but adrenocorticotropic hormone had none.

The possible mode of action of *p*-oxypropiophenone is discussed.—D. Duncan.

3474

McCallion, D. J. and Wong, W. T. **A study of the localization and distribution of glycogen in early stages of the chick embryo.** *Canad. J. Zool.*, 1956, **34,** 63–67. [Dept. Biol., Acadia Univ., Wolfville, N.S.]

Glycogen was measured histochemically in chick embryos in each of 3 stages of development, the definitive streak, the head process stage and the head fold stage. In general the content was greatest in the first and least in the third of these stages. The concentration of glycogen in the ectoderm was greatest at the first and fell at the other 2 stages; there was little or none in the mesoderm and endoderm at any stage.

D. Harvey.

3475

Ravaioli, L. Frazionamento elettroforetico de liquido allantoideo di embrione di pollo. [**Electrophoretic fractionation of allantoic fluid of the chick embryo.**] *Rend. Ist. Super. Sanità, Rome*, 1955, **18,** 1119–1128. French, English and German summaries.

For each analysis was used the allantoic fluid from 5 eggs incubated at 39° C. and relative humidity 85 per cent. Eggs were taken on the ninth, tenth, eleventh, twelfth and thirteenth days of incubation. Total and protein N were estimated and the fluid was concentrated by dialysis before paper electrophoresis.

Protein N increased from 0·91 to 6·53 [? mg.] per cent. and total N from 0·237 to 1·324 [? mg.] per ml. during the 5 days of study, but each showed a slight decline on the eleventh day, probably because of an increase in fluid volume. On electrophoresis the protein was divided into 3 distinct bands, the first of which migrated at the same rate as chicken serum albumin, the other 2 somewhat more slowly. On the twelfth and thirteenth days the velocity of the first band decreased so that it tended to merge with the second.—D. Duncan.

3476

Johnston, P. M. and Comar, C. L. **Distribution and contribution of calcium from the albumin, yolk and shell to the developing chick embryo.** *Amer. J. Physiol.*, 1955, **183,** 365–370. [Univ. Tennessee-Atomic Energy Commission Agric. Res. Programme, Oak Ridge.]

Three experiments were made on 72, 72 and 60 fertile eggs of mixed breeds which, after allowing for temperature equilibration, were injected with 25 μC. of ^{45}Ca as chloride. The eggs were then incubated under standard conditions; at 24-hr. intervals 4 or more eggs were selected at random and samples of yolk, albumin, blood and extra-embryonic fluid were taken for measurement of radio-activity and for chemical analysis. Beginning with the third day, 2 or more embryos were taken for ^{45}Ca and total Ca estimation. After hatching, daily blood samples were taken for 8 more days and analyses were made of both the blood and the chick.

The embryonic ash increased logarithmically between 3 and 9 days and between 9 and 19 days. The Ca of the embryo increased logarithmically between 3 and 9 days, between 9 and 15 days and between 15 and 21 days. The correlation is presented between the Ca content of the ash and the degree of ossification. The embryonic ^{45}Ca derived from the albumin ranged from 0·00076 per cent. of the amount injected at 3 days to 82 per cent. at 20 days. Specific activity values indicated that up to about 10 days most of the embryonic Ca was derived from the yolk. After 10 days the shell began to contribute Ca to the embryo.

G. F. Garton.

3477

Machlin, L. J., Struglia, L. and Pearson, P. B. **Metabolism of methionine and cysteine sulfur in the developing chick embryo.** *Arch. Biochem. Biophys.*, 1955, **59,** 326–331. [Animal and Poultry Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

After incubation for 24 hr., cysteine or methionine labelled with ^{35}S was injected into the whites of eggs. The percentage recovery of ^{35}S in the newly hatched chick was in taurine 10·5, sulphate 11·9, methionine 1·3 and cystine 49·3 from radio-active cysteine and 9·1, 10·1, 34·8 and 43·2 from radio-active methionine. Most of the sulphate was bound to protein. The sulphate S content of whole egg increased from 2·9 mg. at the beginning of incubation to 7·1 mg. in the newly hatched chick. The embryo always contained less than the remainder of the egg up to 18 days' incubation.

A. Hepburn.

SENESCENCE

3478

Orchard, N. P. **Blood changes in the aged.** *Geriatrics*, 1955, **10,** 459–468. [Dartford, England.]

Samples of blood from the cubital vein and of bone marrow from the iliac crest were taken from 150 patients whose ages ranged from 65 to 99 years

and who were living in an institution. They were chronically sick, but not with diseases known to affect haemopoiesis. The findings are tabulated separately for age and sex in 2 decades from 65 years and for over 85 years; in these groups there were 22, 26 and 10 men and 28, 38 and 26 women. The mean values for blood with standard error were, for all the men, red cell count 5·04 ± 0·08 million per c. mm.; Hb 15·46 ± 0·23 g. per 100 ml.; mean corpuscular Hb concentration 34·83 ± 0·23 per cent.; packed cell volume 44·62 ± 0·62 per cent.; mean corpuscular volume 88·49 ± 0·57 c. μ. [tabulated 88·15 c. μ.]; mean corpuscular diameter 7·58 ± 0·03 μ.; white cell count 7205 ± 279 per c. mm.; red sedimentation rate (Wintrobe) 17·84 ± 1·21 mm. in 1 hr. Corresponding averages for all the women were 4·82 ± 0·05; 14·58 ± 0·19; 34·49 ± 0·22; 42·29 ± 0·45; 87·94 ± 0·52; 7·50 ± 0·02; 6494 ± 185; 17·51 ± 1·10. No gross change was found in the bone marrow.

The findings are discussed and compared, as far as possible, with those of other workers. The main conclusions are that in both sexes there is an increase in red cell diameter in old age; that a sex difference exists in packed cell volume, which is significantly less in women than in men; and that anaemia is not a physiological change accompanying ageing.—D. Harvey.

3479

LORENZINI, R. and INNOCENTI, E. L'indagine elettroforetica delle lipoproteine del siero nella pratica clinica. Il quadro lipoproteico dell'età presenile e senile in rapporto con la presenza di gerontoxon. [**Electrophoretic study of serum lipoproteins in clinical practice. The lipoprotein picture in pre-senility and senility in relation to the presence of gerontoxon.**] *Acta gerontol.*, 1955, **5**, 291–304. [Ist. Clin. Med. Gen., Univ. Modena.] French and English summaries.

Electrophoretic studies were made of serum from 55 subjects of both sexes aged from 45 to 86 years. The subjects were divided into 2 groups, those without signs of localised lipoidosis, and those who although clinically normal had *arcus senilis* (gerontoxon) or xanthelasma. The first group contained 12 men and 10 women, the second 21 men and 12 women. The results are shown in tables and diagrams.

The normal subjects of the first group showed higher levels of γ-globulin and sometimes of β-globulin than younger subjects, but the total protein was normal because albumin was low. There was some increase in the lipid fraction of medium velocity in lipidograms. The subjects with *arcus senilis* or xanthelasma showed similar behaviour of the serum proteins. The lipid fractions of medium and low velocity were increased, that of high velocity tended to be reduced. It is concluded that in these subjects the changes characteristic of advancing age were exaggerated.

D. Duncan.

EXPERIMENTAL STUDIES OF IMMUNITY AND MICRO-ORGANISMS

3480

SMITH, J. M. and DUBOS, R. J. **The behavior of virulent and avirulent staphylococci in the tissues of normal mice.**
The effect of nutritional disturbances on the susceptibility of mice to staphylococcal infections.
The effect of dinitrophenol and thyroxin on the susceptibility of mice to staphylococcal infections. *J. Exp. Med.*, 1956, **103**, 87–108; 109–118; 119–126. [Labs., Rockefeller Inst.]

(a) Not nutritional, but the strains of staphylococci used in the nutritional experiments are described.

(b) Despite wide individual variations in susceptibility to an infective dose of staphylococci, mice fasted for 36 or 48 hr. before infection were much more susceptible than those not fasted. The livers of mice fasted before infection gave about 10 times as many bacterial colonies in cultures as those of fed mice on any day after infection. Glucose given in the drinking water during the fasting period consistently increased the effect of fasting, so did Na salts of butyric, glutaric and pyruvic acids, but lactate seemed to have some protective value, in 1 per cent. solution. Glucose had no effect when the mice were not fasted.

Mice fed on a low-protein diet with 4 per cent. skimmed milk powder or given a normal diet in restricted amount were retarded in growth, but there was no significant effect on their resistance to staphylococcal infection.

(c) When mice were given enough dinitrophenol or thyroid extract in their drinking water to retard or prevent growth their susceptibility to staphylococcal infection was greatly increased. Even when the organism injected was unable to cause death in mice on normal diet, mice given dinitrophenol or thyroid died. This agrees with the effect of these substances on susceptibility to experimental tuberculosis (Abst. 3987, Vol. 25).

D. Duncan.

3481

SCHNEIDER, H. A. and ZINDER, N. D. **Nutrition of the host and natural resistance to infection.**

5. An improved assay employing genetic markers in the double strain inoculation test. *J. Exp. Med.*, 1956, **103,** 207–223. [Rockefeller Inst. Med. Res.]

For part 4 see Abst. 2487, Vol. 19.

5. Weanling mice were fed either on a synthetic diet, diet 191, or on whole wheat and whole dried milk; the latter diet produces the greater resistance to infection with *Salmonella typhimurium*, as described earlier (Abst. 3397, Vol. 18). The double strain inoculation test with an avirulent followed by a virulent strain was also described in that paper, but has now been modified. Weanling mice receive diet 191 for 3 weeks and are then moved to individual cages in the infection room and given either diet 191 or the wheat diet. After 4 days they receive an intraperitoneal inoculation of 10^3 viable cells of avirulent RIA strain of *S. typhimurium*, followed 2 days later by 10^3 viable cells of virulent, xylose-fermenting strain SR-11. Two days after the second injection the mice are killed and the salmonellae in their spleens are counted on eosin and methylene blue agar containing xylose. The counts of virulent bacteria per spleen are consistently low in mice on the wheat diet. The effect of the diet was detected 24 hr. after a change in either direction. A group of 5 mice is enough for each test.—D. Duncan.

3482

TAYLOR, D. J. and GREENBERG, J. **Hyperactivity of metachloridine against *Plasmodium gallinaceum* in chicks maintained on a purified diet.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 551–554. [Nat. Microbiol. Inst. Lab. Trop. Dis., Nat. Insts. Health, Bethesda, Md.]

For a description of the technique and purified diet see Greenberg *et al.*, *Amer. J. Hyg.*, 1954, **60,** 99 and reference in Abst. 1651, Vol. 23. In this series week-old chicks on stock diet and the C-2 purified diet were given intravenously 16×10^6 erythrocytes containing sporozoites of *Plasmodium gallinaceum* and 9 antimalarial drugs were tested. With 7 of them diet had no effect; sulphadiazine and metachloridine were 16 times as active when the chicks had C-2 diet. Addition of 41 per cent. soya bean meal to this diet completely annulled its effect. The substance responsible was not in the fat or soluble protein or acid extract.; it was soluble or labile in alkali.—I. Leitch.

3483

BADIALI, C., LA PLACA, M. and ROMANO, G. C. Ulteriori ricerche sull'influenza della vitamina C sullo sviluppo del *B. di Koch.* [**Further researches on the influence of ascorbic acid on the growth of *Mycobacterium tuberculosis*.**] *Boll. Ist. sieroterap. milan.*, 1955, **34,** 530–535. [Ist. Igiene, Univ. Bologna.] English summary.

It had previously been shown that when ascorbic acid had been added to the culture medium of Dubos, *Mycobacterium tuberculosis* survived as long as ascorbic acid was still present in the medium but died some 3 days after the vitamin could no longer be detected (*Nuovi Ann. Ig. Microbiol.*, 1954, **5,** 217).

In the present investigation the culture medium was that of Dubos or a physiological solution glycerinated to 5 per cent. Ascorbic acid was added, 1 mg. per ml., and the concentration in the medium was estimated by indophenol titration. Test tubes containing the medium with and without addition of ascorbic acid were incubated at 37° C. for 10 days, by which time ascorbic acid could no longer be detected. They were then inoculated with *Mycobacterium tuberculosis*. At intervals from 2 to 360 hr. later, the contents of a tube were centrifuged; the sediment was washed and half of it was inoculated at *p*H 6·6 into normal culture medium and half subcutaneously into a living guineapig. With the glycerinated medium only the test on guineapigs was made.

In the tests without ascorbic acid a nodule developed in the guineapig and progressed to ulceration. In the tests with ascorbic acid the reaction was progressively less the longer the organisms had been in contact with the medium which had formerly contained ascorbic acid.

In sub-culture the organisms no longer grew in Dubos medium after 20 hours' contact, or in glycerinated medium after 120 hours' contact.

It is concluded that the bactericidal action was due to one or more stable products of the autoxidation of ascorbic acid.—E. M. Hume.

3484

PALMER, H. B., LAFFER, N. C. and FABER, J. E. (Jr.) **The oral administration of *Lactobacillus acidophilus* into the Syrian hamster. 1. Oral population in relation to dental caries.** *J. Dent. Res.*, 1955, **34,** 876–885. [Dept. Bacteriol., Univ. Maryland, College Park.]

3485

KOSER, S. A. and THOMAS, J. L. **Amino acid requirements of oral lactobacilli.** *J. Infect. Dis.*, 1955, **97,** 287–298. [Walter G. Zoller Mem. Dent. Clin., Univ. Chicago, Ill.]

At least 8 to 10 amino acids, and often more, were essential for growth of 28 strains of oral lactobacilli. Other amino acids stimulated growth, which was often otherwise slow. Arginine, cysteine or cystine, glutamic acid, leucine, phenylalanine, tryptophan; tyrosine and valine were essential for most lactobacilli. Histidine and proline were essential for *Lactobacillus acidophilus*. *Iso*leucine was essential for a strain of *L. fermenti* and stimulated growth of all other lactobacilli.

L. acidophilus was more exacting in amino acid requirements than *L. plantarus* and *L. casei*. *L. fermenti*, in contrast to *L. casei*, usually required threonine and was stimulated by alanine in the presence of vitamin B_6. The amino acid requirements of oral lactobacilli were similar to those of cultures from other sources.—A. Hepburn.

3486

WILLINGALE, J. M. and BRIGGS, C. A. E. **The normal intestinal flora of the pig. 2. Quantitative bacteriological studies.** *J. Appl. Bacteriol.*, 1955, **18**, 284–293. [Nat. Inst. Res. Dairying, Univ. Reading.]

For part 1 see Abst. 5017, Vol. 24.

Bacterial counts of faeces and caecal contents were made by inoculation of serial 1 : 10 dilutions into liquid media in quintuplicate. After 3 days of incubation the numbers of bacteria were assessed from probability tables. The media were reinforced clostridial medium, tomato glucose broth and MacConkey's broth. Faecal samples were obtained freshly from live pigs and faecal and caecal samples from pigs at slaughter.

From a large number of counts were estimated the day-to-day variation in faecal counts of individual pigs on one ration over 4 weeks, variations between different individuals on the same ration, and the effect of different rations. The normal range of total viable counts under all these conditions was $1{\cdot}0 \times 10^8$ to $9{\cdot}9 \times 10^9$ per g. Faecal and caecal counts of individual pigs were very similar when corrections were made for percentage dry matter.

The predominant bacteria were streptococci and lactobacilli, with smaller numbers of coliform bacteria, micrococci, bacilli, *Pseudomonas* spp., and moulds.—J. C. Appleby.

3487

RICHTER-OTTO, W. Untersuchungen der Kotflora bei mit Antibioticis gefütterten Ratten. **[Faecal flora of rats fed with antibiotics.]** *Arch. Tierernährung*, 1955, **5**, 257–287. [Anst. Vitaminforsch., Potsdam-Rehbrücke.]

Four groups, each of 2 male and 9 female rats with an average initial weight of 55 g., were the parent generation. They received to appetite a mixed ration containing no antibiotic, or 25 mg. penicillin, streptomycin or aureomycin per kg. ration. Observations were made on these rats and on 3 filial generations.

There was no statistically significant effect of the antibiotics on growth or on reproduction, with the exception that the litters of F_3 rats in the penicillin group were larger than the litters of controls, with slight significance. Bacteriological examination of the faeces showed that aureomycin and penicillin tended to reduce the counts of all bacteria except coliforms, which were increased, as were fungi. Streptomycin inhibited coliforms and increased enterococci. The results are given in full in tables.—D. Duncan.

3488

SAMMONS, H. G., VAUGHAN, D. J. and FRAZER, A. C. **Synthesis of long-chain fats by bacteria isolated from human faeces.** *Nature*, 1956, **177**, 237. [Dept. Pharmacol., Univ. Birmingham.]

An organism which appeared to resemble *Streptococcus faecalis* was isolated from the stool of a patient with steatorrhoea under treatment with folic acid. This organism synthesised fat in peptone glucose medium, particularly in the presence of folic acid, where it amounted to 200 mg. in 10 ml. medium in 4 days. The fat was collected from the surface of the culture, and some of its properties are given.—J. C. Appleby.

3489

OXFORD, A. E. **The rumen ciliate protozoa : their chemical composition, metabolism, requirements for maintenance and culture, and physiological significance for the host.** *Exp. Parasitol.*, 1955, **4**, 569–605. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

A review.

3490

WIERINGA, G. W. De invloed van enting met verse en gedroogde pensinhoud op de ontwikkeling van de pensflora bij kalveren. [**Effect of inoculation with fresh and dried matter from the rumen on the development of the rumen flora of calves.**] *Tijdschr. Diergeneesk.*, 1956, **81**, 242–249. [Lab. Rijksseruminrichting.] English, French and German summaries.

Test calves were isolated at birth in disinfected cement stalls with fresh oat straw for bedding. For the first 3 days they had colostrum and then whole milk. Hay was offered from the fourth day and after a week 500 g. calf meal also. Four calves were not inoculated ; 4 were inoculated daily from the 4th to the 18th day with commercial preparations, A or B, and 2 on the 4th and 5th day with a fresh bolus of cud. As soon as hay was eaten, samples of rumen contents were taken regularly by stomach tube. The samples were filtered under CO_2 at 39° C., the cellulose-splitting activity was estimated in an artificial rumen, and bacterial counts were made.

The results show that drying produced considerable changes in the micro-organisms, both commercial preparations showing an excess of less desirable forms, such as spore-forming anaerobes

and *Bacterium coli*; characteristic rumen organisms were not found. Clinically the dried preparations did no good; in particular, they did not prevent diarrhoea. The calves given cud developed a normal rumen flora within 2 weeks and there was no diarrhoea.—I. Leitch.

3491

WILSON, M. K. and BRIGGS, C. A. E. **The normal flora of the bovine rumen. 2. Quantitative bacteriological studies.** *J. Appl. Bacteriol.*, 1955, **18**, 294–306. [Nat. Inst. Res. Dairying, Univ. Reading.]

For part 1 see Abst. 5015, Vol. 24.

2. Counts of viable bacteria from cows with rumen fistulae were made as described in part 1. Figures for numbers viable are given for 5 portions of the rumen, for day-to-day variations from 1 animal, for different cows on the same diet, for different rations, and for hourly samples from individual cows during 25-hr. and 7-hr. periods.

Numbers viable under these conditions ranged from 10^7 to 10^{12} per g., with 94 per cent. of counts between 10^8 and 10^{10} per g. A high correlation was found between these counts and direct microscope counts made by mixing suitable dilutions of rumen fluid with nigrosine and spreading a known volume over 4 sq. cm. on a slide.—J. C. Appleby.

3492

BENTLEY, O. G., JOHNSON, R. R., HERSHBERGER, T. V., CLINE, J. H. and MOXON, A. L. **Cellulolytic-factor activity of certain short-chain fatty acids for rumen microorganisms *in vitro*.** *J. Nutrition*, 1955, **57**, 389–400. [Dept. Animal Sci., Ohio Agric. Exp. Stat., Wooster.]

Rumen fluid obtained from steers fed on alfalfa hay was passed through a Sharples centrifuge and the deposit of microflora and other suspended material was collected. The deposit from 1 litre of fluid was suspended in 200 ml. phosphate buffer at *p*H 7 containing 0·01 per cent. cysteine hydrochloride. This suspension was added to a medium containing 1·0 g. cellulose, 0·168 g. urea, 0·1 g. glucose, salts, *p*-aminobenzoic acid and biotin. CO_2 was passed through the mixture and the *p*H was maintained at 6·7 to 6·9 by adding saturated Na_2CO_3 solution. After fermentation for 30 hr. the volume was adjusted to 100 ml. and the disappearance of cellulose was estimated on duplicate 10-ml. aliquots.

The addition of 10 ml. rumen fluid or the steam distillate from 20 ml. rumen fluid to the basal medium increased the rate of digestion of cellulose about threefold. Short-chain fatty acids were then added to the basal medium at the rate of 2 to 10 mg. per 100 ml. and it was found that valeric and caproic acids and, to a less extent, *iso*butyric and *iso*valeric acids increased the rate of breakdown of cellulose. The activity of the volatile fatty acid fraction of rumen fluid was found to be mainly due to valeric acid.—G. A. Garton.

3493

MURRAY, J. F. and MACLEOD, R. A. **Cellulose digestion by rumen micro-organisms and its stimulation by fishery by-products: 2. Preparation of an active washed inoculum and the development of a chemically defined fermentation medium.** *Fish. Res. Board Canada, Progr. Rep. Pacific Coast Stat.*, 1955, No. 104, 23–25. [Pacific Fish. Exp. Stat., 898 Richards St., Vancouver 2, B.C.]

For part 1 see Abst. 3505, Vol. 24.

2. A method of preparing a standardised washed cell suspension of rumen organisms, and a basal medium suitable for study of cellulose digestion, are described. The medium contained inorganic salts with cellulose and carbohydrate. The best source of N was found to be leucine, *iso*leucine and valine, either together or alone, with urea. Detailed results are not given.—J. C. Appleby.

3494

STRANKS, D. W. **Microbiological utilization of cellulose and wood. 1. Laboratory fermentations of cellulose by rumen organisms.** *Canad. J. Microbiol.*, 1956, **2**, 56–62.

A preliminary report is made upon a method of using rumen micro-organisms for rapid breakdown of cellulose. The fermentor was designed to allow continuous removal of end products by dialysis with an ion-exchange resin. Under these conditions 84 per cent. of the cellulose supplied was decomposed within 72 hr.—J. C. Appleby.

3495

MÅNSSON, I. and ANDERSSON, P. **The decomposition of nitrite by rumen bacteria. Preliminary report.** *Nord. Vet.-Med.*, 1956, **8**, 224–226. [Dept. Bacteriol. Epizcötol., Roy. Vet. Coll., Sweden.] German and Swedish summaries.

It was demonstrated that strains of bacilli and of coliform bacteria from the sheep's rumen are able to reduce nitrite in pure culture.

J. C. Appleby.

See also Absts. 2840, 3052, 3105, 3107.

MISCELLANEOUS FEEDING EXPERIMENTS

3496

NESENI, R. and MÜLLER, C. Über die Muskelfaserstärke von Klein- und Grosstieren. [**Strength of the muscle fibres of small and large animals.**] *Ztschr. Tierzücht. Züchtungsbiol.*, 1955, **65,** 335–358. [Inst. Tierzuchtforsch., Dummerstorf.]

The muscle fibres of geese, cocks, rabbits, wethers, pigs and cattle were compared. There were differences with age and bodyweight and possibly with sex. There was no difference due to diet in cocks, and the difference between 3 groups of geese on different diets may have been due to age, not diet. Wethers kept entirely indoors had less strong muscle fibres than those which spent part of their time on pasture.—D. Duncan.

3497

SERGEEVA, M. A. Vliyanie pitaniya s razlichnym sootnosheniem zhirov i uglevodov na uslovnoreflektornuyu deyatelnost sobak. [**The influence of different ratios of fat and carbohydrate in the diet on conditioned reflex activity in the dog.**] *Vop. Pitan.*, 1956, **15,** 9–15. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

In 4 dogs with the conditioned reflex of salivation in response to different stimuli, the responses were less and the latent period was longer when the diet contained 60 per cent. fat and 20 per cent. carbohydrate than on the isocaloric standard diet with 30 and 50 per cent., respectively. Excitability was increased when the diet contained 15 per cent. fat and 65 per cent. carbohydrate.—D. Duncan.

3498

HELLSTRÖM, B. E. **Experimental approach to the pathogenesis of retrolental fibroplasia. 5. The influence of the state of nutrition on oxygen-induced changes in the mouse eye.** *Acta paediat.*, 1956, **45,** 43–57. [Histol. Dept., Karolinska Inst., Stockholm.] French, German and Spanish summaries.

[Early papers in the series had no bearing on nutrition.]

5. Groups of mice, 16 hr. old, were exposed for 10 days to oxygen concentrations of 98 to 100 per cent. Some groups were then killed, others were kept for a further 10 days in air. Some groups were underfed or overfed during exposure to oxygen, and were fed normally during subsequent stay in air; some were overfed or underfed for both periods, others were fed normally throughout. One group was underfed without exposure to oxygen and a final group was exposed neither to oxygen nor to under- or over-feeding. Underfeeding was effected by separating the young from their mothers every third day and by increasing the number of young given to one mother to nurse. Overfeeding was effected by reducing the number nursed by one mother. Underfeeding reduced rate of weight gain to about half that of controls. There was slight retardation of the outgrowth of vessels in the retina, other signs of delayed differentiation of the eye and frequent haemorrhages in the nerve fibre layer. Oxygen exposure caused a complete, or almost complete, inhibition of outgrowth of retinal vessels, irrespective of the state of nutrition.

The hyperplasia of vessels of the nerve fibre layer, which occurs when animals exposed to oxygen are transferred to air, was greater in those underfed during exposure to oxygen than in those overfed during exposure to oxygen, and was greater in the latter than in animals underfed both during exposure to oxygen and during subsequent stay in air. The proliferation of hyaloid vessels was not influenced by nutrition. The findings are discussed in relation to retrolental fibroplasia in premature infants.—F. C. Aitken.

3499

BIELIŃSKA, Z. Badania biologiczne nad wartością odżywcza wytypowanej, ograniczonej racji pokarmowej dla człowieka. [**Biological studies on the nutritive value of prescribed limited food ration for man.**] *Rocz. Państwowego Zakł. Hig.*, 1955, **6,** 401–417. Russian and English summaries.

The object of this study was to assess the effects which a deficient diet would have on man by studying its effects on rats. The diet would provide for a human subject 2550 Cal., protein 73 g., fat 51 g., carbohydrate 450 g., Ca 0·7 g., Fe 23 mg., vitamin B_1 2 mg., riboflavin 1·9 mg., vitamin C 73 mg. and carotene 6700 I.U. This diet was adapted for rats; in comparison with the stock diet, an isocaloric supply of this diet was low in protein, 9·5 against 25·4 per cent., in Ca, 115 against 1479·5 mg. per cent., in P, 243 against 964·5 mg. per cent. and in Fe, 9·8 against 40·2 mg. per cent.

The effect of the diet on growth and reproduction of 15 rats about 4 weeks old was studied first. Ten similar rats on the stock diet served as controls. After 5 months the bodyweight of the experimental animals was about half that of controls, and they had lighter build and scanty, dry hair with impaired pigmentation. Most of them had conjunctivitis. The average litter size in the experimental group, among those females which were mated successfully, was 4, that of controls 8. Three out of 10 females and one out of 5 males were infertile.

Apart from conjunctivitis the animals were generally free of disease ; but among those females who had had young there occurred vertigo caused by abscess of the middle ear, deep abscess in the upper part of the sternum, changes in the respiratory system, and cracking of skin with ecchymosis on the back, just below the neck. Females which did not reproduce were more lively and did not show any pathological change either when alive or at post mortem. X-ray photographs showed considerable decalcification of bones, least among non-reproducing females, greater among those which reproduced but did not lactate, and greatest among those which lactated.

The diet produced a much less spectacular effect on rats 2½ months old, but weight gain was significantly impaired. In the next experiment 4 male and 8 female rats were kept for 3½ months on the stock diet and were then switched to the experimental diet for 1 month before mating and during pregnancy and lactation. Their reproductive capacity did not appear to be affected. After giving birth the females appeared normal and fed their young, but in one changes of reproductive organs and enlargement of the spleen were found at post mortem. X-ray films showed some decalcification of bones, but no deformity.

The second generation of experimental rats, kept on the deficient diet, showed very poor growth. Second-generation animals aged 5 months weighed only 39 per cent. of the normal and were considerably shorter than their parents, which in turn were significantly shorter than control rats ; the average lengths were 25·7, 32·3 and 35 cm. in the above order. The second generation was characterised by poor condition, light build, poor hair and relatively large head. There were also some developmental changes, especially in the eyes, which were protuberant in some and had unusually small eye-balls in others ; the experimental rats were also prone to infection, especially of the respiratory system. Bony structure and teeth were grossly deformed. Bones were brittle and deformities of vertebral column, ribs and legs were found. Attempts to obtain a third generation of experimental rats were unsuccessful.

W. Z. Billewicz.

3500

BARTNIK, J., PIEKARSKA, J. and KLIMCZAK, Z. Wpływ naturalnych produktów spożywczych na wartość odżywczą i biologiczne działanie pożywienia. [**The effect of natural foods on the nutritive and biological value of the diet.**] *Rocz. Państwowego Zakł. Hig.*, 1955, **6,** 389–399. Russian and English summaries.

Rats 3 weeks old and weighing on the average 53 g. were divided into 3 groups of 12, 6 males and 6 females in each. Each group was kept on a diet composed of different proportions of potatoes, sauerkraut, beans, coarse rye flour, casein, lard and sugar. Vegetable products made up 80, 50 and 33 per cent. of the rations. All diets were supplemented with vitamins and minerals in sufficient quantities. The diets were approximately isocaloric and of equal protein content. The experiment was divided into 5 days of adaptation and 3 experimental periods. In period 1, 59 days, all rats were kept on diets described above. In period 2, 20 days, all rats were given diet 1. In period 3, 20 days, all rats were given a stock diet.

Diets 1 and 2 were eaten willingly, but diet 3 appeared to be much less appetising. Diet 2 gave the best coefficients of food utilisation. The average weight gains per 100 Cal. digested of the 3 rations were 5·89, 5·97 and 5·33 g. The average gains per g. protein digested were 1·43, 1·54 and 1·35 g. The average daily weight gains in the 3 groups were 2·65, 2·58 and 2·25 g.

The results of the second and third periods suggest that the effects of malnutrition in the early stages of development of an animal are difficult or even impossible to correct later. It is considered that the results would be still more in favour of diets containing natural vegetable foods if they were given to appetite and without vitamin and mineral supplements.—W. Z. Billewicz.

3501

RATNOFF, O. D., KOLETSKY, S. and PATEK, A. J. (Jr.) **Hepatic damage in rats fed human foodstuffs.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 620–623. [Dept. Med., Sch. Med., Western Reserve Univ., Cleveland, Ohio.]

Studies were made on young male rats which had received Purina dog chow and tap water to appetite until the start of the experiment. Twelve rats then continued to receive chow and water, 45 rats were given a diet of spaghetti, olive oil, and wine diluted with an equal volume of water, 12 rats a diet of spaghetti, olive oil and 10 per cent. glucose in water and 12 rats a diet of spaghetti, olive oil and diluted wine with a supplement of vitamins of the B group. All the diets were given to appetite and the foods used were analysed ; details of the composition of each food are given. Animals which survived were killed after from 45 to 343 days ; the livers of those and of animals which died or were killed when moribund were removed for examination.

The 12 animals fed on chow grew rapidly and remained healthy throughout the experiment ; histological examination of the liver revealed no abnormality. Significant liver lesions consisting of diffuse parenchymal necrosis and fatty infiltration occurred in the rats on the spaghetti diets. Both lesions were associated with moderate fibrosis ; the relative frequency of the lesion

depended on the nature of the diet and the duration of survival. The specific substances responsible for the changes were not ascertained.

G. F. Garton.

3502

HEWES, C. G. **The influence on the growth and progeny of the guinea pig resulting from oral administration of aureomycin (chlortetracycline) and penicillin.** *J. Nutrition*, 1955, **57**, 353–360. [Dept. Anat., Dent. Sch., Univ. Maryland, Baltimore.]

In a first experiment 3 groups, each of 12 male and 12 female 6-week-old guineapigs, were used. One group served as control and the other 2 groups received an aqueous solution of 0·55 mg. aureomycin or penicillin by mouth daily for one week and on alternate days for the remainder of the experiment. After 9 weeks 7 females from each group were mated with males of the same group. The offspring of each experimental animal were given 0·1 mg. of the antibiotic in aqueous solution by mouth daily for 6 weeks. The control animals were given a diet of rabbit chow with ascorbic acid added to their drinking water throughout the experiment.

In a second experiment 2 groups, each of 6 male weanling guineapigs, were given 0·3 and 0·5 mg. aureomycin by mouth, for 9 weeks. Growth and structural changes in tissues were compared with those of male controls in the first experiment.

The progeny of the animals treated with antibiotic had a slightly greater mean birthweight than the progeny of the control animals; this difference was no longer apparent after administration of the drugs to the young for 6 weeks. No other effect on reproduction was found. The guineapigs in the second experiment showed a significantly greater average weight than the controls after 9 weeks. Of the organs and tissues removed for study, only the tibiae of the experimental animals weighed significantly more than those of the controls. The heart and spleen weighed significantly less in the experimental animals than in the controls. Sections of these organs and tissues showed no histological difference between experimental and control animals. Increased structural growth was noted in the greater length of the tibia in the aureomycin-fed animals.—G. F. Garton.

3503

SUR, G., SWAMINATHAN, M. and SUBRAHMANYAN, V. **Studies on the invitro digestibility of sago globules prepared from different starches by salivary and pancreatic amylases.** *Bull. Central Food Technol. Res. Inst., Mysore*, 1955, **5**, 1–2.

Sago globules prepared from raw starches of wheat, maize, rice, kaffir corn, milo, tapioca root, sweet potato, potato, arrowroot, banana stem and sago palm (*Metroxylon sago*) were used in digestibility studies *in vitro* with solutions of saliva and pancreatin. The digestibility of the raw starches and the cooked and uncooked sago globules was estimated.

Raw tapioca starch and cereal starches were digested equally well, the other starches less well. Sago cooked was better digested than uncooked, and uncooked sago better than raw starch.

T. D. Bell.

3504

YOSHIDA, M. and MORIMOTO, H. **Utilization of sweet potato starch by rats and its effect on the digestion of dietary protein.** *J. Nutrition*, 1955, **57**, 565–577. [Lab. Animal Feeding, Nat. Inst. Agric. Sci., Chiba-shi, Japan.]

In digestibility trials 8 male rats were given diets of starch 65, butterfat 10, casein 10, fishmeal 5, brewer's yeast 4, cellulose 3 and salt mixture 3 per cent. The starch was derived from raw or steamed maize, sweet potato or potato. Each rat was given 15 g. food daily, with free access to water, for 10 days; faeces were collected for analysis. In the second series 6 rats were given diets of starch 68, whole egg powder 23, butterfat 2, cellulose 3, salt mixture 3 and vitamin mixture 1; the daily food intake was 18 g. and the starches used were raw maize starch and raw, purified or autoclaved sweet potato starch. In the third series the same 6 rats as in the second series were given 18 g. daily of a low-protein diet of starch 77, whole egg powder 5, butterfat 10, cellulose 3, salt mixture 4 and vitamin mixture 1 per cent.; the starches were raw maize starch and raw sweet potato starch.

The coefficients of digestibility of raw maize, sweet potato and potato starch were 99, 97 and 57 per cent.; the differences were statistically significant. When steamed, all the starches were utilised almost completely and no significant difference was found. Raw sweet potato starch caused diarrhoea and decreased the apparent digestibility of protein; this effect was less when the starch was purified and disappeared when it was steamed. Raw potato starch was little utilised and also reduced the apparent digestibility of protein.—G. F. Garton.

3505

KIK, M. C. **Nutrients in rice bran and rice polish and improvement of protein quality with amino acids.** *J. Agric. Food Chem.*, 1956, **4**, 170–172. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

Data are given for the contents of 17 amino acids in rice bran and rice polish, and for all the vitamin B complex components, together with Ca, P, Fe, protein, fat and ash.

In experiments with rats on a basal diet of which all the protein was supplied by either rice bran or rice polish the addition of 0·2 per cent. L-lysine plus 0·2 per cent. DL-threonine produced an increased rate of growth over 10 weeks of up to 16 per cent. The further addition of 0·1 μg. vitamin B_{12} to the diet supplemented with amino acids produced increases of 27 and 43 per cent. Protein efficiency ratios were also increased.

J. S. Thomson.

3506

EAGLE, E., BIALEK, H. F., DAVIES, D. L. and BREMER, J. W. **Biological vs. chemical evaluation of toxicity and protein quality of cottonseed meals.** *J. Amer. Oil Chem. Soc.*, 1956, **33,** 15–21. [Res. Labs., Swift and Company, Chicago, Ill.]

The free, total or combined gossypol content of 68 cottonseed meals given to rats as 67 per cent. of the diet was not correlated with toxicity. The protein quality of the meals was poorly correlated with the solubility of their N in 0·02 *N* NaOH.

A. Hepburn.

3507

LEE, J. G. **Detoxication of tung meal.** *J. Agric. Food Chem.*, 1956, **4,** 67–68. [Dept. Agric. Biol. Chem., Louisiana State Univ., Baton Rouge.]

Previous work on treated tung meals with chicks (Lee and Watson, *J. Amer. Oil Chem. Soc.*, 1953, **30,** 32) was repeated with rats. Tung nut flakes were extracted with Skellysolve B, air-dried and ground. The meal was extracted with ethanol, or moistened and steamed at 100° C. for 2 hr., or both, or extracted with ethanol and steamed dry. The treated meals, and untreated meal, formed 20 per cent. of a ration consisting otherwise of casein 20, dextrose 50, minerals 2, maize oil fortified with vitamins 5 and dextrose fortified with vitamins 3 ; details of the vitamin additions are given. There was also a control ration containing 25 per cent. casein and 2 per cent. Ruffex, with dextrose replacing the tung fraction. The rations were given for 21 days to paired littermate weanling rats in groups of 5, individually housed and fed to appetite. Mean weight gain and feed consumed per g. weight gain showed that the treated meals, except that extracted with ethanol and unsteamed, were comparable with the control ration, the best being the meal extracted with ethanol and steamed moist ; that is, the results with rats were similar to those with chicks. Discrepancies between the findings and those of Mann *et al.* (Abst. 4232, Vol. 24) are possibly explained by their omitting moistening before heating or by other differences in method.

In a further experiment, the casein of the ration was replaced by dextrose, so that the treated tung meal was the sole source of protein. When the modified ration alone or with supplements of 0·3 per cent. DL-methionine, 0·8 per cent. L-lysine hydrochloride or 0·1 per cent. L-tryptophan, or with additional amounts of tung meal, was given for 30 days to groups of matched littermate weanling rats, the results showed that lysine was the first limiting amino acid of the tung protein.

It is concluded that detoxified tung meals are not promising as economical protein supplements to cereals.—W. M. Deans.

3508

BOOTH, A. N. and DEEDS, F. **Chronic toxicity study of phytic-acid-treated soybean oil for rats.** *Food Res.*, 1955, **20,** 582–586. [U.S. Dept. Agric., Agric. Res. Serv., W. Utilisation Res. Branch, Albany 10, Calif.]

Weanling rats fed for more than 400 days on a basal diet containing maizemeal, casein and linseed cake meal and with 0·65 per cent. Ca did not show any evidence of toxicity as judged by growth and histology when soya bean oil treated with phytic acid (Evans *et al.*, *J. Amer. Oil Chem. Soc.*, 1953, **30,** 143) replaced 10 per cent. of the whole diet. Two per cent. phytic acid alone, with or without 0·7 per cent. Ca, produced a decrease in the rate of growth and testicular atrophy with this diet, but had no effect with a diet of Purina Chow which was inferior for supporting growth and contained 1·17 per cent. Ca.—A. Hepburn.

3509

WALKER, D. G. and WIRTSCHAFTER, Z. T. **Histopathogenesis of aortic aneurysms in the Lathyrus-fed rat.** *Arch. Pathol.*, 1956, **61,** 125–135. [Res. Lab., Med. Serv., Veterans Admin. Hosp., Portland, Oreg.]

Of weanling rats equally divided between the sexes, 8 were given a stock diet and 24 had pellets made from equal parts of the stock diet and seeds of *Lathyrus odoratus*. Massive aortic haemorrhage caused the deaths of 8 in the experimental group before they were due to be killed ; the survivors in fours and the control animals in pairs were killed at 6, 7, 8 and 9 weeks of age. The heart, aorta, and pulmonary and coronary arteries were examined both macroscopically and microscopically.

Only in the aorta of the experimental rats were intramural haematomas and dissecting aneurysm seen, but in the other vessels examined in rats from that group deficiency of elastic fibres and hyperplasia of fibroblasts were found. The dissecting aneurysm is thought to be a sign in the aorta of a more generalised elastolytic disorder. There are 23 illustrations.—D. Harvey.

3510

FALKMER, S. and KJELLGREN, K. **Morphologic and functional changes under hypothermia. An experimental study on rabbits with special**

reference to the liver. *Acta Soc. Med. upsalien.*, 1955, **60,** 199–223. [Dept. Pathol., Univ. Upsala.]

Adult rabbits of both sexes, weighing between 2 and 5 kg., were fed to appetite on turnips, hay and crushed oats with commercial feeding lime. The rabbits appeared clinically healthy, though postmortem examination showed that half of them had bacterial or mycotic lesions; since the incidence was similar in experimental and control groups the affected animals were not excluded, but numbers with and without lesions are given throughout the paper.

For experiments rabbits were anaesthetised generally with Nembutal and locally with Xylocain, and were given Ringer's solution intravenously to keep the water balance as nearly normal as possible.

Hypothermia was induced as described elsewhere (Kjellgren, *Acta Soc. Med. Upsal.*, 1953–54, **59,** 391); 13 rabbits served as controls. Cooling was such that rectal temperatures fell to between 28° and 30° C. Some rabbits were killed at the end of the experiment, others from 8 hr. to 153 days afterwards.

Morphological changes were confined to the liver and adrenals of rabbits killed immediately after the cooling experiment and were absent even in those allowed to live 8 hr. afterwards. Changes were typical of hypoxia.

Functional after-effects were slight. Some of the survivors subsequently reproduced. Secretion of bile and bile pigments was reduced during cooling, especially when cooling was intra-abdominal. The control animals showed during experiments a low prothrombin value and low prothrombin-proconvertin index, which were ascribed to the anaesthesia. These changes were absent in the hypothermic rabbits. Cooled rabbits had low serum protein values 24 and 48 hr. after re-warming, but not immediately after. The drop was mainly in the albumin fraction. No change was found in serum protein of controls.—D. Duncan.

3511

FENTON, P. F. **Growth and fat deposition in the mouse. A definition of obesity.** *Amer. J. Physiol.*, 1956, **184,** 52–54. [Dept. Biol., Brown Univ., Providence, R.I.]

Weanling male mice of the C57 BL/Fn and I/Fn strains were fed on a diet containing Crisco 45 and maize oil 5 per cent. The animals were killed in groups at intervals up to 6 months and carcase fat was estimated.

The fat content of C57 BL/Fn mice increased linearly with age and with the fat-free weight of the animals until the third month of life. The fat content of all the I/Fn mice increased with the fat-free weight in a nearly constant ratio of 0·1. Obesity is defined as a significant increase in this ratio.—A. K. Lough.

3512

MICKELSEN, O., TAKAHASHI, S. and CRAIG, C. **Experimental obesity. 1. Production of obesity in rats by feeding high-fat diets.** *J. Nutrition*, 1955, **57,** 541–554. [Lab. Biochem. Nutrit., Nat. Inst. Arthritis Metabol. Dis., U.S. Pub. Health Serv., Bethesda, Md.]

Groups of male rats weighing about 300 g. were given either a high-fat diet of casein 25, sucrose 7, starch containing vitamins of the B group 1, salts 4, Crisco 60, vitamins A and D 2 and vitamin E 1 per cent., or a low-fat diet of casein 30, sucrose 61, vitaminised starch 2, salts 4, vitamins A and D 2 and vitamin E 1 per cent.; the remainder received a stock diet. After 36 weeks the rats on the stock diet weighed 425 g., those on the low-fat diet 417 g. and those on the high-fat diet 511 g. Even higher weights were attained more rapidly in animals which survived forced feeding with high-fat diets, but the difficulties of the procedure prevented its use as a routine method for securing large numbers of obese rats. More than 75 per cent. of the rats maintained on these diets for 6 months or more developed middle ear or upper respiratory infections.

Groups of 5 or 10 rats 3 to 4 weeks old were given the high-fat diet, the low-fat diet, Ingle's semi-liquid diet (Abst. 108, Vol. 20) or a stock food. The effect of penicillin added to these diets was studied and the intake of vitamins of the B group was doubled. The high-fat diets were supplemented with 5 per cent. whole liver powder and vitamin B_{12}. The growth rates of rats of the NIH black, Sprague Dawley and Osborne Mendel strains on the high-fat diets were compared. All rats received food to appetite. A group of weanling rats on the high-fat diet and one on Ingle's diet were kept under conditions of limited movement. The 3 strains of rats were found to have the same response. The maximum weight attained on the high-fat diet was 1655 g. About 70 per cent. of the rats of the Osborne Mendel strain attained weights over or close to 1000 g.

G. F. Garton.

3513

ANLIKER, J. and MAYER, J. Comportement alimentaire de souris obèses et des souris normales. [**Feeding behaviour of obese and normal mice.**] *C.R. Acad. Sci.*, 1956, **242,** 285–286.

The mouse cage used was in a soundproof box and contained a mechanism which released food in 40-mg. tablets and recorded each time the mouse took one. The mice studied were rendered obese by hypothalamic lesions or by injection or had the syndrome of hereditary obesity and diabetes; each category had its controls.

Control mice showed a 24-hr. cycle of eating, but this periodicity was absent in the obese mice. The mice with hereditary obesity ate bigger meals

less often than those with induced obesity. Periods of satiety occurred in normal, but not in obese, mice. It is concluded that it is an elimination of the mechanism of satiety, not an increase in activity of centres controlling eating, which leads to hyperphagia and obesity in these mice.

D. Duncan.

3514

FULLER, J. L. and JACOBY, G. A. (Jr.) **Central and sensory control of food intake in genetically obese mice.** *Amer. J. Physiol.*, 1955, **183,** 279–283. [Div. Behaviour Studies, R. B. Jackson Mem. Lab., Bar Harbor, Maine.]

When the standard Purina chow diet was diluted by addition of 45 per cent. cellulose and 5 per cent. gum arabic as binding agent, neither genetically obese mice nor their non-obese littermates could maintain bodyweight. When the dilution was only 5 per cent., growing obese mice showed reduced weight gains, but non-obese mice did not. When dilution was 25 or 35 per cent. the nutrient intake of controls even increased. Weight increase in obese mice ceased when dilution was 35 per cent.

When food was made bitter by inclusion of quinine or burnt sugar all the mice reduced their intake at first, but later the reduction of intake was greater in the obese than in control mice. When fat was added to the chow diet both groups reduced their bulk intake, but the reduction was greater in the controls.

It is concluded that the obese mice were less able to adjust their food intake and adapt themselves to changes in diet.—D. Duncan.

3515

MAYER, J. and MARSHALL, N. B. Mode d'action de l'aurothioglucose et régulation glucostatique de la nutrition. [**Mode of action of gold thioglucose and glucostatic regulation of nutrition.**] *C.R. Acad. Sci.*, 1956, **242,** 169–171.

Gold thioglucose injected into mice at the rate of 1 mg. per g. bodyweight causes the death of about half the mice and produces obesity in half the survivors. Gold thiomalate has about the same toxicity, but does not cause obesity. Obesity caused by gold thioglucose is identical with that produced by hypothalamic lesions. Histological examination revealed haemorrhages, oedema and cellular degeneration in the ventromedial region of the hypothalamus in mice killed shortly after injection of gold thioglucose, but not in those given gold thiomalate. Gold thioglucoanilide and gold sodium thiosulphate were inactive. Lesions were produced in the hypothalamus of rats by gold thioglucose, but all the animals died within 3 days; apparently it is only the higher toxicity of the substance for rats which prevents the manifestations of hyperphagia and obesity. In mice simultaneous administration of sodium thioglucose prevented the effects of gold thioglucose on the hypothalamus.

The results support the theory that the ventromedial region of the hypothalamus contains " glucoreceptors ".—D. Duncan.

3516

ALONSO, L. G. and MAREN, T. H. **Effect of food restriction on body composition of hereditary obese mice.** *Amer. J. Physiol.*, 1955, **183,** 284–290. [Res. Div., American Cyanamid Company, Stamford, Conn.]

The results of 3 tests are reported, in 2 of which only fat was estimated; the third was more intensive and included also measurements of water and protein contents. The systems of feeding were the same in all 3; a set of lean and one set of obese mice were fed to appetite, and another set of obese was pair-fed with the lean mice.

The first test, with 5 pairs of mice of opposite sex and 9 weeks of age at the beginning, lasted for 10 months. Three obese mice developed ulceration of the skin and were discarded. Although the obese mice on the restricted diet gained only slightly more weight than the lean, their percentage of body fat was more than double that of the lean mice. In the second test the 6 mice were 7 months old at the start and large depots of fat had by then been acquired by the obese animals. Restriction of their diet caused them to lose some weight, but their fat content remained about twice that of the lean group.

In the third test with 26 mice, habitual wastage of food by some of the obese on the restricted diet allowed their being grouped at 2 levels of reduced intake, namely, 4·1 and 2 g. daily; mean daily intake when feeding was to appetite was 7·6 g. for the obese and 5·4 g. for the lean mice. Weight gain of the lean siblings was between the rates for the 2 restricted groups. The percentages of fat, which differed significantly, were, for the groups in the above order, 34, 20, 42 and 12. For the obese mice the differences in average weight between the restricted groups and the unrestricted one were 24 and 39 g., but in terms of water, fat and protein the proportionate losses were about the same at both rates of restriction.

It is concluded that obese mice metabolise their food in a manner different from that of lean mice by depositing more fat per g. food eaten.

D. Harvey.

3517

MAYER, J., ZOMZELY, C. and FURTH, J. **Body composition and energetics in obesity induced in mice by adrenotropic tumors.** *Science,* 1956, **123,** 184–185. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

There were 3 groups of mice of the same strain : 16 mice bearing pituitary adrenocorticotropic tumours, 14 also, with tumours but from which adrenals had been removed at the time of implantation, and 17 normal animals. Bodyweight was similar in the groups, about 27 g. Measurements were made of food eaten, of spontaneous activity and of oxygen consumption and, for some mice, fatty acids and cholesterol were estimated in the whole carcase and the liver. The findings for the groups in that order were, for food consumption, $5{\cdot}8 \pm 0{\cdot}9$, $5{\cdot}1 \pm 0{\cdot}7$ and $4{\cdot}8 \pm 1{\cdot}0$ g. daily and for activity, 4555 ± 2439, 4336 ± 1997 and 6024 ± 3003 revolutions daily. Oxygen consumption did not differ.

The chemical estimations showed that, although they were not overweight, the mice in group 1 were obese in that they had twice as much extrahepatic fat as the normal and 3 times as much as the adrenalectomised mice, and body cholesterol and the fatty acids and cholesterol in liver were similarly increased. [The findings have already been mentioned in the note added in proof to the Review Article by the senior author on p. 881, Vol. 25.]—D. Harvey.

3518

NEDERVEEN-FENENGA, M. and DALDERUP, L. M. **Nutrition and caries. 4. Histologic investigation.** *J. Dent. Res.*, 1956, **35,** 39–48. [Netherlands Inst. Nutrit., Amsterdam.]

For part 3 see Abst. 2226, Vol. 24.

4. The 9 methods of staining which were used are described. They were applied to the study of the changes occurring in rat's molars before caries could be seen macroscopically. The process, similar to that described in human teeth by Barker (*J. Amer. Dent. Assoc.*, 1931, **18,** 17) and by Rosebury and Karshan (*J. Dent. Res.*, 1933, **13,** 379 ; *J. Amer. Dent. Assoc.*, 1944, **21,** 1599), is the appearance of lamellae running from the surface of the enamel to the boundary between enamel and dentine. It is accompanied by decalcification and depolymerisation of mucopolysaccharides. Some further lines of research are indicated which either are being or will be followed.

D. Harvey.

3519

DALDERUP, L. M. and JANSEN, B. C. P. **Nutrition and caries. 5. The influence of feeding cooked rations on experimental dental caries in the rat. 6. Influence of limited feeding on experimental rat caries with some remarks on the feeding of the parents. 7. The influence of yeast on experimental dental caries in the rat.** *Internat. Ztschr. Vitaminforsch.*, 1955, **26,** 192–199 ; 199–209 ; 209–219. [Netherlands Inst. Nutrit., Amsterdam.] German and French summaries.

5. The diets were a coarse maize diet (Abst. 569, Vol. 2), a diet based on the average food eaten by the Dutch population (see also Abst. 876, Vol. 26) and a highly purified ration (Title 3429, Vol. 18). Rats were given these diets ; for the experimental groups the change from the raw to the cooked form was made at weaning. The method of scoring was that of Keyes modified as already described (Abst. 2226, Vol. 24). Data are presented in summary form.

From the rate of growth of the rats there was no evidence that cooking had affected the nutritive value of anp of the diets. Its effect was greatly to reduce caries production by the first and second diets. On the third and highly purified diet, which was finely ground, the incidence of caries was low compared with that on the others and the change on cooking was much less than with them.

6. The change of incidence of caries produced by reducing intake of food has already received brief notice (Abst. 876, Vol. 26). Rats were fed on the Dutch diet either as eaten or after modification by the addition of yeast or by including more vegetables and potatoes and less sugar, meat and fat. The second of these changes also reduced the incidence of caries. There was no evidence that restriction in the feeding of a parent group affected the incidence of caries in its offspring.

The findings are discussed in relation to those of other workers. The effect of restricted feeding is thought to arise not from the smaller intake of food, but rather from its remaining in the mouth for a shorter time, the restricted animals having shown a distinct tendency to bolt their food.

7. The effects were studied of the addition of yeast to each of 4 diets, 3 of which were those already mentioned in part 5 ; the fourth was a diet devised by Bonting (Abst. 2379, Vol. 25) and resembling the average Dutch diet especially in its acid base balance. To the first 3 diets yeast was added at the rate of 5 per cent., other constituents being reduced accordingly ; the fourth already had 5 per cent. yeast and the effects were examined of removing the yeast from it and increasing other constituents accordingly.

The presence of yeast in 3 of the diets had no influence on the incidence of caries but with the fourth diet, Sognnaes's highly purified one (Title 3429, Vol. 18), the inclusion of yeast caused a distinct reduction of incidence.—D. Harvey.

3520

MUHLER, J. C. **The effect of chronic inanition and frequency of food ingestion on the dental caries experience in the rat.** *J. Nutrition*, 1955, **57,** 441–445. [Dept. Chem., Indiana Univ., Bloomington.]

Five groups of weanling rats of both sexes, 160 in all, caged individually, had fluorine-free water and a stock maize cariogenic diet (Abst. 898, Vol. 26) as follows: (1) to appetite (controls), (2) 60 per cent. and (3) 40 per cent. of that eaten by the controls, (4) to appetite but only for 3 periods daily of ½ hr., (5) to appetite but only for 1 period daily of 1½ hr. After 140 days they were killed and caries was evaluated.

Restricted rats of groups 2 and 3 were found to have a great deal less caries than controls. There was a tendency for rats fed 3 times a day to have more caries than those fed only once, but the difference was not significant and may have been due merely to the greater amount of food eaten by the former. The results show that the increase in caries after pituitary removal (see Title 901, Vol. 26) was not due to the reduction of food intake. It is considered that the food intake of rats in experiments on caries should be taken into account.

W. M. Deans.

3521

OCKERSE, T. **Experimental periodontal lesions in the white-tailed rat in South Africa.** *J. Dent. Res.*, 1956, **35,** 9–15. [Dept. Health, Pretoria.]

Two groups each of 20 white-tailed rats (see Abst. 4885, Vol. 23) were given diets containing food yeast, salts and fish liver oil; one (A) had, per cent., sugar 79 and casein 8 and the other (B) had sugar 40, casein 25 and whalemeal 22. Some animals in each group showed periodontal lesions but, the study being of caries, these were not recorded. Further work was done with first litters from mothers on diet A, given diets similar in their contents of linseed meal, alfalfa meal and bone-meal, milk powder, brewer's yeast, fish liver oil and salts but differing in that one (C : 7 rats) had coarse yellow maizemeal 40 and sugar 30 per cent., and the other (D : 11 rats) whalemeal 10 and sugar 60 per cent. Feeding lasted 11 months for these groups. Two more groups (E and F) each of 7 rats from second litters were treated in the same way. There was a control group (G) on a stock diet. The numbers of animals showing lesions in the groups C to G in order were 2, 9, 7, 8 and 0.

Radiographic and microscopic illustrations from particular animals show the extent to which bone destruction occurred, but explanations of the cause of the lesions or of their appearing only between first and second molars could not be advanced.

D. Harvey.

GENERAL METABOLISM AND FEEDING HABITS OF ANIMALS OTHER THAN MAMMALS AND BIRDS

3522

PLAGNOL, H. and VIALARD-GOUDOU, A. Électrophorèse sur papier du sérum de différents serpents. [**Paper electrophoresis of the serum of different snakes.**] *Ann. Inst. Pasteur*, 1956, **90,** 276–281. [Inst. Pasteur, Saigon.]

3523

SAVIANO, M. Ricerche istofisiologiche sul pancreas di ofidi normali e di ofidi trattati con allossana. [**Histophysiological study of the pancreas of normal snakes and snakes treated with alloxan.**] *Arch. Sci. biol., Bologna*, 1955, **39,** 671–688. [Ist. Fisiol. Umana, Univ. Modena.]

3524

DESSAUER, H. C. **Effect of season on appetite and food consumption of the lizard, *Anolis carolinensis*.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90,** 524–526. [Dept. Biochem., Sch. Med., Louisiana State Univ., New Orleans.]

Colonies of 8 to 15 adult male lizards were made up at different seasons from animals recently captured. They were kept at 28° ± 2° C. in natural light for 1½ to 2½ months and fed on mealworms (*Tenebrio molitor*) to appetite, but starved for 4 days before being weighed. The energy value of the mealworms was estimated to be 2 Cal. per g.

Appetite was greatest in animals caught in June and July and least in those caught between October and April. Lizards stored fat throughout the summer, but especially towards autumn. Bodyweight and fat content declined progressively from autumn to the middle of January.

Liver N in lizards killed between January and April was on the average 0·717, S.D. 0·151 mg. per g. fat-free bodyweight, and increased to 0·976 ± 0·159 mg. by June, when it remained fairly constant until early winter.

The seasonal variation of appetite is thought to be correlated with changes in length of daylight.

D. Duncan.

3525

MILLER, M. R. and WURSTER, D. H. **Studies on the blood glucose and pancreatic islets of lizards.** *Endocrinology*, 1956, **58,** 114–120. [Dept. Anat., Sch. Med., Stanford Univ., Calif.]

3526

DAVISON, J. **Body weight, cell surface, and metabolic rate in anuran Amphibia.** *Biol. Bull.*, 1955, **109,** 407–419. [Dept. Zool., Univ. Minnesota, Minneapolis.]

Respiratory rate was studied in frogs of 7 species with an approximately geometric series of bodyweights of about 1·0, 4·5, 6·0, 35·0 and 350·0 g. The frogs were fasting and inactive. The surface area per c.mm. of fibres from the gastrocnemius muscle was estimated from camera lucida drawings.

Within species the surface law, c.c. O_2 per hr. per g. $= kW^{-\frac{1}{3}}$ was valid. Three values for k were sufficient for all the species. There was also a species constant relating muscle cell surface to bodyweight, sq. cm. per c.c. $= k'W^{-\frac{1}{3}}$. Therefore metabolic rate and muscle surface are directly proportional and c.c. O_2 per hr. per g. $= k/k'$ sq. cm. per c.c. fibres. This was not valid between species. Buccopharyngeal frequency was a species constant and independent of bodyweight. If buccopharyngeal frequency represents central nervous activity, and if the respiratory system depends on muscle cell surface, nervous activity and muscle surface may interact *in vivo* in the control of respiration. Theoretical implications of the findings are discussed.—D. Duncan.

3527

SASSEN, A. Étude de la toxicité des acides aminés chez la grenouille. [**Toxicity of amino-acids for the frog.**] *Arch. internat. Pharmacodyn.*, 1955–56, **104,** 100–112. [Lab. Thérap. Exp., Univ. Louvain.]

Of 18 common amino acids tested, 17 were toxic when injected into frogs, the LD_{50} doses supplying from 0·115 to 3·0 mg. N. The exception was glutamic acid. The *d*-forms of arginine, histidine, phenylalanine and threonine were less toxic than the *l*-forms. Although the signs of poisoning were similar to those found after injection of heated proteins or of protein hydrolysates, it was considered that the toxicity of these was not explained by the liberation of amino acids. Glutamic acid injected with other amino acids did not modify their toxicity.—W. M. Deans.

3528

SCHJEIDE, O. A., LEVI, E. and FLICKINGER, R. A. **A study of the yolk proteins of frog eggs by physical and chemical means.** *Growth*, 1955, **19,** 297 – 306. [Div. Radiobiol., Atomic Energy Project, Univ. California, Los Angeles.]

From ultracentrifugal, electrophoretic and chemical analyses of vitellin and livetin derived from egg yolks and embryos of *Rana pipiens* at the oocyte and tailbud stages it was shown that the ratio of livetin to vitellin in the cells increased during development. Vitellin, it is suggested, may be the source of materials required for growth and differentiation processes as, for example, of inorganic P for incorporation into nucleic acids and of phospholipin for the fat-hydrolysing enzymes.

D. Harvey.

3529

SWIFT, D. R. **Seasonal variations in the growth rate, thyroid gland activity and food reserves of brown trout (*Salmo trutta* Linn).** *J. Exp. Biol.*, 1955, **32,** 751–764. [Freshwater Biol. Assoc., The Ferry House, Far Sawrey, Ambleside.]

Samples of 50 fish from a population initially of 250 3-year-old brown trout in 2 ponds were measured monthly; in a second investigation there were 100 fish in a pond and all were measured and weighed monthly. A random sample of 9 fish monthly were killed and analysed. Nine others were used for estimation of thyroid activity 6, 24, 48 and 72 hr. after injection of ^{131}I.

There were 2 peaks of growth rate, one towards the end of April and one in August. Tissue analyses showed that muscle and liver remained remarkably constant in composition except that liver glycogen in females fell in autumn.

The main storage organ was the gut wall, which contained much fat in July and less in spring and autumn. Maturation of the gonads was complete in October, with a peak of protein content. There was a peak of thyroid activity in midsummer.

D. Duncan.

3530

GELINEO, A. and GELINEO, S. La concentration de l'hémoglobine dans le sang chez des poissons d'eau douce. [**Haemoglobin concentration in the blood of freshwater fishes.**] *C.R. Soc. Biol.*, 1955, **149,** 1410–1411. [Lab. Biol. Méd., Fac. Méd., Paris.]

The Hb value of the blood of 12 species of Danube fish was estimated immediately after capture during the month of May; the average for 76 specimens was 10·4 g. per 100 ml. It was greater in the carp, 11·4 g. per 100 ml., than in the pike-perch, the catfish and the pike, 9·4 g., and the sturgeon, 10·4 g.

These values for fish are higher than those of batrachians and reptiles.—G. F. Garton.

3531

LIEBMANN, H. Ernährungsstörung und Degeneration als primäre Ursache der Bauchwassersucht bei Fischen. [**Nutritional disturbance and degenerative changes as the primary cause of abdominal dropsy in fish.**] *Berl. Münch. tierärztl. Wochenschr.*, 1956, **69,** 21–25. [Teichwirtsch. Versuchsanst., Wielenbach.]

The disorder of freshwater fish known as infectious abdominal dropsy, because this was the most characteristic sign, has in recent years

changed its character. Ascites has become less common, and the fish instead show numerous small or large ulcers, exophthalmos, anaemia and inflamed anus. Internal examination shows excess of fluid in the body cavity, discoloured liver and general inflammation, and especially characteristic haemorrhages in the swim bladder and muscles. The disorder, previously known only in carp, now affects trout, especially rainbow trout.

The spread of the infection is discussed, and it is concluded that some predisposing condition of the animal or the environment occurs. The artificial conditions of modern fish-farming, with overcrowding and artificial feeding, are blamed. Poor, weak covering with scales is conducive to infection and is ascribed to incorrect feeding. Nutritional studies are called for.—D. Duncan.

3532

LUDWIG, D. and BARSA, M. C. **Oxygen consumption of whole insects and insect homogenates.** *Biol. Bull.*, 1956, **110,** 77–82. [Dept. Biol., Fordham Univ., New York 58.]

The insects studied were the Japanese beetle, *Popillia japonica*, and the mealworm, *Tenebrio molitor*. Eggs of both species, incubated at 30° C., and larvae and pupae of the mealworm were used at different stages; the oxygen consumption of the eggs or insects was compared with that of homogenates of the same stages, in a Warburg apparatus. Homogenation reduced the consumption of oxygen at all stages except in Japanese beetle eggs from the third to the sixth day of incubation. The degree of reduction depended on the stage of development. Intact mealworm pupae showed a U-shaped curve of respiratory rate during metamorphosis, but in the homogenates this curve was abolished. The greater the dilution of the homogenates, the greater the reduction in respiration.—D. Duncan.

3533

EISNER, T. **The digestion and absorption of fats in the foregut of the cockroach, *Periplaneta americana* (L).** *J. Exp. Zool.*, 1955, **130,** 159–176. [Biol. Labs., Harvard Univ., Cambridge, Mass.]

Triolein oil, the glycerol ester of oleic acid, was digested *in vitro* by dilutions of crop fluid from cockroaches. Boiling the crop fluid prevented digestion of the fat, but addition of 10 per cent. $MgCl_2$ or 10 per cent. quinine sulphate did not. Starved or fed cockroaches fed on triolein were killed and were found to have hydrolysed part of the triolein; hydrolysis was delayed in the starved insects. Lipase was found histologically in the epithelium of all parts of the midgut and in the caeca, but not in the salivary gland, crop or hindgut. This was true also for *Blaberus craniifera* and *Blatta orientalis*.

Oleic acid was found in the intestinal cells 1½ hr. after a meal, light mineral oils after 6 hr. and heavy mineral oil only after about 5 days. Mixture with 3 or 15 per cent. of oleic acid greatly increased the rate of absorption of mineral oils and also of olive oil. Emulsions of olive oil were absorbed much more quickly when they contained crop fluid or extracts from the midgut of other cockroaches.

It is concluded that lipase secreted by the midgut and caeca of cockroaches passes forward into the lumen of the crop. Total degradation is not essential for absorption of fat in the foregut, but partial hydrolysis greatly accelerates absorption.

D. Duncan.

3534

KILBY, B. A. and NEVILLE, E. **Amino acid metabolism in locust tissues.** *Biochim. biophys. Acta*, 1956, **19,** 389–390. [Dept. Biochem., Univ. Leeds.]

3535

WATANABE, A., ITO, R. and SASA, T. **Micro-algae as a source of nutrients for daphnids.** *J. Gen. Appl. Microbiol., Tokyo*, 1955, **1,** 137–141. [Tokugawa Inst. Biol. Res.]

Daphnids are a favourite food of freshwater fish, so freshwater algae were investigated as food for daphnids. The daphnids were *Daphnia longispina* and *Moina macropa*, and the algae cultivated were the green algae *Chlorella ellipsoidea*, *Scenedesmus obliquus* and *Chlamydomonas* sp., and the nitrogen-fixing blue-green algae *Nostoc muscorum* and *Tolypothrix tenuis*. Measured quantities of algae and daphnids were kept in 300 ml. filtered pond water, in diffuse daylight at from 21° to 26° C., and the daphnids were counted at intervals. Green algae gave good rates of multiplication of both daphnid species; the blue-green algae were less effective, possible because they were filamentous and less easy to eat than the unicellular organisms.

Blue-green algae have been used to seed paddy fields because of their capacity for nitrogen fixation. Sometimes green algae have spontaneously appeared and blue-green algae have disappeared, with the appearance of daphnids. It is now realised from the results of the present research that daphnids, and green algae which promote their multiplication, must be excluded if the technique for enriching the paddy fields is to succeed.—E. M. Hume.

See also Absts. 2935, 3333.

5. HUMAN DIET IN RELATION TO HEALTH AND DISEASE

DIET

REQUIREMENTS

3536

National Nutrition Council, South Africa. **Recommended minimum daily dietary standards.** *S. African Med. J.*, 1956, **30,** 108–111.

The standards proposed " should be regarded as adequate for the maintenance of health without allowing for a safety margin for ill-health, or for great individual differences in absorption and metabolism " and the figures given are " for nutrients in foods as consumed and do not allow for losses during transport, storage, preparation or serving ". The reference man and woman are taken to be 25 years of age, to weigh, respectively, 160 and 130 lb. and to be living in a climate with mean annual temperature 60° F. For the moderately active person the standards recommended are, for the man, Cal. 3000, protein 65 g., Ca 0·7 g., Fe 9 mg., vitamin A 4000 I.U. assuming 1/3 present as the vitamin, vitamin B_1 1, riboflavin 1·6, nicotinic acid 15 and ascorbic acid 40 mg.; for the woman, in the same order of nutrients, 2300, 55, 0·6, 12, 4000, 0·8, 1·4, 12 and 40. There are standards also for women during pregnancy and lactation and for children of both sexes up to 10 years and separately for boys and girls from 10 to 12, 13 to 15 and 16 to 20 years.

Amounts of energy for heavy workers are 4500 and 2800 Cal. for the man and the woman but, if the woman does heavy work in the fields, she may need considerably more than this. For lactation the energy requirement is taken to be 120 Cal. per 100 ml. milk produced. Reference is made to the extra Fe which local investigations have shown as likely to be derived from the iron pots commonly used by Bantu people for cooking.—D. Harvey.

3537

Solis, M. Demanda alimenticia de la población de la República de Panamá en 1950. [**Nutritional needs of the population of the Republic of Panama in 1950.**] *Serv. Interamer. Cooperacion Agric. Panamá*, 1955, Foll. No. 7, pp. 22.

The estimate of needs of the population of Panama is based on the census of 1950, which gave a total of 756,631 " civil " inhabitants and 48,604 Indians. The ages of 742,000 persons were known. Their requirements were estimated from the tables prepared by Reh (*Inst. Nutric. Centro Amér. Panamá, Publ. Cient.* E-54, 1952). With the addition of estimates for the needs of the infants less than 6 months old and for 6107 foetuses of more than 6 months' gestation, the total requirement of the whole population was calculated. It included for the year energy 586,883 Megacal., protein 16,571 metric tons, Ca 260 tons, Fe 3 tons, vitamin A 346 kg., vitamin B_1 289 kg., riboflavin 433 kg., nicotinic acid 2944 kg. and ascorbic acid 18,619 kg. Suggestions are made for the quantities of different foods needed to supply these amounts of nutrients; in order to supply the calcium requirement a much larger amount of milk would be needed than could at present be produced.—D. Duncan.

3538

Leverton, R. M., Gram, M. R., Chaloupka, M., Brodovsky, E. and Mitchell, A. **The quantitative amino acid requirements of young women. 1. Threonine.**

Leverton, R. M., Gram, M. R., Brodovsky, E., Chaloupka, M., Mitchell, A. and Johnson, N. **2. Valine.** *J. Nutrition*, 1956, **58,** 59–81; 83–93. [Nebraska Agric. Exp. Stat., Lincoln.]

1. The general procedure used in a series of investigations of the requirements of young women for 5 amino acids is described. The subjects were 35 healthy college girls, in age from 19 to 26 years, and the acids studied were threonine, valine, tryptophan, phenylalanine and leucine. A semi-synthetic basal diet of sugar, maize starch, butter, maize oil, lemon juice and jelly was used to which were added mineral and vitamin supplements and, to improve palatability, small amounts of auxiliary foods low in N, orange, tomato and grape juices, peaches, pineapple, raw carrot and lettuce, were allowed. The amino acids were given as a mixture of 12 in the proportions found in egg protein and in amounts equivalent to 15 or 20 g. protein. Nitrogen balance was studied as the amount of a particular acid was reduced and equilibrium was assumed if output was from 95 to 105 per cent. of intake. When all 5 acids had been studied a final test was made with a mixture containing the minimum amounts of each.

In the study of threonine requirement the auxiliary foods supplied, on the average, 30 mg. daily and the range of amounts required to maintain N equilibrium was from 103 to 305 mg. Of 21 subjects all were in equilibrium with 305 mg., all but 4 with 214 mg. and 2 were able to maintain it with 103 mg. No relation was found between amount of threonine and bodyweight or creatinine coefficient. The rounded amount of 310 mg. daily is suggested as likely to cover the needs of all normal young women like those studied.

2. In the study of valine requirements the auxiliary foods supplied, on the average, 100 mg.

daily. At the level of 650 mg. all of 7 women were in equilibrium or in positive balance; with 465 mg. 3 were in negative balance. At the level of 375 mg. 5 of the 7 were in negative balance; balances for the 2 others were irregular, but both had nausea and lost appetite. In the later trial with 650 mg. all of 8 women were in equilibrium. There was no relation between amount of valine and creatinine coefficient or energy intake.

The minimum requirement of women like these is taken to be 650 mg. daily.—D. Harvey.

3539

MITCHELL, H. H. **The need for calcium is flexible.** *Modern Med.*, 1955, **23**, 85–91. [Dept. Animal Nutrit., Univ. Illinois, Urbana.]

Studies of calcium metabolism in the last decade show that the amount of Ca required daily to give equilibrium or storage in animal or man depends on the intake to which the subject has been accustomed. The less the habitual intake, the more economically Ca is used; a sudden change from high to low intake means loss of stored Ca and gradual, often slow, adaptation to the new level. There is no evidence to suggest that saturation of stores, bone trabeculae, is necessary for health. The infant with small stores uses Ca more efficiently than older children and the pregnant and nursing woman may also be more efficient than average.

For these reasons, diet standards for Ca have little significance. On an incremental or turnover basis, needs decrease from 16·5 mg. per kg. body-weight in the infant to 2·5 to 4 mg. in childhood, increase to 5·5 mg. during adolescence and decrease to a very low level at maturity. Pregnant women require for the foetus amounts rising to 300 mg. daily at term and, for 500 to 800 ml. milk, 170 to 272 mg. Ca daily. All of these must be multiplied by factors varying from 2 or less to 5 or more, depending on the accustomed level and the foods from which the Ca is derived.—I. Leitch.

3540

DEMPSEY, C. A., GREINER, T. H., BURCH, N. R., CHILES, D. and STEELE, J. **The human factors in long range flight.** *J. Aviation Med.*, 1956, **27**, 18–22. [Aero Med. Lab., Wright-Patterson Air Force Base, Ohio.]

Freedom of choice of tinned foods, but with a limit of twelve 8-oz. tins, was allowed to representative pilots when they underwent tests simulating 2 periods of 18 and 19 hr., respectively, of cruising to and from a target and 1 period of 19 hr. of continued vigilance over a target. With the protective clothing provided there was no evidence of physiological stress. Energy intake was about half the amount of 5000 Cal. normally provided for the period of 56 hr.—D. Harvey.

3541

MEYER, F. L., BROWN, M. L., WRIGHT, H. J. and HATHAWAY, M. L. **A standardized diet for metabolic studies: its development and application.** *U.S. Dept. Agric. Tech. Bull.* No. 1126, November 1955, pp. iv + 81. [Human Nutrit. Res. Branch, Agric. Res. Serv.]

In cooperation with the University and the Agricultural Experiment Station of Maryland, a standardised diet was developed, believed to be suitable for studies of requirement and utilisation of most nutrients except protein and amino acids.

In the first of the 4 sections of the bulletin the diet is described, with tables of nutrients and typical meal patterns. The diet consists of a "core" of natural and refined foods providing most nutrients in restricted amount, and 2 complements. The "core" foods are apples, pears, peaches, green beans, celery, lettuce, dried potatoes and unenriched cereals other than maize, with small amounts of beef, haddock, evaporated milk and specially prepared tomato purée to make the diet pleasanter. Complement 1 supplies more carbohydrate, protein or fat with little change in minerals or vitamins, from the following foods: cake flour, gluten flour, vitamin-free casein, gelatine, sugar, low-vitamin jellies, and fat. Complement 2 supplies additional minerals and vitamins in synthetic or purified form. For reference levels, *i.e.*, intakes regarded as reasonable for preliminary or equalisation periods, it was planned to adjust the quantities so as to give Cal. 2000, protein 60, fat 80, carbohydrate 250 g., Ca 700, P 1000 [erroneously headed g. in Table 4, p. 10], Fe 10 mg., vitamin A 4000 I.U., vitamin B_1 0·8, riboflavin 1·0, nicotinic acid 7, ascorbic acid 60 mg.; and of nutrients of which the amounts required by man are still doubtful, Cu 0·8, I 0·105, Mg 220, Mn 2, K 2100, Na 2400 (these 2 not including salt and baking powder), Zn 4, choline [misprinted as chlorine in Table 1, p. 4] 300 mg., cobalamin 5 μg., folic acid 100 μg., pantothenic acid 4 mg., vitamin B_6 0·8 mg., vitamin D 400 I.U. The diet as actually used (see below) differed slightly from this. The necessary adaptations for studies of requirement or utilisation of a particular nutrient, or of interrelationships of nutrients, are explained in detail.

The third section includes recipes and methods of preparing the foods, methods of administering minerals and vitamins, and methods for collection and analysis of samples of foods, urine, faeces and blood. The fourth consists of a brief review of the literature on adults' requirements of essential nutrients. A bibliography of 192 items is appended.

The second, and longest, section describes a metabolic study made on 6 women students in the spring of 1952 to test the acceptability of the diet

and the suitability of the reference levels and to study the effect of different fat intakes on the utilisation of other nutrients. There were eight 5-day periods; during the second 4, 3 of the subjects had their fat intake reduced to 28 g. by replacing butterfat by isocaloric amounts of sugar and jelly. The diet proved acceptable and all but 1 of the subjects maintained weight. The results are presented in tables and graphically for the subjects individually. A reduction of the fat intake did not significantly affect N retention, total faecal lipids and fractions, retention of Ca, Mg or P, or excretion of vitamin B_1, riboflavin or ascorbic acid. For the 6 subjects, mean retentions were: N 0·78 g., Ca 24 mg., P 34 mg., Mg — 26 mg., on intakes of N 10·97 g., Ca 728 mg., P 948 mg., Mg 182 mg. Mean urinary excretions were: vitamin B_1 67 μg., riboflavin 116 μg. and ascorbic acid 11 mg., on intakes of vitamin B_1 795 μg., riboflavin 976 μg., ascorbic acid 57 mg. There were great differences between individuals, not explained by differences in height, weight or age, and for these a hormonal origin is suggested. For future studies lower reference levels of vitamin A, 3000 I.U., vitamin D, 300 I.U., and ascorbic acid, 40 or 50 mg., are suggested.—W. M. Deans.

FEEDING OF INFANTS AND CHILDREN

3542

CHERRY, A. **Establishing breast feeding.** *Med. J. Austral.*, 1953, i, 844–845. [Largs Bay, S. Australia.]

The difficulties of establishing breast feeding are discussed. Feeding should be on reasonable demand till an adequate flow of milk is well established, and discipline and habit-training should not begin until then. Systems are often too rigid and, though applicable in hospital, they may not be suitable in the home.—E. M. Hume.

3543

ISBISTER, C. **Breast feeding.** *Med. J. Austral.*, 1954, ii, 486–488. [Sydney.]

The article is a general one furnished by special request, and is intended primarily for clinicians. It pleads for more ease in the management of breast feeding and for co-operation between doctors and health centre sisters to establish and maintain lactation in the 80 per cent. of women who are physically and psychologically capable of feeding their infants. A great many important points in the management of lactation are made.

E. M. Hume.

3544

MILLIS, J. **Some aspects of breast feeding in Singapore.** *Med. J. Malaya*, 1955, **10,** 157–161. [Dept. Social Med. Pub. Health, Univ. Malaya.]

The duration of breast feeding was studied in 3 groups of women delivered of single, mature infants without congenital defect in a maternity hospital. There was no history of abnormality during pregnancy and delivery. The groups were 106 Southern Indian women of the lower income groups, 103 Chinese women of the lower income groups and 114 Chinese women of the middle and upper income groups of urban Singapore. Thirty-eight Indian women, 30 poor Chinese and 59 wealthier Chinese weaned their babies before the twelfth week. The principal reason given was failure of lactation in all 3 groups, but in the last group employment of the mother away from home and indifference of the mother were of importance also. The incidence of breast feeding in the wealthier Chinese women was similar to published data for women in Britain; the incidence in the other groups was uniformly higher than for British women. Indian women were less successful in breast feeding than the poor Chinese women. In the former only, poor lactation was associated with high parity and low maternal age. See also Absts. 2634, Vol. 25 and 3582, Vol. 26.—F. C. Aitken.

3545

SAINZ DE LOS TERREROS AMÉZAGA, C. Abuso en el empleo de las leches enteras acidificadas. [**Use and misuse of acidified whole milk.**] *Medicamenta*, 1956, **25,** 106–107. [Madrid.]

Although acidified whole milk is valuable in some pathological conditions, it is not to be regarded as a suitable diet for the healthy infant. Some infants are intolerant of it from the start, others develop dyspepsia or an intractable and protracted loss of appetite leading to failure to gain weight. A plea is made for care in its use.

D. Duncan.

3546

CUTILLO, S. Considerazioni su taluni aspetti della fisiologia dell'alimentazione nel corso dell'allattamento artificiale. [**Discussion of certain aspects of the physiology of nutrition during artificial feeding.**] *Lattante*, 1955, **26,** 462–474. [Ist. Clin. Pediat., Univ. Naples.] English summary.

The use is described of 2 types of milk powder acidified with lactic acid, one of whole-cream milk, the other with the percentage of fat reduced, the respective energy values being 475 and 432 Cal. per 100 g. By mixing and diluting them to different extents, diets of widely varying composition were obtained for babies of all ages and nutritional states; transitional diets also could easily be prepared. Such milk mixtures were satisfactory when given to 39 infants, normal, premature and dystrophic, up to 5 months of age. The rates of weight increase and values for serum protein, Hb and number of red cells are tabulated.—E. M. Hume.

3547

GLATZEL, H. Die Bedeutung einer mangelhaften Ernährung der Mutter für das Kind. [**Significance for the child of deficient maternal diet.**] *Deutsch. med. Wochenschr.*, 1955, **80**, 1879–1885. [Flensburg.]

A review.

3548

SOGANDARES, L. Programas de alimentacion suplementaria como medida preventiva en la desnutricion infantil. .[**Programmes of supplementary feeding for preventing malnutrition among children.**] *Bol. Ofic. sanit. panamer.*, 1955, **39**, 464–468. [Serv. Nutric., Dep. Salud Pub., Panama.]

The plans promoted by UNICEF for improving nutrition of schoolchildren, pre-school children and infants in Panama are briefly outlined with some conclusions and recommendations mainly concerned with the problems of obtaining co-operation from parents, medical authorities and social workers in order to carry out the programmes of dietary supplementation.—A. M. Copping.

3549

MOORE, M. C., GOLDSMITH, G. A., BUTLER, R. E., WOLF, M. H. and MARTIN, M. P. **Effect of nonfat dry milk solids on growth and nutriture of children.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 1223–1227. [Louisiana Dept. Health, Sch. Med., Tulane Univ., New Orleans.]

In a rural area, where milk consumption was low, children in one school were given a daily supplement to the school lunch of non-fat milk solids equivalent to 0·67 pint milk. In 43 children in this school and 43 comparable controls in a second school where no supplement was given nutritional state was assessed and height, weight, pelvic width and calf circumference were recorded at the beginning, during and at the end of the 14-month experiment. The only significant results of the milk supplement were a greater gain of weight in boys receiving the supplement compared with controls and a greater percentage in the supplemented group of children whose skin improved during the experiment.—F. C. Aitken.

3550

MACK, P. B., MILSOM, A. K. and CARNEY, P. L. **A study of two levels of bread enrichment in children's diets.** *Monogr. Soc. Res. Child Development*, 1953 (1955), **18**, Serial No. 57, No. 2, pp. 92. [Nelda Childers Stark Lab. Human Nutrit. Res., Coll. Household Arts Sci., Texas State Coll. Women.]

The children from 3 of the 4 orphanages taking part in the bread study had previously been subjects of an experiment to compare a low-meat diet with a high-meat diet. At the end of the meat diet study, children in the 3 institutions were given the basal diet of the bread study with enriched bread for 4 months. During this period the children in the fourth institution had their usual diet with unenriched bread. In the following 36 months all 4 institutions had the basal diet modified as follows: institution 1, bread with double enrichment for 18 months, unenriched bread for 18 months; institution 2, bread with ordinary Federal enrichment for 36 months; institution 3, bread with ordinary enrichment for 24 months, bread with no enrichment for 12 months; institution 4, bread with no enrichment for 18 months, bread with ordinary enrichment for 18 months. The intakes of nutrients from the basal diet with unenriched bread approached the allowances recommended by the National Research Council. The age distribution in any one institution was kept relatively constant by dropping a few older children from time to time and adding younger children. In institutions 1, 2 and 3 the average number of children, aged 6 to 14 years, was 40 in the different periods of study and there were 15 in institution 4.

The criteria used to assess the influence of enrichment of bread on nutritional status were: overall medical rating, bodyweight and growth, skeletal maturation of hand and bone density, condition of the eye, tongue, gums and skin, heart dysfunction, appearance of fatigue resistance, reflex activity, nervous habits, dark adaptation, Hb, red cell count, haematocrit, mean corpuscular Hb concentration (M.C.H.C.), mean corpuscular Hb (M.C.H.), blood levels of vitamin A, carotene, ascorbic acid, proteins, Ca, P and phosphatase, and urinary excretion of vitamin B_1, riboflavin and the nicotinic acid excretion product F_2. For each criterion standards were adopted for classification of children. The percentage monthly changes in percentage of children in designated classes, shown diagrammatically, were the ultimate bases of assessment of the value of bread enrichment. When improvement in rating, occurring during consumption of enriched bread, was increased during subsequent consumption of unenriched bread the effect was termed a carry-over.

Ordinary enrichment was associated with improvement in overall medical rating (with carry-over), development according to Wetzel grid, skeletal status, resistance to fatigue, response to test for reflex action (with carry-over), M.C.H.C. and M.C.H., skin and tongue condition, incidence of corneal vascularisation and urinary excretion of B vitamins. Favourable changes were in general more extensive with double than with single enrichment.—F. C. Aitken.

See also Absts. 3571, 3784.

DIETARY SURVEYS AND INDIVIDUAL STUDIES

3551

EPSTEIN, F. H., CAROL, R. and SIMPSON, R. **Estimation of caloric intake from dietary histories among population groups.** *Amer. J. Clin. Nutrit.*, 1956, **4**, 1–9. [Res. Dept., Sidney Hillman Health Centre, New York.]

In this study it was assumed that the energy intake of a person of steady weight can be predicted from surface area by the use of the nomogram of Boothby *et al.* (Abst. 3555, Vol. 6), and that the predicted value can be used to check the accuracy of dietary histories. Of the 317 men and women interviewed, about one-third gave histories of energy intake agreeing within ± 10 per cent. with the predicted intakes; two-thirds agreed within ± 20 per cent., and 85 per cent. of the men and 75 per cent. of the women gave histories of energy intake within ± 30 per cent. of predicted intakes. It is concluded that dietary histories appear to provide a valid basis for the estimation of the food intake of population groups but not of individuals.—F. C. Aitken.

3552

JOHNSON, M. L., BURKE, B. S. and MAYER, J. **Relative importance of inactivity and overeating in the energy balance of obese high school girls.** *Amer. J. Clin. Nutrit.*, 1956, **4**, 37–44. [Dept. Maternal Child Health, Harvard Sch. Pub. Health, Boston, Mass.]

Diet histories and a picture of physical activity were obtained by interview from 28 obese and from the same number of normal girls. Intake of energy by obese was significantly less than by normal girls, but these normal girls were significantly more active than the obese.—F. C. Aitken.

3553

LYONS, J. S. and TRULSON, M. F. **Food practices of older people living at home.** *J. Gerontol.*, 1956, **11**, 66–72. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Diet histories were obtained in interviews with 100 men and women aged 65 years or over. The nutrients most frequently low were Fe, Ca and vitamin C in the women's and energy, Ca, vitamin B_1 and riboflavin in the men's diets. Thirty-five per cent. of the men and 52 per cent. of the women had more than the allowances of energy recommended by the U.S. National Research Council. Forty-eight per cent. of the men and 57 per cent. of the women were overweight by 10 per cent. or more.—F. C. Aitken.

3554

HOBSON, W. and PEMBERTON, J. **The health of the elderly at home.** *Brit. Med. J.*, 1956, i, 587–593. [Dept. Social Indust. Med., Univ. Sheffield.]

A general account is given of a survey of the health, diet and blood biochemistry of 476 elderly people living at home. Some of the more detailed results have been published in other journals (see, *e.g.*, Absts. 4841, Vol. 23; 2081, Vol. 24).

The incidence of specific causes of ill health and disability ranged from scurvy, found in 0·4 per cent., to errors of refraction requiring spectacles for their correction, found in 97·5 per cent. Cardiovascular conditions were responsible for more disability than any other condition.

The intakes of energy and nutrients of those graded as fit are tabulated by age group and it is suggested that these mean intakes provide average standards of adequacy for the elderly.

Estimations were made of Hb and blood urea, and of Ca, cholesterol and alkaline phosphatase in serum; means and range of values are tabulated.

F. C. Aitken.

3555

SAINT, E. G., ABRECHT, H. F. and TURNER, C. N. **Old age: a clinical, social and nutritional survey of seventy patients over sixty-five years of age seen in a hospital out-patient department in Melbourne.** *Med. J. Austral.*, 1953, i, 757–764. [Clin. Res. Unit, Walter and Eliza Hall Inst. Med. Res., Melbourne.]

Most of the 30 men and 40 women examined had come to the out-patient department with gastro-intestinal complaints, and major operations were performed on 33 with excellent results. Other disabilities of old age were recorded. The patients were classed in 4 grades according to their general health and capacity for physical activity.

The social survey included marital status, income and housing, mental adjustment to ageing, and employment.

The standards of the Oxford Nutrition Survey were used to assess dietary status. It was excellent in 12 patients, good in 31, borderline in 24 and inadequate in 3. Their dietary habits were particularly influenced by their energy expenditure, facilities for preparing meals, state of dentition, income, presence and degree of alcoholism, food habits and ignorance of food values. Patients living in their own homes were better off in every respect.

Advice about properly balancing the diet and about energy intake produced good results.

M. H. Pierce.

3556

MCGARY, V. E., SHIPMAN, M. E. and BERNSTEIN, L. M. **Acceptability of irradiated foods. Dietary procedures.** *J. Amer. Dietetic Assoc.*, 1956, **32**, 123–127. [Med. Nutrit. Lab. Fitzsimons Army Hosp., Denver.]

The test foods were canned and frozen and alternate cans were sent to be sterilised by irradiation with mixed fission products. The test foods were peaches, strawberries, ground beef, ham and bacon, haddock, green beans, beets, cereal bar, bread and powdered milk. These contributed 35 per cent. of total calories in the diet during balance and acceptability studies. The preparation and serving of the foods and the methods of analysing the diets in the balance studies are described. The results of the balance studies will be reported later. In 9 subjects there was little difference in acceptability of irradiated and non-irradiated foods.

F. C. Aitken.

3557

CARRÉRE, P. Enquète sur le budget familial par carnets de comptes annuels à Marseille. (mars 1953 à février 1954). [**Study of family budgets in Marseilles by questionnaire on annual expenditure (March 1953 to February 1954).**] *Bull. Inst. nat. Hyg., Paris*, 1955, **10,** 685–720.

For accounts of a previous survey see Absts. 5106, Vol. 24; 2571, Vol. 25; *Bull. Inst. Nat. Hyg., Paris*, 1955, **10,** 407. The present survey, on the same lines, covered 60 families with 236 persons, some, but not all, the same as before. Expenditure on food was highest in winter, and ranged from 38·5 to 54 per cent. of total expenditure and from 200 to 322 fr. per head daily, mean 242 fr., in 5 groups classified by total expenditure; but the mean cost per Cal. and the proportions of total energy furnished by carbohydrate, protein and fat were almost the same in all groups. Animal protein and Ca intakes were low; consumption of meat, fish and cheese was fairly high but that of milk, eggs and fresh vegetables low. Seasonal variations in consumption of different foods were not great, apart from fruit and vegetables. Intakes of energy and fat were highest in summer, largely owing to the use of salad oil.

Disadvantages of the method of survey are discussed and the interview method is considered to offer wider possibilities.—W. M. Deans.

3558

CARRÈRE, P. Étude sur le genre de vie des chômeurs (novembre-décembre 1954-janvier 1955). [**Mode of life of unemployed, November-December 1954-January 1955.**] *Bull. Inst. nat. Hyg., Paris*, 1955, **10,** 883–919.

As a sequel to studies of dockers (Abst. 2703, Vol. 22), large families (Abst. 4918, Vol. 23) and tradesmen (Abst. 1009, Vol. 24) in Marseilles, a survey was made in the winter of 1954–55 of a random sample of registered unemployed. There were 139 families with 506 persons, classified in 4 groups: head of household unemployed, no other earner, with children, 48 families, without children, 22, with other earner, 28; head of household working, other member unemployed, 41. Barely half were receiving unemployment benefit. The percentage of total expenditure devoted to food was 58, 52, 63·5, 53·5 in the 4 groups. Only 99 families supplied information about diet. Mean daily expenditure on food was 212, 264, 243, 270 fr., mean energy intake 2134, 2489, 2561, 2533 Cal. In general, intakes of animal protein and Ca were below standard, owing to ignorance of the value of dairy products and the high price of meat and fish and (in winter) of green vegetables. Group 1 had the most ill balanced diet, with too little meat, eggs, cheese, milk and fresh vegetables; these families used a lot of cereals, especially pastes and rice and dried vegetables; fat intake was adequate, but it was mostly oil. The amounts of foods they consumed were much the same as in the unemployed group in the survey of large families, except that the latter had more bread and milk and less cheese and fresh vegetables. Over the whole sample, the commonest reaction to unemployment was to reduce expenses all round, though some preferred to cut down expenditure on food, others on clothing or amusements.—W. M. Deans.

3559

DEAN, W. T. **Nutritional status of women industrial workers in Virginia.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 24–28. [Virginia Agric. Exp. Stat., Blacksburg.]

Studies were made on 103 women, of whom 50 were employed in a government arsenal and 53 in a garment factory. Seven-day food records were collected for each subject when the study began in the autumn of 1952 and when it ended 12 months later. At the end of the first 6 months information was collected by the 24-hr. recall method. The mean daily intake of 9 nutrients was calculated and the data are tabulated according to age group and in comparison with U.S. National Research Council (1953) recommendations (Abst. 3538, Vol. 24). Physical examinations were made at the beginning and end of the study. At the beginning of the study and at 6-month intervals finger-tip samples of blood were analysed for Hb, vitamin A, carotene and ascorbic acid.

Only a small percentage of the women were poorly developed physically; except for gingivitis, changes in the papillae, caries and neurological conditions there were few abnormalities. In the autumn of 1952 and 1953, with some exceptions, no more than 9 per cent. of the subjects had intakes of nutrients two-thirds or less of the recommended allowances. From the 24-hr. recall studies in the spring of 1953, between 17 and 48 per cent. of women had daily intakes of Fe, Ca, vitamin A and ascorbic acid which were less than two-thirds of the recommended allowances.

According to standards which are described the levels of blood constituents were classified as good, fair or poor ; few were poor. There was evidence that the recommended allowances of ascorbic acid and vitamin A are greater than the amounts necessary to maintain levels in the blood that may be considered satisfactory.—G. F. Garton.

3560

BRINE, C. L. and TATE, E. B. **Effect of food losses on nutritive content of diets in four institutions.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 19–23. [Arthur D. Little, Inc., Cambridge, Mass.]

Diet studies were made on all or on a representative sample of the persons living in 4 institutions in the United States during a 14-day survey period in either the winter or the summer of 1953 or in the summer of 1954. The population in 3 of the institutions, of which 2 were for old people and 1 for children, ranged from 90 to 804 ; in the fourth, a children's home where the food was prepared in cottages each with 15 residents, 2 such cottages, a boys' and a girls', were surveyed. During the study period, data were collected on the weight of food delivered to the kitchen, on the weight of inedible refuse and on the weight of food lost during preparation and serving of meals. The losses were expressed in terms of weight purchased.

In terms of weight, food losses in the 3 large institutions were high, from one-fifth to one-fourth of the total food issued. In the cottages the loss was 5 per cent. During preparation and serving there were losses from all foods, greatest from leafy, green and yellow vegetables, potatoes and sweet potatoes, meat, poultry and fish, and dry beans and peas and nuts and least from milk, cream, ice-cream and cheese, citrus fruit and tomatoes. Loss of nutrients was highest for Fe and nicotinic acid and lowest for Ca and riboflavin. In the large institutions the losses for the nutrients studied ranged from 13 to 38 per cent. ; in the cottages they were from 3 to 10 per cent.

When compared with U.S. National Research Council (1948) standards, nutrients in food issued in all 4 institutions were adequate, but in food eaten in the 2 institutions for the aged there were deficiencies of Fe in both, vitamin A and nicotinic acid in one and ascorbic acid in the other. Relative to recommended allowances, the values for the children's institutions were higher than those for the old.

It was thought that kitchen practices in institutions would cause losses of nutrients greater than would be found in family circumstances, vegetables and meats often being boiled or kept hot for long periods and the cooking water being thrown away.

G. F. Garton.

3561

SCOTT, E. M. **Nutrition of Alaskan Eskimos.** *Nutrition Rev.*, 1956, **14,** 1–3. [Arctic Health Res. Centre, Pub. Health Serv., Anchorage, Alaska.]

This short paper describes the change in feeding habits, from a diet rich in protein to a more mixed one with cereals and sugar as cheap sources of energy, which is taking place as Eskimos in Alaska forsake their traditional existence in small communities of a few families for life in villages of a hundred or more persons. In these villages which are growing up around schools, churches and stores the settlers have had difficulty in maintaining the herds of reindeer, which require nomadic conditions, and supplies of imported foods arrive only twice a year. Long-term problems arise if attempts are made to raise the economic status of the Eskimo either by encouraging migration to the larger centres of white population or by developing the resources of the tundra where he lives. In a city his lack of education places him low in the economic scale, and hitherto the development of local resources has not been achieved.

The outlook, though bleak, is not considered hopeless, since an innate adaptability may ensure his survival in a white civilisation.—D. Harvey.

3562

VÉLEZ BOZA, F. Estudio de la alimentación en un grupo de colectividades de Caracas durante los años de 1953–54. [**Diets of a group of institutions in Caracas during the years 1953–54.**] *Arch. venezol. Nutricion*, 1955, **6,** 35–47. [Inst. Nac. Nutrición.] English and German summaries.

Inventories of food were made for a week in 10 institutions : a children's home, a pre-natal and a post-natal home with 213 persons ; 6 private schools with 279 persons and an " official " school with 202 persons. Standards for requirements were those of Liendo Coll and Bengoa (Abst. 2548, Vol. 25) for energy and of the U.S. National Research Council (Abst. 3538, Vol. 24) for protein in terms of protein calories, equivalent to 13 per cent. of calories from protein at 1 to 3 years of age and about 8 per cent. for those over 20. Fat requirement was taken as 30 per cent. and carbohydrate at 55 per cent. [as stated].

In institutions in which the diet was sufficient the cost of food per head daily in bolivars ranged from 1·31 to 2·51 and where it was insufficient from 0·30 to 1·29. Diets in the private schools and the public assistance homes on the average were inadequate in energy value but had enough protein ; the " official " school had a large surplus of all proximate nutrients ; in detail, the pre-natal home and one of the private schools had adequate diets.—I. Leitch.

3563

FÉRY, R. L'Aurès. [**The Aurès.**] *Presse méd.*, 1956, **64,** 219–222.

This description of the partly nomadic Berber people of the Aurès, a mountainous region of Algeria to the north-east of Biskra, includes some notes on their food habits.

The staple food is semolina made from barley or maize; wheat is merely a means of exchange. The cereal is made into "galettes" (girdle-cakes) and "couscous"; for the latter coarse barley semolina is steamed, mixed with oil, moistened with a broth of meat and vegetables and spiced with cloves, coriander and pimento. These two foods, with dates, form most of the diet. Meat is rarely eaten fresh but is dried and eaten in small quantities in "couscous". Milk is made into butter and cheese; the usual beverage is whey. Besides dates, dried apricots and, in season, pomegranates, watermelons and grapes are eaten. Food is adequate in quantity, but the diet is monotonous and too high in carbohydrate. The people have communal stores for food and other possessions.

The women are not kept indoors; they attend to hens and goats and help at harvest time. They have no special routine or diet during pregnancy. Infants are wrapped in swaddling clothes and never washed. They are breast fed on demand, 2 years for a boy, 18 months for a girl, but are given "galettes" and dates very early. Rickets is unknown in the region. The weaned child gets the family diet and later may find and eat herbs and clay; infestation with worms is common.

The rest of the article deals with non-nutritional diseases. Disease is ascribed to evil spirits, cold and accidents.—W. M. Deans.

3564

SMARTT, C. G. F. **A note on the value of dried milk as an addition to the normal African diet in institutions.** *E. African Med. J.*, 1956, **33,** 27–30. [Mirembe Hosp., Dodoma, Tanganyika Territory.]

Male mental patients aged from 25 to 35 years when given a good African diet including 4 oz. meat 5 times a week showed a small continuous rise in weight which was greatest during their first 6 months in hospital and which gradually decreased with the length of stay in hospital. The addition of 4 oz. dried milk daily to the diet of 20 patients receiving such a diet caused an increase in average weight gain, large when compared with that of similar subjects not given dried milk. In 4 weeks the mean weekly gain was $5\frac{1}{4}$ lb. in those given milk and only $1\frac{1}{2}$ lb. in those not given it; in patients who had been over 2 years in hospital at the time of the trial the corresponding figures were $4\frac{1}{4}$ lb. and $\frac{1}{4}$ lb., respectively, which suggests that even a "good" African diet is deficient in some way that milk can correct.—L. Wills.

3565

GOVIL, K. K., BHATNAGER, D. P. and PANT, K. C. **Dietary habits in Uttar Pradesh in relation to income.** *J. Indian Med. Assoc.*, 1956, **26,** 138–141. [Provincial Hyg. Inst., Lucknow.]

In continuation of previous work (Absts. 1049, 3560, Vol. 24) a diet survey on 238 families (1489 persons) was made during 1952, 1953 and 1954 [period for which a single family was studied not clear]. The families were classified by monthly income per consumption unit in rupees: group 1 (147 families, 1021 people) had 30 R. or less; group 2 (34, 234), 31 to 40 R.; group 3 (32, 144), 41 to 50 R.; group 4 (25, 90) over 50 R.

Wheat, rice, both raw and parboiled, cheap grains, *i.e.*, barley, bajra (*Pennisetum typhoideum*), juar (*Sorghum vulgare*) and maize, and peas were all used. As income increased, wheat tended to replace rice, cheap grains and pulses, and ghee to replace cheaper vegetable substitutes; and except for green leafy vegetables, which were eaten in similar amounts by all groups, more vegetables, fruit and milk were used. Nearly half the families took meat and other non-vegetarian foods, but intakes were irregular and bore no relation to income. A table of daily intakes per consumption unit in oz. is included. For the 4 groups the respective daily intakes of energy and nutrients per consumption unit were: energy, 2857, 2942, 3030, 3206 Cal.; animal protein 5·7, 14·7, 12·9, 15·3 g.; vegetable protein 73·7, 68·0, 69·5, 72·9 g.; fat 40·3, 64·9, 69·9, 83·9 g.; carbohydrate 543·3, 505·4, 516·6, 521·4 g.; Ca 688·5, 900·1, 900·5, 1095·7 mg.; Fe 39·0, 38·4, 39·1, 44·0 mg.; vitamin A 2199, 2589, 2828, 3641 I.U.; vitamin B_1 2·0, 2·1, 2·2, 2·4 mg.; riboflavin 1·1, 1·3, 1·3, 1·5 mg.; nicotinic acid 18·2, 19·3, 20·5, 22·1 mg.; ascorbic acid 50·3, 54·3, 60·3, 74·9 mg. Groups 1 and 2 were considered to be having too little energy and all groups too little animal protein; intakes of Ca and vitamin A were adequate only in Group 4 and vitamin C only in groups 3 and 4. The mean monthly incomes were 19·3, 34·2, 48·0 and 74·0 R. and the expenditures on food 17·2, 24·5, 24·6 and 28·4. The monthly cost of a balanced diet in Uttar Pradesh was reckoned to be at least 34 R., including condiments and fuel. It was concluded that lack of means would prevent groups 1 and 2 from doing any better (2/5 of the families in group 1 were in debt or living on reserves) but that people in groups 3 and 4 should be educated into using more green vegetables and milk or other animal protein.—W. M. Deans.

3566

WILSON, W. **A dietary survey of aborigines in the Northern Territory.** *Med. J. Austral.*, 1953, ii, 599–605. [Austral. Inst. Anat., Canberra.]

A survey of dietary intake, food consumption patterns and eating habits of 2486 aborigines living in 5 government settlements, 6 missions and 6 cattle stations in the Northern Territory of Australia was made in August, September and October, 1951, towards the end of the dry season. Most of the food was issued as rations ; some of it was as cooked meals and some was uncooked. A modified "food list" and questionnaire method were used. According to the rations consumed, the aborigines were divided into 38 groups.

The main items of diet were flour or bread, meat, sugar and tea. Compared with the consumption of the average white Australian, the mean consumption per head by aborigines of cereals, flour and bread was greater by almost 100 per cent., and of sugar and meat by 30 per cent. Tea consumption was about the same, but that of milk, vegetables, fruit, potatoes, fats and eggs was less than half. Meat was the only food produced locally in sufficient amount to provide a regular supply for the aborigines. The cost and difficulties of transport restricted the variety of other foods, especially as some centres received supplies only 3 times in a year. The contribution of indigenous foods to the diet was not significant.

The food consumption was evaluated in terms of specific nutrients, and the intake of each group studied was compared with the recommended dietary allowances (restricted) of the Food and Nutrition Board of the National Research Council of America. Over 80 per cent. of the groups were receiving the recommended allowances of calories, protein and vitamin B_1, but a large number were grossly low in their intake of vitamins A and C and of Ca. When classified into grades by a descending scale from A to E (Abst. 2341, Vol. 17), 84 per cent. of the diets were in grade D or lower, compared with 26 per cent. of 2593 Australian households previously surveyed.

The food consumption and nutrient intake of working stockmen were better than in the other groups. Only some missions and government settlements provided special rations for pregnant or lactating women and children. The standard of cooking by employed cooks or the aborigines themselves was generally poor.—M. H. Pierce.

See also Absts. 3030, 3572, 3611.

GENERAL STUDIES : DIET PLANNING : EDUCATION

3567

KING, C. G. **Food and nutrition in 1955.** *J. Agric. Food Chem.*, 1956, **4,** 33–37. [Nutrit. Found., New York.]

3568

KUPPUSWAMY, S. and SWAMINATHAN, M. **Human nutrition.** *Annu. Rev. Biochem. Allied Res. India,* 1954, **25,** pp. 15. [Div. Biochem. Nutrit., Central Food Technol. Res. Inst., Mysore.]

3569

WALFORD, L. A. and WILBER, C. G. **The sea as a potential source of protein food.** *Advances in Protein Chem.*, 1955, **10,** 289–316. [Fish and Wildlife Serv., U.S. Dept. Interior, Washington, D.C.]

3570

FRYER, J. H. **Some recent advances in clinical nutrition.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 97–101. [Dept. Clin. Med., Sch. Nutrit., Cornell Univ., Ithaca, N.Y.]

3571

DEN HARTOG, C. and DE HAAS, J. H. Enquête naar het melk- en kaasverbruik bij schoolkindern op het platteland. [**Inquiry into the consumption of milk and cheese by rural schoolchildren.**] *Voeding,* 1956, **17,** 12–26. [Voorlichtingsbur., Voedingsraad, The Hague.] English summary.

The inquiry was made by school medical officers and covered over 5000 children in 49 school medical districts. The record form is reproduced ; the results are summarised by province and shown in tables and diagrams with legends in Dutch and English. The method of interrogation by interested doctors may have overestimated habitual use of milk and cheese.

Consumption was higher in the north and west than in the east and south. If 500 ml. milk daily and 100 g. cheese weekly be taken as desirable standard, half or less than half the children in the east and south attain that standard. Consumption per head was less in larger families and children had less than adults.—I. Leitch.

3572

DEN HARTOG, C. De betekenis van het melkgebruik voor de Nederlandse bevolking. [**Significance of milk for the Netherlands population.**] *Voeding,* 1956, **17,** 9–11.

Of the following nutrients, as shown by the 1953 inquiry of the Food Department of the Ministry of Agriculture, Fisheries and Food, milk at 580 ml. per head daily supplied, in percentages, Ca 76·3, animal protein 53·3, riboflavin 56·1, P 38·5, vitamin B_1 17·1, vitamin A 24·7, pantothenic acid 30·4 and vitamin B_{12} 56. This takes no account of distribution within the population. A special inquiry suggests that pregnant women, drinking between 400 and 700 ml. daily, have less

than the recommended amounts. Similar studies of schoolchildren have shown that consumption standardised to 8½ years of age is higher, 615 ml. daily, by the children of professional parents than by those of unskilled workers, 460 ml., and that there were parallel differences in height and weight. Milk in school did not affect consumption at home.—I. Leitch.

3573

VAN SYCKLE, C. **Consumption of fresh and evaporated milk and dry milk solids.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 1228–1231. [Dept. Home Econ., State Coll. Washington, Pullman.]

In 226 households of 2 or more persons in Everett, Washington, the average weekly consumption of fresh milk, with evaporated milk and dry milk solids in terms of milk equivalent, was 12·5 qt. Children drank more fresh milk than young adults and young adults more than older adults.—F. C. Aitken.

3574

WOLGAMOT, I. H. and FINCHER, L. J. **Bread: facts for consumer education.** *U.S. Dept. Agric. AIB* No. 142, November 1955, pp. 22.

Federal definitions and standards of identity for standardised breads, including enriched bread, and descriptions of other breads commonly used in the United States are given with an account of the making of bread on a commercial scale. The nutritive value and contribution to the diet of ¼ lb. bread of different kinds and of 5 cents' worth of enriched and unenriched bread are shown in tables and charts.—F. C. Aitken.

3575

BRACHMANN, G. Vom Topfblümlein zum Volksnahrungsmittel. Aus der Geschichte des Erdapfels. [**From pot plant to staple food. The history of the potato.**] *Lebensmittel u. Ernährung*, 1956, **9,** No. 2, 11–12.

A historical sketch of the slow spread of the potato into Germany and Austria. In the poverty-stricken Ennstal as late as the forties of last century it was used only as cattle feed. At present in Austria a third of the crop is used for human food, more than a third for animal feeding, about 4 per cent. for spirit, about 2 per cent. for starch and the rest for drying, export or seed.

W. M. Deans.

3576

LANGER, A. and HENSHAW, P. S. **The interacting effects of public health, fertility behavior and general economy on standards of living. 3. Quantitative evaluation of component determinants with respect to raising or maintaining present standards.** *Amer. J. Med. Sci.*, 1955, **230,** 605–621; 697. [Nat. Committee Maternal Health, Inc., 2 East 103rd St., New York 29.] Interlingua summary.

For parts 1 and 2 see Absts. 965 and 2269, Vol. 26.

See also Absts. 3501, 3549.

FOOD ECONOMICS AND STATISTICS

3577

WADHAM, S. M. **The world food problem—technical or social?** *Med. J. Austral.*, 1953, i, 209–216. [Univ. Melbourne.]

The march of agriculture and the growth of population are compared throughout the world, with particular attention to Australian aspects of the problems.—E. M. Hume.

3578

SCHULZ, T. **A 'human needs' diet: autumn 1955.** *Bull. Inst. Statistics Oxford*, 1956, **18,** 87–93.

The cost of a "human needs" diet in the autumn of 1955 was 68s. 8½d. compared with 63s. in the spring (Abst. 967, Vol. 26), a rise of over 8 per cent., due mainly to the increased costs of bacon, other meat, eggs and cheese, and potatoes. Barley, rice and dried peas were cheaper, but there was a tendency to replace such foods by others requiring little or no cooking.

Subsidiary tables show the amounts of energy, protein, Ca and Fe, relative to bread as standard obtained from sixpenceworth of the foods listed, and the contributions of these foods to the nutrients and cost of the "human needs" diet. Bread and flour, both fortified with Ca, were the cheapest and best balanced foods, though cheese and milk provided more Ca and dried peas and lentils more protein for the money. As sources of animal protein, herrings, cheese and [condensed] skimmed milk cost about half of what meat did and a third of what eggs did.—W. M. Deans.

See also Absts. 2894, 3537, 3565.

DIET IN ETIOLOGY OF DISEASE

METHODS OF ASSESSING STATE OF HEALTH

3579

BOLTON, J. H. **Food, the appearance of the tongue, and the appreciation of bone vibration.** *Med. J. Austral.*, 1955, i, 10–13. [Melbourne.]

Diet histories that were roughly quantitative were taken from 68 patients, aged from 18 to 78, examined during 4 years' private practice. None showed definite signs of organic disease apart from atherosclerosis in the older patients. The state of the tongue was classified, by appearance, into one of 6 grades described; the changes are regarded as very early signs of pellagra. Appreciation of bone vibration was measured by direct comparison between observer and patient, a fork of 256 vibrations per second being applied to the pad of the index finger. Six degrees of perception are described, and a mechanical vibrometer showed that grading for an individual remained reasonably constant.

Foods recorded in the diet histories were grouped as animal proteins, fruit, vegetables and foods containing B vitamins; for each group histories were classified as high, moderate and low. Analysis by multiple regression showed that only animal protein, particularly the daily intake of meat and eggs, significantly affected tongue grading, and foods rich in B vitamins, particularly cereals and yeast extract, were of importance in relation to perception of bone vibration. Age had a significant effect on both.

The value of tongue change as an index of nutritional state was shown by a multiple correlation coefficient of 0·64. Records of bone vibration were relatively consistent in the hands of a single observer and their value as a nutritional index was shown by a multiple correlation coefficient of 0·63.

M. H. Pierce.

3580

GANDEVIA, B. and HOSSACK, D. **Tongue appearance and serum albumin level in the assessment of nutritional status, with reference to the effects of a protein-rich diet.** *Med. J. Austral.*, 1955, i, 344–346. [Royal Melbourne Hosp.]

Repeated estimations of "tongue grade" (Bolton, see preceding Abst.), of albumin and total protein in serum, and of Hb were made on 2 groups of clinically healthy students, whose intakes of protein were recorded, one of 24 students living at home, the other of 16 students living in institutions. The mean intake, in g. daily, of first-class protein was 63 for the first and about 46 for the second. Those living at home showed a significantly better tongue grade, 0·85 against 1·39, and a higher mean for serum albumin, 4·57 against 4·07 g. per cent. Values for Hb and total protein were not significantly different. After 2 weeks at home on a diet which was very rich in protein, those who had been in institutions gave values like those of students living at home.

Statistical analysis showed that tongue grade and serum albumin reflected the dietary protein intake of a group, and could be used to assess nutritional status in respect of protein. The influence of protein intake on blood volume and on values for serum albumin and Hb is discussed.

M. H. Pierce.

3581

EISENMENGER, W. J. **Hepatic function and protein metabolism in cirrhosis of the liver.** *Med. Clins. N. Amer.*, 1955, **39**, 719–734. [Hosp. Rockefeller Inst. Med. Res., New York.]

GENERAL STUDIES

3582

MILLIS, J. **Gain in weight and length in the first year of life of Chinese infants born in Singapore in 1951. The influence of nutrition on the growth rate in the first year of life of Chinese infants born in Singapore in 1951.** *Med. J. Austral.*, 1954, i, 283–285; 322–327. [Dept. Social Med. Pub. Health, Univ. Malaya, Singapore.]

See also Absts. 2634, Vol. 25; 3544, Vol. 26.

(a) A representative group of 73 male and 55 female term, normal pure Chinese infants of families in the lower income groups in Singapore in 1951 was studied; 103 babies were still under observation on their first birthday.

Weight curves were constructed from 2055 measurements made every 2 weeks from birth to 12 weeks, and then every 4 weeks to one year of age. The curves for Chinese infants in Singapore were similar to those for Chinese infants in China (Gin, Abst. 2236, Vol. 18), and for the first 20 weeks of life they corresponded with those of white infants in America and Australia, but in the second half of the first year they were lower. At one year old, the average Chinese male infant was from 47 to 54 oz. and the average Chinese female infant from 54 to 60 oz. lighter than the corresponding white child.

The length of the babies was recorded, in 337 measurements at birth and at 24 and 52 weeks of age. The mean birth length of Chinese male babies was 19·3 in. and of females 19·0 in., both being less than those of white American babies. The proportional increase in length of Chinese and American babies in the first year was the same.

(b) Observations were made on 103 term, normal pure Chinese infants, 57 males and 46 females. They were divided into 4 groups according to the duration of breast feeding, less than 12 weeks, 12 to 32 weeks, 32 to 48 weeks, and longer than 48 weeks. Supplementary feeds were of sweetened condensed milk and powdered milk. At 24 weeks of age, 31 infants were receiving rice, cornflour or oatmeal, and after 24 weeks many were given meat and fish. Only 2 received vegetables at any time during the first year. Supplements of orange juice, cod liver oil and yeast extract were little used.

At one year old, 32 infants were receiving less than one pint of milk a day, and their diet was deficient in first-class protein, vitamin C and probably riboflavin. There was no clinical sign of scurvy, but there was some retardation of growth, low resistance to infections and slow healing of skin wounds in the second half of the first year.

The mean weight of each group at different ages was calculated. During the first 24 weeks, wholly or partly breast-fed babies increased in weight more rapidly than artificially-fed babies, but there was no correlation between gain in weight and duration of breast feeding, and there appeared to be no advantage to gain in weight from breast feeding after 28 weeks.

The infants were medically graded at one year old; 4 were very good, 21 good, 63 satisfactory and 15 poor. Infants breast fed for longer tended to be graded higher. The incidence of minor illnesses was small in the first 5 months, but increased rapidly.

All but 3 of the babies made satisfactory progress by generally accepted standards. Housing and hygiene were poor, but variations within a group did not seem to be reflected in the progress of the child.—M. H. Pierce.

3583

JANSSENS, P. G. Over de kleutersterfte in de arbeidersgezinnen van de Kilo-Moto goudmijnen. [**Death rate of toddlers among workers in the Kilo-Moto gold mines.**] De mortaliteitsoorzaken der schoolkindersterfte van de Klo-Moto mijnen. [**Causes of death among schoolchildren of the Kilo-Moto mines.**] *Ann. Soc. belg. Méd. trop.*, 1955, **35,** 151–171; 173–186. French summaries.

(a) A report is made on the causes of death found at autopsy between 1938 and 1943 in 679 child patients dying in the native hospital of Mongbwalu (Ituri), which serves the families of the workers in the Kilo-Moto gold mines. Of these, 544 were children from 13 months to 3 years of age, and 135 were aged from 3 years to 6 years. Pulmonary diseases were the cause of death in 60·1 per cent., malaria in 13·2 per cent. and nutritional diseases in only 2·1, the total number dying from the last being 14. Two children had typical kwashiorkor, but the malnutrition of the rest was non-specific. The state of nutrition and development of the children as a whole was good. Fatty infiltration of the liver was far too frequent to have been caused by protein deficiency.

(b) In continuation of the previous inquiry, autopsies on 162 children aged from 6 to 15 years are reported. Respiratory diseases contributed a lower, but still the largest, proportion of deaths, 22·8 per cent. Deaths from nutritional disease were 3 from kwashiorkor and 1 from cachexia. Those with kwashiorkor were aged 7·8 and 15 years, and fatty infiltration of the liver was extensive. It was present in many of the older children, as in the toddlers, and could not be of nutritional origin.

E. M. Hume.

3584

ARAKAWA, T., SATO, Y., IZURUMACHI, A. and MORINAGA, C. **Studies on the nutrition of children in Hirosaki area. 23rd report. Hepatic enlargement of children with nutritional dystrophy.**

ARAWAKA, T., SATO, Y. and KAGAYA, A. **24th report. Hepatic enlargement of breast-fed infants and its relation to nutritional dystrophy of their mothers.**

SATO, Y. **25th report. Liver biopsy findings in children with nutritional dystrophy.** *Tohoku J. Exp. Med.*, 1955, **63,** 81–85; 87–91; 93–101. [Dept. Paediat., Sch. Med., Hirosaki Univ.]

23. In 1779 children between 6 and 12 years of age in 3 districts in the Hirosaki area records were made of palpable livers and of nutritional dystrophy. The numbers of boys were 428, 317 and 164 and the percentages with nutritional dystrophy 14·4, 47·6, 79·9 and with palpable livers 11·6, 20·8, 33·5. For girls the numbers were 410, 312 and 148 and corresponding percentages 4·8, 26·2, 67·5 and 4·6, 8·3, 27·7. The liver was palpable more often in dystrophic children than in the others.

24. The mothers of 50 infants who were exclusively breast fed and the palpability of whose livers was measured were examined for nutritional dystrophy; 24 were found to have the disease and 26 to be free from it. Riboflavin was estimated in their milk and mean values for these respective groups were $24{\cdot}6 \pm 3{\cdot}3$ and $32{\cdot}7 \pm 2{\cdot}7$ μg. per 100 ml. The 26 mothers without the disease were equally divided in respect of liver enlargement in their infants; of the 24 with the disease only 1 had an infant whose liver was not palpable. The riboflavin content of the mother's milk was not closely related either to the incidence or to the extent of the enlargement of the infant's liver.

25. The histological findings are tabulated for specimens obtained by biopsy from the livers of 30 children in all of whom signs of nutritional

dystrophy, such as angular stomatitis, cheilosis, swelling or atrophy of lingual papillae, and skin pigmentation, were present, whose livers were enlarged and in some of whom there were other complications. The commonest abnormalities, which appeared on the number of occasions indicated, were the plant-cell appearance as defined by Gillman and Gillman (" Perspectives in Human Malnutrition ", 1951, Grune and Stratton, New York) 22, diffuse fibrosis 12, basophilia of parenchyma 11, cloudy swelling 10, zonal necrosis 5 and fatty drops 5.—D. Harvey.

3585

CLEMENTS, F. W. **Some studies on the aetiology of knock-knees.** *Med. J. Austral.*, 1954, i, 737–741. [Inst. Child. Health, Univ. Sydney.]

Knock-knees are relatively common in Australia. The incidence of knock-knees and of Harrison's sulcus and the degree of dental caries in 100 children during the first 10 years of life showed no correlation *inter se*, or with the occurrence of rickets, proved by X-ray, in infancy.

The alignment of the bones in the knee joints of normal and knock-kneed children suggested that subnormal tensile strength of the anterior cruciate ligament is the main cause.

The histology of the cruciate ligaments was studied at different stages of development in the rat, guineapig, human foetus, newborn infant and young child. Nutritional experiments on young rats showed that a low-protein diet or artificially produced rickets did not affect the microscopic structure of the ligament. Acute and chronic scurvy in the guineapig did produce soft, easily broken cruciate ligaments which differed microscopically from those of normal animals. The reasons for such differences are discussed.

M. H. Pierce.

3586

GOODMAN, J. I. and DOWDELL, W. **The specter of malnutrition in chronic illness.** *Ann. Int. Med.*, 1955, **43**, 1241–1258. [Cleveland, Ohio.]

One hundred and thirty-eight from a series of 431 malnourished patients in a county home previously described (Goodman, *J. Amer. Med. Assoc.*, 1953, **152**, 1336) are reviewed in detail. Enlarged liver was found in 89 and in 85 was attributable to malnutrition. Forty subjects had no teeth and in 25 teeth were carious. Average red cell count was 3·95 million per c.mm. and Hb value 11·6 g. per 100 ml. Serum protein levels were within normal limits. The response to a high-energy diet was favourable in over half the patients. The causes of malnutrition were: poor food and eating habits, mental disorders, anorexia, low social status, carcinoma of oesophagus, intercurrent infection and inattention by attending staff to the patient's intake of food.—F. C. Aitken.

3587

TRÉMOLIÈRES, J., MOSSÉ, A., LYON, L., PASCHOUD, J. and DÉROBERT, L. Enquête sur le régime alimentaire cirrhogène chez l'homme. **[Study on cirrhosis-producing diet in man.]** *Bull. Inst. nat. Hyg., Paris*, 1955, **10**, 673–684.

Studies were made on 48 subjects with cirrhosis. Diet is taken as that recorded by 3 interviewers who checked methods against each other. Questions covered 5 years and, separately, the last 6 months before the first illness. Members of the families other than the patients were questioned also. Women are, in general, reluctant to admit addiction to alcohol; men urge the compulsion to be sociable as an excuse.

Estimates are presented for the approximate consumption of alcoholic drinks (vin, 10°), at table and total, by men and women separately, as in the average French family. The totals are for men and women, as calories from alcohol, per cent. of food calories: agricultural labourers 27·9 and 14·4; heavy workers 25·4 and 13·5; manual workers 23·1 and 9·1; other workers 15·8 and 9·3; professional 17·3 and 10·2. In comparison with these estimates, cirrhotics during the 5 years before breakdown ate less and drank the equivalent in calories of, on the average, 79 per cent. of food calories; during the last 6 months, they ate still less and drank relatively more, so that the calorie value of alcohol, on the average, exceeded that of food. The diet then resembled that of semi-starvation as induced by Keys. Metabolism studies were therefore made on 7 cirrhotics over 1 to 2 months with a rehabilitation diet. Retention of N was much more than in Keys's rehabilitation studies, 5 to 15 g. N in 24 hr. as compared with 3 to 6 g. It is suggested that alcohol in amounts equivalent to or exceeding the energy value of food, with a semi-starvation diet, inhibits the use of protein and that therefore omission of alcohol and return to normal diet means over-normal retention of N.—I. Leitch.

3588

EPSTEIN, F. H., SIMPSON, R. and BOAS, E. P. **Relations between diet and atherosclerosis among a working population of different ethnic origins.** *Amer. J. Clin. Nutrit.*, 1956, **4**, 10 – 19. [Res. Dept., Sidney Hillman Health Centre, New York.]

Energy and fat intakes of 250 men and 164 women were estimated from diet histories. Mean age of the men was 57 and of the women 54. Most of the subjects were Italian or Jewish. Italians and Jews ate about the same amount of fat; the Jews tended to eat a higher proportion of animal fat. In men, but not in women, a fat intake of 40 per cent. or more of total calories was associated with a greater prevalence of atherosclerosis and

high blood cholesterol than was a fat intake of 30 per cent. or less of total calories. Overweight was not related to prevalence of atherosclerosis or high blood cholesterol in men or women. The frequency of atherosclerosis was about the same for Italians and Jews. Jewish men and women had higher incidences of high blood cholesterol than had Italians. In a larger group of men the incidence of coronary artery disease among Jews was twice that among Italians. The findings are discussed.—F. C. Aitken.

3589

MICHAUX, L. and GEORGES-JANET, L. Un facteur d'anorexie mentale des adolescentes. La répudiation des soucis matériels, affirmation " d'intellectualisme pur ". [**A mental factor in anorexia in adolescents. Repudiation of material cares an affirmation of " pure intellectualism ".**] *Presse méd.*, 1956, **64,** 181–183. [Paris.]

Case histories are given of 5 young women aged from 17 to 20 with anorexia. None had ever had a good appetite, and in all the psychological background was similar. They had intellectual or artistic gifts and aspirations unshared by their poor or uneducated parents, and although they expressed gratitude and attachment, they repudiated their parents' interest in material things, such as food, and thus were in a state of perpetual conflict. Some were cured or improved by a change of environment.—W. M. Deans.

3590

BRÜCKE, F. Krebsangst und Nahrungsmittel. [**Fear of cancer in relation to foods.**] *Lebensmittel u. Ernährung*, 1955, **8,** No. 12, 5–7.

A lecture.

3591

CAMBON, E. N. and CAMBON, K. G. **Health survey in a British Guiana mining community.** *Arch. Indust. Health*, 1955, **12,** 539–542. [Mackenzie Hosp., British Guiana.]

In all, 1730 native employees, mainly African in origin, of a bauxite mining and milling company in the interior of British Guiana were medically examined. The climate is hot and wet, with mean temperature 80° F. and annual rainfall about 100 in.

Over 95 per cent. had caries; whether it was due to diet or to lack of dental care is not known. Hb value was between 70 and 80 per cent. in 1207, but the average for women at the mothers' welfare clinic was only about 54 (7·83 g.). For native typists in the firm's office it was 64 (9·28 g.) and for native nurses 76 (11·08 g.). Whether the difference is due to better prevention of hookworm infestation, which is common, or to better diet is not known. Nine cases of diabetes were found; treatment is difficult since the local diet is chiefly of carbohydrate and high-protein foods are too dear for the average person.

The view is expressed that nutrition cannot be improved without a change in the general agricultural policy of the colony. There is a chronic shortage of meat, fish and green vegetables; much food is imported, even English potatoes, although rice can be grown on a fairly large scale.

W. M. Deans.

3592

FLOCH, H. Aspects nutritionnels de problèmes de pathologie guyanaise. [**Nutritional aspects of pathological problems in Guiana.**] *Arch., Inst. Pasteur Guyane franç. Publ.* No. 379, October 1955, pp. 5.

A short review article.

3593

BOYER, P. H. **Low birth weight in fibrocystic disease of the pancreas.** *Pediatrics*, 1955, **16,** 778–784. [Dept. Paediat., Coll. Phys. Surg., Columbia Univ., New York.] Interlingua summary.

The distribution of birthweight in a group of white infants, 75 girls and 98 boys, with fibrocystic disease of the pancreas, was compared with that of 1000 white infants of both sexes born from November 1948 to June 1950 in Sloane Hospital for Women, and the results are shown in tables and graphically. For each sex separately, mean birthweight and proportion of infants weighing over 3000 g. at birth were significantly less for the afflicted group. It is suggested that in this disease either the mother fails to supply some substance essential for the growth of the foetus, or the foetus, by reason of some inherited metabolic defect, is unable to utilise the nutrients supplied.

A preliminary report (Anderson and Boyer, paper in preparation) on 100 women who had already had an infant affected with the disease and who during a subsequent pregnancy had been instructed to take a diet rich in protein, minerals and vitamins, supplying from 2500 to 2800 Cal. daily, indicates that the birthweight was raised thereby, even where the infants again had fibrocystic disease of the pancreas. Whether the incidence of the disease can be reduced by better diet during pregnancy is not yet clear.—W. M. Deans.

3594

NIXON, W. C. W. **Diet, weight control, and toxaemia in pregnancy.** *Postgrad. Med. J.*, 1955, **31,** 266–271. [Dept. Obstet. Gynaecol., University Coll. Hosp., London.]

A clinical review.

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3595

MACK, H. C., KELLY, H. J. and MACY, I. G. **Complications of pregnancy and nutritional status. 1. Toxaemias of pregnancy.** *Amer. J. Obstet. Gynecol.*, 1956, **71,** 577–592 (with discussion 592–595). [Dept. Obstet. Gynaecol., Harper Hosp., Detroit, Mich.]

The subjects studied, more than 1000 white and Negro women, are stated not to be representative of any particular community or hospital group. Toxaemic were compared with normal patients, by month of pregnancy and by race, in terms of Hb and levels of protein, vitamins A and C, carotenoids and alkaline phosphatase in serum. The results did not support the view that malnutrition plays an important part in susceptibility to pre-eclampsia and eclampsia. Newer and better survey techniques are thought to be necessary. See also Abst. 5104, Vol. 24.—A. M. Thomson.

3596

BELL, M. E. and WILLS, L. **Racial differences in incidence of pre-eclampsia and eclampsia in Fiji.** *J. Obstet. Gynaecol. Brit. Empire*, 1955, **62,** 917–921. [Dept. Nutrit. Res., Univ. Otago Med. Sch., Dunedin, N.Z.]

A review of hospital records for 1947–50 in Suva confirmed the authors' finding that pre-eclampsia and eclampsia are rare in Fijian but relatively common in Indian women (*Fiji Med. Dept. Annual Rep.*, 1950 (Government Press, Suva)). Theories which account for the difference in terms of diet are briefly reviewed. It is concluded that more information is needed, since the ways of life of the two races differ in many respects.—A. M. Thomson.

3597

ANDRÉ, J. and HOLEMANS, K. Mortinatalité et mortalité néonatale des 10 premiers jours en secteur Foréami (Kwango, Congo Belge). [**Stillbirths and neonatal mortality in the first 10 days in the Foréami district (Kwango, Belgian Congo).**] *Ann. Soc. belg. Méd. trop.*, 1955, **35,** 661–671. [Léopoldville.] Flemish summary.

In a rural district where the traditional African mode of life still persisted, 7·19 per cent. of the 5732 infants born in 1954 were premature with a birthweight under 2 kg.; 21·58 per cent. were classed as debilitated and had a birthweight between 2 and 2·5 kg., and 71·23 per cent. were normal with a birthweight above 2·5 kg. The total stillbirth and neonatal death rate during the first 10 days of life was 75·54 per 1000 live births. Most of the deaths were among the premature and debilitated infants, especially the boys. The figures agree broadly with those from the relatively wealthy mine area of Kilo-Moto. Obstetrical difficulties cause fewer stillbirths among Africans than among Europeans; prematurity and debility, both regarded as connected with chronic malnutrition, are the chief cause of stillbirth. The syphilis rate is low. All the mothers had chronic malaria but malaria in infants is not considered to be a cause of early death.—L. Wills.

See also Abst. 3304.

DEFICIENCY DISEASES

General

3598

GRANDE COBIÁN, F. Consideraciones sobre la fisiologia patológica de las enfermedades carenciales. [**Pathological physiology of deficiency diseases.**] *Rev. Asoc. méd. argent.*, 1955, **69,** 339–346.

A review.

3599

PLATT, B. S. **Recent research on vitamins. Vitamins in nutrition: orientations and perspectives.** *Brit. Med. Bull.*, 1956, **12,** 78–86. [Human Nutrit. Res. Unit, Med. Res. Counc. Labs., Hampstead, London.]

3600

NAKAGAWA, I. **Studies on vitamin requirements.** *Bull. Inst. Pub. Health, Tokyo*, 1954–55, **4,** No. 4, English part, 6–34. [Dept. Nutrit., Inst. Pub. Health, Tokyo.]

The subject of requirements for vitamins is reviewed. It is emphasised how difficult it is to determine what human requirements really are. It is considered that allowances should be generous unless such generosity proves to be too misleading.

E. M. Hume.

3601

BURGIO, G. R. and GIACALONE, O. Ricerche elettroforetiche sul siero di sangue in alcuni stati distrofico-carenziali dell'infanzia. 1. Casistica. Quadri sieroproteici. [**Electrophoretic investigation of the blood serum in certain states of deficiency and malnutrition in childhood. 1. Case histories. Picture of the serum proteins.**] *Pediatria*, 1955, **63,** 630 – 667. [Clin. Pediat., Univ. Palermo.] French, English, German and Spanish summaries.

Total protein was estimated, and a full analysis of the protein fractions was made by electrophoresis with the apparatus of Tiselius, in the blood of 22 normal babies up to 2 years old, 20 infants with non-specific malnutrition, 22 children with specific deficiencies chiefly of riboflavin, or with kwashiorkor, and 12 infants with "pernicious anaemia of infancy".

In the group with non-specific malnutrition, mean values for total proteins were normal or slightly low. The α_1- and α_2-globulin fractions

were high. Albumin and γ-globulin were slightly low.

The group with kwashiorkor or other deficiency was not homogeneous. Total proteins were always low. Mean values for albumin and α_2-globulin were low; α_1-globulin was high and γ-globulin was normal or somewhat high.

Some of the infants with "pernicious anaemia" had signs of other deficiencies, but if the anaemia was uncomplicated the mean plasma values were within the normal range or slightly low.

E. M. Hume.

3602

WENT, L. N. and GANDASOEBRATA, R. R. **Some investigations into the blood chemistry of kwashiorkor.** *Doc. Med. geogr. trop.*, 1955, **7,** 363–370. [Dept. Biochem., Fac. Med., Univ. Indonesia, Djakarta.]

In a series of 58 infants aged from 9 months to 4 years, whose nutritional state varied from "normal" to that associated with frank kwashiorkor, the total serum protein value was lower the poorer the nutritional state. The mean value for the "normal" was 7·0 g. per 100 ml. and for the patients with kwashiorkor 4·1 g. per 100 ml. The mean albumin: globulin ratio was 1·1 for the "normals" and 0·5 for the remainder. The mean γ-globulin value for "normal" and malnourished children ranged from 1·6 to 1·8 g. per 100 ml.—L. Wills.

3603

GOPALAN, C. **Kwashiorkor in Uganda and Coonoor. (A comparison of some salient aspects.)** *J. Trop. Pediat.*, 1955, **1,** 206–219. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor.]

In an interesting general article it is made clear that in all important respects kwashiorkor is similar in India and Africa. The small differences reported result from local differences in mode of life, diet, incidence of infection and infestation and possibly, in the hair changes, from race.—L. Wills.

3604

GEBER, M. and DEAN, R. F. A. **The physiological changes accompanying kwashiorkor.** *Courrier*, 1956, **6,** 3–15. [Med. Res. Counc., Group Res. Infantile Malnutrit., Mulago Hosp., Kampala, Uganda.] French and Spanish summaries.

In a study of the effects of treatment of kwashiorkor (see Abst. 2193, Vol. 23) on the signs of irritability and petulance which often accompany the disease, 25 successive children, admitted to hospital for treatment, were tested on arrival and again after treatment for 1 and 4 weeks. The Gesell tests which were applied and which are intended to measure psychomotor development are briefly described. The results of the psychological tests agreed with those of biochemical tests in the acute stages, mental outlook being affected to the greatest extent in those in whom blood chemistry was most abnormal. During recovery this agreement did not persist in all.

In hospital mothers were allowed to stay in close association with their children, but the extent of interest shown in the welfare of a child varied greatly. The child's rate of recovery seemed to be influenced by the relationship of mother to child. Where this was good recovery tended to be rapid and complete; where it was bad the unsatisfactory psychological conditions were likely to persist after physical recovery. The implications of the African child's mode of early life and of the tribal custom of sending it at an early age, often at weaning, to live with a relative are discussed.—D. Harvey.

3605

SAID, M. **Kwashiorkor in Negri Sembilan.** *Med. J. Malaya*, 1955, **10,** 20–47. [Maternity Ward, Gen. Hosp., Seremban.]

The first half of this paper gives details of the histories of 9 children, 6 Malay and 3 Tamil, between $1\frac{1}{2}$ and 5 years of age who were admitted to hospital and of whom 2 of the Tamils died. In the second half these clinical findings are discussed in relation to descriptions of the disease as it occurs in Africa (Brock and Autret, p. 278, Vol. 22), in Indonesia (see Absts. 2304, 3608, Vol. 24) and in Fiji (see Abst. 818, Vol. 23).

For all 6 Malay children it was the appearance of blindness or kerotomalacia and not malnutrition that was the reason for their being brought to hospital. The occurrence of abnormally long eyelashes, as reported from Indonesia, was confirmed. Treatment was with skimmed milk powder and Casilan and, except in the 2 who died and in whom dehydration was severe, diarrhoea and skin disorders soon abated. Since eyesight was affected in all the Malay patients it is thought possible that many others with kwashiorkor but without eye lesions may remain undetected, and pleas are put forward for surveys to be made in villages and on rubber estates and for the inclusion of the elements of nutrition in the syllabus of education of pupil midwives.—D. Harvey.

3606

DUGGAN, J. N. **Effects of vitamin deficiency in ophthalmology.** *Calcutta Med. J.*, 1955, **52,** 355–365.

A lecture.

3607

PIRIE, A. **Recent research on vitamins. Vitamin deficiency and vision.** *Brit. Med. Bull.*, 1956, **12,** 32–34. [Nuffield Lab. Ophthalmol., Univ. Oxford.]

3608

BROWN, J. A. K. **Observations on the general incidence of blindness and certain other diseases in Uganda.** *E. African Med. J.*, 1956, **33,** 19–24. [Uganda.]

Surveys made in Uganda aimed at including every individual in the areas selected. Of 23,016 persons so examined, 84 were completely blind; 4 were lepers but the cause for the remainder is not mentioned. Of 17,042 persons examined in 22 counties in 12 districts, 35 had kwashiorkor. Twelve of the cases occurred in one county; in 11 counties no case was found. The examination was not always made by the same person and the standard, therefore, may not have been uniform.

E. M. Hume.

3609

PANJA, G. **Nutritional disorders of the skin in the tropics.** *Antiseptic*, 1955, **52,** 921–929.

3610

ANDRÉ, J. and HOLEMANS, K. Signification des cheveux roux chez le nourrisson noir du Kwango. [**Significance of reddish hair in the negro infant of the Kwango.**] *Ann. Soc. belg. Méd. trop.*, 1955, **35,** 467–477. Flemish summary.

Of 642 representative infants aged up to 3 years, 368 or 57·3 per cent. had hair changes; the incidence was highest between the ages of 6 and 12 months. Protein balance studies showed that a protein deficit, which was present from birth, increased to a maximum of 8·5 g. daily between 6 and 12 months. The incidence of kwashiorkor reached its maximum 9 months after the time of maximum incidence of red hair, suggesting that the hair changes are an early sign of protein deficiency. The infants with red hair had significantly lower weights than those of the same age with black hair. The incidence of infestation, chiefly with ascaris, in all the children was 60·74 per cent.; it was at a maximum between the ages of 2 and 3 years. From a statistical analysis of the incidence of red hair among the infants with and without infestation it was impossible to exclude infestation as a cause of red hair in the age group from 6 to 12 months, but it could be excluded in the age group from 2 to 3 years. From these contradictory results it is concluded that infestation increases the demand for protein and thereby favours the development of red hair, particularly in the critical period between 6 and 12 months. The conclusion is confirmed by the rarity of red hair in the infants of the well fed urban population of Léopoldville although the infestation rate is similar to that among the rural children. The incidence of red hair is considered as a useful index to the nutritional state of a population.—L. Wills.

3611

DAKSHINAMURTI, K. and DEVADATTA, S. C. **Studies on the nutrition of urban population groups.** *Proc. Indian Acad. Sci.* [*B*], 1956, **43,** 121–133. [Christian Med. Coll., Vellore.]

Seven-day diet studies were made of 507 families living in an area noted for high incidence of cirrhosis of the liver. The results in terms of quantities of foods and nutrients are tabulated per consumption unit per day. Intakes of energy, protein and fat were low and the diets were generally poor in quality as well as quantity. Sample diets were analysed for amino-acid content. The data are tabulated and discussed in relation to the etiology of liver injury.—F. C. Aitken.

3612

LUYKEN, R. and LUYKEN-KONING, F. W. M. **Nutritional state of the Marind-Anim tribe in South New Guinea.** *Doc. Med. geogr. trop.*, 1955, **7,** 315–339. [Centr. Inst. Nutrit. Res. T.N.O., Utrecht.]

The nutritional status of the tribe was determined from body measurements, an assessment of the nutritional condition and the presence of clinical signs of deficiency. The results showed that in infants the weight and growth curves flattened at weaning, that in general adults and children were better nourished on the coast than inland, and that the most frequent deficiencies were of vitamin A, vitamin B_1 and protein. The staple food was sago. The meat supply, which depended entirely on hunting, and the fish supply were irregular and both were reduced during the wet season.—L. Wills.

3613

MCCARTHY, D. D. **Liver enlargement and protein deficiency states in Polynesians in Western Samoa, Niue and New Zealand.** *N.Z. Med. J.*, 1955, **54,** 651–657. [Island Territories Res., Med. Sch., Otago.]

The percentage with enlargement of the liver at all ages up to 20 years was 11·9 in Samoa, 7·07 in Niue and 0·97 for Maoris in New Zealand; for children between the age of 1 and 4 years the corresponding figures were 18·4, 15·8 and 7·2. The incidence among boys was greater than among girls. None of the children showed any sign of kwashiorkor, and gross malnutrition was uncommon though many children were undernourished. Starchy foods predominated in the diet of both Samoans and Niueans and probably in the diets of infants among the Maoris. The findings and the presence of gynaecomastia in adult males and that of cirrhosis of the liver in the older age groups in both sexes in Samoa are taken as evidence of protein deficiency in Polynesian diets.

L. Wills.

3614
DAVIES, J. N. P. **Siderosis in African livers. A geographical note.** *E. African Med. J.*, 1956, **33,** 25–26. [Dept. Pathol., Makerere Coll. Med. Sch., Kampala, Uganda.]

Frank haemosiderosis, so frequently found in the livers of Africans in Johannesburg, was not found in viscerotomy material obtained from the Virus Research Institute at Entebbe, and taken from 90 Africans from different parts of East and Central Africa. In 3 there was an excess of Fe in the liver, but no appreciable cirrhosis.—L. Wills.

See also Absts. 2908, 2909, 2913, 3156, 3190.

Vitamin A

3615
PEIRCE, A. W. **Carotene and vitamin A in human fat.** *Med. J. Austral.*, 1954, i, 589. [Div. Biochem., C.S.I.R.O., Univ. Adelaide.]

Two highly coloured specimens of human fat were extracted with acetone and light petroleum, and β-carotene and vitamin A were separated chromatographically and estimated by spectrophotometry. The values obtained in μg. per g. fat for the 2 samples were β-carotene 6·1 and 5·1, and vitamin A 2·2 and 2·0; they were of the same order as the highest previously reported in the literature. The percentage of the total pigments that represented β-carotene was 47 and 38.

Subcutaneous connective tissue from an emaciated subject, containing little fat but patches of yellow pigment, was extracted also, and the spectral transmission curve corresponded closely with that of carotene.

It is concluded that carotene is removed with difficulty from subcutaneous fat deposits, and that carotene which escapes conversion to vitamin A in the wall of the small intestine is probably lost to the body thereafter.—M. H. Pierce.

3616
CLELAND, J. B. **The colour of human fat.** *Med. J. Austral.*, 1954, i, 588. [Dept. Pathol., Univ. Adelaide.]

At autopsy the colour of the fat in 20 bodies, 12 males aged from 14 to 81, and 8 females aged from 22 to 75, was classified according to Ridgway's "Color Standards and Color Nomenclature" (Washington, 1912). Twelve colours were recorded, ranging from deep chrome to primuline yellow.

It is noted that the fat of babies is very pale in colour, but that age, sex and the condition causing death appear to bear no relation to the colour of the fat. The possible relation to diet and the fate in the body of carotenoids associated with fat are discussed.—M. H. Pierce.

3617
RIECHERT, W. Der Vitamin-A-Gehalt des Blutes vor und nach Belastungen mit Vitamin A. [**Vitamin A content of the blood before and after test doses of vitamin A.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 38–39. [Med.-Diagnost. Inst., Städt. Krankenanst., Karlsruhe.]

Of 150 healthy subjects, the percentage having values per 100 ml. plasma of from 100 to 150 I.U. was 17, from 150 to 200 I.U. it was 38·5, and from 200 to 250 I.U. it was 29. A single dose of 150,000 I.U. vitamin A as an aqueous emulsion (Arovit) raised the blood value, with the peak after from 3 to 4 hr. Return to the initial value was complete after from 8 to 10 hr. The maximum value attained varied greatly between individuals. When the same test was made after daily administration of 150,000 I.U. for 14 days, no consistent relationship was found between the history of past intake and the magnitude of the peak caused by the test dose.—T. Moore.

3618
GOUNELLE, H. and BLONDIN, M. Le retentissement des états colitiques sur la nutrition mis en lumière par l'épreuve d'hypervitaminémie A. [**The effect of colitis on nutrition as shown by the high-blood-vitamin-A test.**] *Arch. Mal. Appar. digest.*, 1955, **44,** 661–665 (with discussion 665). [Centre Recherches Foch, Inst. Nat. Hyg.]

The fasting value for vitamin A was estimated by the Carr Price method in the blood plasma of 14 patients with colitis of different types, and of 12 normal subjects, before and 3 and 6 hr. after oral administration of 500,000 I.U. vitamin A. For the normal subjects and patients, respectively, the mean values in I.U. vitamin A per 100 ml. plasma were before the test dose 129 with range 39 to 266, and 88 with range 14 to 231, and 6 hr. after it 807 with range 556 to 1263, and 235 with range 57 to 400. It is concluded that in colitis absorption of the vitamin is impaired, and that the other fat-soluble vitamins, D, E and K, and lipids in general are likely to be affected in the same way, so that a state of multiple deficiency may arise as a complication in colitis.—E. M. Hume.

3619
KRAUSE, R. F. and SANDERS, P. L. **The distribution of vitamin A in cells of normal and pathologic human livers.** *Amer. J. Clin. Nutrit.*, 1956, **4,** 68–70. [Dept. Biochem., Sch. Med., Univ. W. Virginia, Morgantown.]

Total vitamin A, vitamin A esters and vitamin A alcohol were estimated in the nuclei, mitochondria and residual cytoplasm, called fraction **x**, from samples of liver taken at autopsy from 7 human adults and 4 infants. Most of the subjects

had been ill, but only 4 had abnormal livers. The reserves ranged from 13 to 395 I.U. total vitamin A per g. Higher concentrations of vitamin A, and higher proportions of the free alcohol, were found in normal than in diseased liver, but disease had no effect on the proportions of the total found in the several cell fractions.—T. Moore.

3620

EHRENGUT, W. Akuter benigner Hydrocephalus durch Hypervitaminosis-A (Syndrom Marie-Sée) bei Keratomalacie. [**Acute, benign hydrocephalus from excess of vitamin A (syndrome of Marie and Sée in a patient with keratomalacia).**] *Ztschr. Kinderheilk.*, 1955, **77**, 468–482. [Kinderpoliklin., Univ. Munich.]

Severe keratomalacia developed in a full-term, artificially fed infant, 4½ months old, that had suffered from severe skin infections. The infant was given in 2 days 5 mg. vitamin D and about 187,000 I.U. vitamin A; 2 days later the child showed fever, opisthotonus and swelling of the anterior fontanelle associated with somnolence, high pressure of cerebrospinal fluid, petechiae and rhinitis, typical signs of acute vitamin A excess (see Title 4984, Vol. 23). Withdrawal of vitamin A gave immediate improvement, but relapse occurred 2 days later when 44,000 I.U. vitamin A were given. Withdrawal of the vitamin again gave improvement. After 17 days vitamin A in small doses was given and the keratomalacia healed. The literature is briefly reviewed.

L. Wills.

3621

LENSON, N. **Wound healing: the role of cod liver oil as a tissue stimulant.** *Amer. J. Surg.*, 1956, **91**, 86–91. [Brookline, Mass.]

A short general article.

Vitamin D

3622

BERGER, H. and STALDER, G. Zur Frage der Aminoacidurie bei der Vitamin-D-Mangelrachitis der Säuglinge. [**Amino acids in the urine of infants with rickets due to deficiency of vitamin D.**] *Ann. paediat.*, 1956, **186**, 163–175. [Kinderklin, Univ. Basle.] English and French summaries.

Glomerular filtration with the help of inulin clearance tests, tubular re-absorption, and urinary excretion, of amino N were estimated in 3 healthy infants and in 5 with rickets, before and after a single dose of 15 mg. vitamin D_2 (Hydrosol, Wander) given by intravenous or intramuscular injection.

In the children with untreated rickets the amount of amino acids in the urine was from 2 to 5 times that in the normal children, and in 4 out of 5 of them the glomerular filtration of amino N was greater than it was after treatment. In normal children or after treatment of rickets tubular re-absorption was from 98 to 99 per cent., but in rickets before treatment it was from 91·4 to 96·4 per cent. The increased excretion is attributed to the decrease in tubular re-absorption. Improvement did not begin immediately after treatment and took some time to complete.

Chromatographic analysis of the amino acids in the urine showed that in rickets the amounts of serine, glutamic acid, glycine, alanine, lysine, threonine, arginine, tyrosine, proline, ornithine and asparagine were increased.—E. M. Hume.

3623

JONXIS, J. H. P. Rachitis. [**Rickets.**] *Maandschr. Kindergeneesk.*, 1955, **23**, 253 – 266. [Groningen.]

See Title 1018, Vol. 26.

3624

LEENSON, R. E. Diagnostika rakhita. [**The diagnosis of rickets.**] *Pediatriya*, 1955, No. 3, 71–76. [Nauch-Issled. Inst. Okhrany Mater. i. Mladen., Sverdlov.]

3625

HOTTA, T., MOTOTSUNE, H. and NAKANO, Y. **On the hepatic rickets.** *Yonago Acta med.*, 1955, **1**, 181–186. [Dept. Paediat., Tottori Univ. Sch. Med., Yonago.]

An infant 2½ months old was admitted to hospital with jaundice. Liver function was disturbed and the diagnosis made was congenital partial stenosis of the bile duct. In the course of examination rickets was found and was diagnosed as hepatic rickets. Chocola D, 20,000 "units" daily, was given orally for 10 days, but the low serum P value did not rise; with 100,000 "units" daily by intramuscular injection the value had risen after 10 days and rose further after 20 days. With ultra-violet irradiation for 10 days it rose further, and with ultraviolet irradiation and 100,000 "units" daily it had reached 6·23 mg. per 100 ml. after 10 days. Healing was then apparent radiographically. Liver function improved at the same time.—E. M. Hume.

3626

GALBRAITH, D. **Vitamin D resistant rickets.** *Med. J. Austral.*, 1953, ii, 208–210. [Melbourne.]

The causes of rickets resistant to vitamin D are briefly summarised and the case of a girl aged 10 years is described. The blood showed a raised content of inorganic P, urea and phosphatase, and a low alkali reserve. For 2½ years 50,000 "units" vitamin D_2 were given daily with little improvement, but when alkali treatment with

sodium citrate and citric acid was added, healing began; after 6 months it was almost complete at the wrists, and the teeth, which were absent, began to appear. The diagnosis was made of renal glomerular rickets but, since alkali treatment promoted healing, it is considered that there must have been pathological changes in the renal tubules also.

E. M. Hume.

3627

HAUGE, B. N. **Vitamin D resistant osteomalacia.** *Acta med. scand.*, 1956, **153,** 271–282. [Med. Dept., Drammen Hosp., Norway.]

After a short review of the subject, a case is described of a woman under observation for 17 years until she died at the age of 55 years from a malignant neurinoma in the left axilla. The patient was fully investigated in life and at post-mortem examination.

Calcium balance experiments with and without additions of Ca, P, vitamin D_2, stilboestrol, deoxycorticosterone and testosterone showed that the patient was in negative Ca balance with loss of about 200 mg. Ca daily. Some of the additions, particularly of vitamin D, brought her into positive balance with increased loss of Ca in the urine, but without improvement in clinical condition. In the course of years she must have lost about 1 kg. Ca, which would represent most of the Ca in the skeleton, so that rehabilitation would take correspondingly long. The results of the balance tests suggested that treatment with vitamin D, Ca and P might have brought her into continuous positive balance, but she died before treatment was instituted. The condition is identified as Milkman's syndrome.

No connection was demonstrated between the skeletal condition and the malignant neurinoma, but association of such a skeletal condition with neurofibromatosis has been reported.

E. M. Hume.

3628

HAMPERL, H. and WEISS, P. Über die spongiöse Hyperostosis an Schädeln aus Alt-Peru. **[Spongy hyperostosis in skulls from ancient Peru.]** *Virchows Arch.*, 1955, **327,** 629–642. [Pathol. Inst., Univ. Bonn.]

The porous outgrowths of bone on 3 skulls with only partly fused sutures, found in the coastal region of Peru, and dating back at least 500 years, are described in detail, with X-ray and histological illustrations, and are discussed with reference to the so-called osteoporosis described by others. The evidence suggests that they are not due to rickets, but to increased demands on the red bone marrow arising from haemolytic anaemia, possibly of the Cooley type. The resemblance to a change in the cranial bones found in severe rickets suggested that that too might arise from the anaemia which often accompanies severe rickets.—W. M. Deans.

3629

WINBERG, J. and ZETTERSTRÖM, R. **Cortisone treatment in vitamin D intoxication.** *Acta paediat.*, 1956, **45,** 96–101. [Paediat. Clin., Karolinska Sjukhuset, Stockholm.] French, German and Spanish summaries.

A girl 11 months old was admitted to hospital with the ordinary signs of vitamin D intoxication after having received a total of 8 million "units" in 5 months. Serum Ca was between 15 and 16 mg. per 100 ml. Cortisone was given every 6 hr. for 2 periods of 4 days, with 3 days' interval. The patient immediately showed signs of improvement. Serum Ca fell to normal and serum citrate rose.

E. M. Hume.

3630

GARTNER, S. and RUBNER, K. **Calcified scleral nodules in hypervitaminosis D.** *Amer. J. Ophthalmol.*, 1955, **39,** 658–663. [Eye Service, Montefiore Hosp., New York.]

In 2 elderly patients who had taken large amounts of vitamin D, calcified nodules were present in the sclera and were demonstrated in one by X-ray and in the other at autopsy.

E. M. Hume.

3631

WAGENER, H. P. **The ocular manifestations of hypercalcemia.** *Amer. J. Med. Sci.*, 1956, **231,** 218–230. [Mayo Clin., Rochester, Minn.]

A review with 37 references.

Vitamin E

3632

BURLINA, A. and PANIZZA, G. Vitamina E and lattazione. **[Vitamin E and lactation.]** *Lattante*, 1955, **26,** 706–714. [Div. Med., Osp. Civile, Oderzo.] English summary.

Ten women whose milk yield was inadequate 3 or 4 weeks after delivery were given 2 intramuscular injections of α-tocopheryl acetate daily for 20 days. Yield was measured for 3 days before treatment and for 3 days at the end of it. Before treatment the daily yield ranged from 200 to 305 ml. and after it from 495 to 590. The dry matter of the milk was increased, the fat being most affected. Tests to ascertain indirectly any effect of vitamin E on pituitary function gave negative results; the B.M.R., the blood sugar curve in response to administration of glucose, Thorn's test, and the 17-ketosteroids content of the urine were all unchanged.—E. M. Hume.

3633

GORDON, H. H., NITOWSKY, H. M. and CORNBLATH, M. **Studies of tocopherol deficiency in infants and children. 1. Hemolysis of erythrocytes in hydrogen peroxide.** *Amer. J. Dis. Child.*, 1955, **90,** 669–681. [Sinai Hosp., Baltimore.]

Suspensions of 2·5 per cent. erythrocytes in a saline-buffer mixture were incubated for 15 min. at 37° C. The erythrocytes were then re-suspended in 0·9 per cent. saline to make a 5 per cent. suspension and incubated at 37° C. with 2·4 per cent. H_2O_2 for 15 min. The suspension was centrifuged and the colour of the supernatant fluid, estimated in a photo-electric absorptiometer, was used as a measure of haemolysis.

The test was applied to the erythrocytes from 282 full-term and 67 premature newborn infants unfed. More than 50 per cent. haemolysis was found in from 25 to 48 per cent. and from 31 to 56 per cent. of these groups; the difference between them was not significant.

Thriving full-term infants fed on cow's milk showed less haemolysis at an average age of 7 weeks than at birth; the average percentage haemolysis was for 29 white babies 43 at birth and 21 after 7 weeks, and for 25 negro infants 49 at birth and 31 after 7 weeks. Other infants of the same age which had been breast fed showed still less haemolysis, 4 per cent. for 7 white and 11 per cent. for 11 negro infants.

Observations were made also on 17 full-term infants admitted to hospital for acute febrile and non-febrile illnesses. Twelve of them, all of whom had been given diets low in fat, showed over 50 per cent. haemolysis. When *dl*-α-tocopheryl acetate was given by mouth to 23 premature and 8 full-term babies, in every one there was a prompt decrease in the percentage haemolysis, even with daily doses as small as 1 mg. per kg. bodyweight.

Further 38 observations were made on 20 malnourished infants and children with steatorrhoea, and in 30 of the observations there was over 50 per cent. haemolysis, which could be corrected by giving large amounts of tocopheryl acetate, up to 300 mg. daily, but in infants with biliary atresia improvement was particularly difficult. Of 21 observations on malnourished infants and children without steatorrhoea only 2 showed more than 50 per cent. haemolysis. Other subjects investigated included infants and children with a variety of rare diseases, but none of them showed more than 4 per cent. haemolysis. The desirability of supplementing the diets of artificially fed infants with tocopherol is discussed.—I. M. Sharman.

3634

PROSPERI, P. Vitamina E ed emocoagulazione. **[Vitamin E and coagulation of the blood.]** *Riv. Clin. pediat.*, 1955, **56**, 532–539. [Ist. Clin. Pediat., Univ. Florence.]

After a review of the subject [no bibliography] in relation to human beings, brief reference is made to the author's success in treating several haemophiliacs with vitamin E. The effect being especially to shorten the coagulation time, the usefulness of the vitamin in emergencies is stressed. Favourable results are recorded also in other haemorrhagic diseases.—E. M. Hume.

3635

BURLINA, A. Azione dell'alfa-tocoferolo sul tasso ematico di glutatione. **[Effect of α-tocopherol on the values for glutathione in the blood.]** *Acta vitaminol.*, 1955, **9**, 246–248. [Div. Med., Osp. Civile, Oderzo.] French, English, German and Spanish summaries.

Of 12 normal adults, groups of 3 were given by mouth a daily dose of 100, 200 or 2000 mg. α-tocopherol, or none. Oxidised and reduced glutathione were estimated by the method of Binet and Weller in the blood before and after 1, 2, 3, 6 and 9 days of treatment, and again 3 days after treatment had ceased. There was no effect at all of giving tocopherol.—E. M. Hume.

3636

SHUTE, W. E. **Congenital heart disease treated with alpha tocopherol.** *The Summary*, 1955, **7**, 52–58. [Shute Inst., London, Ont.]

The value of treatment with α-tocopherol, usually 300 I.U. daily for prolonged periods, was studied in 35 patients with congenital heart disease. Their ages ranged from 14 months to 53 years. The tocopherol was effective in counteracting anoxia and relieving cyanosis and dyspnoea. Twelve patients were rendered symptom-free by the treatment and 22 were improved. A 3 to 6 months' course of tocopherol is recommended as a preparation for surgical treatment.—T. Moore.

3637

SCHMIDT, L. **Seven years' clinical experience in the treatment of rheumatic and ischaemic heart disease by vitamin E.** *The Summary*, 1955, **7**, 64–69. [Central Coal Board, London.]

Good results are claimed from treatment of 347 patients with rheumatic heart disease, 68 with coronary heart disease and 93 with angina pectoris by massive doses of tocopherol for prolonged periods. One illustrative case, in which the patient had been under observation for several years, is described for each of the conditions.

T. Moore.

3638

O'CONNOR, V. R. and HODGES, J. P. S. **Medical cases of cardiovascular and renal diseases treated with high doses of alpha tocopherol.** *The Summary*, 1956, **8**, 24–27. [Leamington Spa, Warwickshire.]

During 8 months 180 patients were treated with liberal doses of α-tocopherol. Except for deaths from other causes, such as cancer, no failure was recorded in the treatment of 12 cases of generalised

arteriosclerosis, 11 of acute peripheral thrombosis, 12 of acute cerebral thrombosis, 1 of cerebral vascular sclerosis, 3 of acute nephritis, 39 of hypertension, 48 of myocardial failure, 1 of heart block, 2 of acute rheumatic fever, 12 of chronic rheumatic heart disease and 2 of congenital heart disease. There was also no failure in the treatment of angina pectoris, of which the number of cases is not stated. One failure was admitted out of 3 cases of chronic renal failure, and 2 failures out of 35 of coronary thrombosis. Tocopherol appeared to be harmful in the treatment of patients with hyperthyroidism.

T. Moore.

3639

SHUTE, E. **Alpha tocopherol for pruritus ani.** *The Summary*, 1955, **7**, 15–16.

Of 23 patients who suffered from *pruritus ani* 12 were cured by treatment with from 400 to 600 I.U. α-tocopherol daily by mouth. The same treatment helped 9 other patients, but was unsuccessful in the remaining 2.—T. Moore.

See also Abst. 2970.

Vitamin B Complex

3640

APTEKAR, S. G. Sostoyanie uslovnoreflektornoi deyatelnosti kak pokazatel' tiaminovoi nedostatochnosti. [**Conditioned reflex activity as a sign of vitamin B_1 deficiency.**] *Vop. Pitan.*, 1956, **15**, 21–28. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

3641

HUNTER, R. A., MERIVALE, W. H. H. and SMITH, A. J. **Disturbances of carbohydrate metabolism caused by barbiturates and alcohol.** *Lancet*, 1955, **269**, 1353–1355. [Guy's Hosp., London.]

In 16 patients who had taken barbiturate for from 2 weeks to 108 months and who underwent the double glucose tolerance test, blood sugar values after 60 and 90 min. were higher, probably significantly higher, than in 16 normal subjects given the same test. Results were high also in a group of 5 alcoholic subjects. Blood pyruvate values after 60 and 90 min. also were high in both abnormal groups compared with those of 5 normal subjects and with the usual value reported in the literature. Daily injection of 20 mg. vitamin B_1 for 14 days improved or restored to normal the pyruvate metabolism in 5 patients who still took barbiturate and in 4 alcoholics deprived of alcohol during treatment. The effect of the vitamin on the blood sugar values varied. Abnormal electroencephalograms improved in 4 of the 5 barbiturate addicts treated with vitamin B_1.—L. Wills.

3642

LICHTENBELT, H. v. M. and FLORIJN, E. De behandeling van coma diabeticum met thiamine-pyrofosfaat. [**Treatment of diabetic coma with thiamine pyrophosphate.**] *Nederland. Tijdschr. Geneesk.*, 1956, **100**, 635–642. [Geneesk. Klin., Univ. Utrecht.] English summary.

See Abst. 2339, Vol. 26.

3643

KOSAKA, K. **A study on the vitamin B_1 metabolism of the patients who received the gynecological laparotomy.** *Acta med. biol.*, 1955, **3**, 151–157. [Dept. Obstet. Gynaecol., Sch. Med., Niigata Univ., Niigata.]

Groups of patients undergoing laparotomy were given 3, 5 or 20 mg. vitamin B_1 daily by injection before and after operation; other subjects had no injection. Values for the amount in the urine and the concentration in the blood until the tenth day after operation are tabulated.

In the untreated patients excretion fell from 258 μg. before to, in general, below 50 μg. after operation; with 3 mg. daily the fall was less and by the fifth day the amount was back to that before operation; with 5 mg. there was little change. The variations in the concentration in the blood were similar, the values being lowest between the third and seventh days in the untreated group, with no change in the group having 5 mg.

D. Harvey.

3644

STERN, E. L. **Detoxification and augmented anesthesia of procaine by thiamine (vitamin B_1).** *Amer. J. Surg.*, 1956, **91**, 164–169. [San Diego, Calif.]

In animal experiments and therapeutic trials in man, the combination of thiamine hydrochloride, which specifically stimulates respiration when given intraspinally, with procaine hydrochloride, a respiratory depressant, reduced the toxicity of the procaine and increased the amount of vitamin B_1 which could be tolerated. The combination could be given intraspinally, intravenously or by infiltration. Vitamin B_1 had variable effects when combined with other spinal anaesthetic drugs which in large doses cause respiratory failure.

L. Wills.

3645

KONDO, T., SAKAKIBARA, H. and IIDA, T. **On the so-called "thiamin-destructive influence" by the saliva of patients with cancer or other disease.** *J. Nat. Cancer Inst.*, 1956, **16**, 971–980. [2. Dept. Surg., Nagoya Univ. Sch. Med., Japan.]

In patients with cancer or disease of the liver, the enzyme activity in the saliva that destroys vitamin B_1 was only about a quarter of that in

normal subjects. Notwithstanding, the vitamin B_1 content of the saliva was greatly reduced in subjects with cancer of the intestinal tract or cirrhosis of the liver, but less so in subjects with other forms of cancer. In a small series of patients with other diseases, the enzyme activity of the saliva was usually within normal limits.

L. Wills.

3646

PEDRO DA CUNHA, D. and DEODATA DE AZEVEDO, M. Sur la thiaminase placentaire. **[Placental thiaminase.]** *C.R. Soc. Biol.*, 1955, **149,** 1833–1835. [Inst. Rocha Cabral, Lisbon.]

When a solution of vitamin B_1 hydrochloride was incubated at 37° C. for 6 or 24 hr. with a homogenate of fresh human placenta, about 25 per cent. of the vitamin B_1 was destroyed in 6 hr., but there was no further loss.

The presence of thiaminase in placental tissue is deduced.—A. M. Copping.

3647

WITTS, L. J. **Recent research on vitamins. Recent work on B vitamins in the blood and gastrointestinal tract, especially in relation to human diseases.** *Brit. Med. Bull.*, 1956, **12,** 14–17. [Nuffield Dept. Med., Univ. Oxford.]

3648

ATKINSON, M. **The migraine syndrome.** *Practitioner*, 1956, **176,** 171–178. [Dept. Otolaryngol., Univ. New York.]

Very considerable relief of symptoms, in some patients amounting to complete suppression of headache for up to 6 years, was obtained in 26 cases of true migraine by treatment with enormous doses of nicotinic acid and nicotinamide, riboflavin and vitamin B_1 given at first both parenterally and by mouth and later by mouth alone for months or years. Maximum relief was obtained often only after months of treatment.—L. Wills.

3649

RALLI, E. P., KUHL, W. J. (Jr.), GERSHBERG, H., BECK, E. M., STREET, E. R. and LAKEN, B. **Effects of vitamin supplementation of the diet on reaction to short-term cold stress in normal young male adults.** *Metabolism*, 1956, **5,** 170–196. [Dept. Med., Coll. Med., New York Univ.-Bellevue Med. Centre.]

Four groups each of 12 normal well fed men were used in the trials. Stress was produced by immersion in water at 9·3° C. for 8 min. Each subject served as his own control, being subjected to stress before and after 6 weeks' treatment with daily supplements given by mouth. The different groups received, respectively, a dummy supplement, 10 g. Ca pantothenate, 12 μg. vitamin B_{12}, or the whole vitamin B complex with ascorbic acid. The response to stress and the effect of the supplements were judged by change in body temperature, pulse and blood pressure, in total and differential white cell counts, in serum Na, plasma K, serum total protein and water, in blood sugar, in lactic acid, ascorbic acid and total cholesterol in the blood, and in the urinary excretion of Na, K, Cl, ascorbic acid, uric acid and creatinine for up to 4 hr. after immersion. The findings are reported in detail.

In general the men had recovered completely in 4 hr. and there was no great difference in the responses obtained after the different supplements, but vitamin B_{12} decreased the mean fall of temperature after immersion. The one underweight subject who took part in the trials was on a diet of consistently low energy value with reduction of all the major components ; he had a severe reaction to the stress both beforehand and after treatment with the vitamin B complex and ascorbic acid.

L. Wills.

3650

WEISS, W. **The skin response to a nicotinic acid ester : an acute phase reaction. Nicotinic acid blood levels in relation to the skin response to a nicotinic acid ester ointment.** *Amer. J. Med. Sci.*, 1956, **231,** 13–19 ; 20–25. [U.S. Air Force.] Interlingua summary.

3651

BIANCHI DONNASIBILLA, L. and OLIVI, O. Potere desaminante e vitamine del gruppo B nel bambino. 4. Azione dell'amide nicotinica. **[Deaminating power and vitamins of the B group in children. 4. Action of nicotinamide.]** *Acta vitaminol.*, 1955, **9,** 249–252. [Clin. Pediat., Univ. Pavia.] French, English, German and Spanish summaries.

For previous parts see Absts. 1186, 2843, Vol. 22.

Amino N was estimated in the blood of 10 children, aged from 6 to 12 years, before, and 15, 30 and 60 min. after, intravenous injection of 15 mg. glycine per kg. bodyweight. The test was made before and at the end of intramuscular treatment with 20 mg. nicotinamide daily for 5 days. After 30 min. the mean value for amino N had fallen whether nicotinamide was given or not. After 60 min. it had fallen still further when nicotinamide was given, but had risen above the initial value when it was not given.—E. M. Hume.

3652

CORSINI, F. Osservazioni sull'eliminazione della vitamina B_2 nell'immaturo. **[Excretion of vitamin B_2 in the premature infant.]** *Boll. Soc. ital. Biol. sper.*, 1955, **31,** 576–578. [Ist. Clin. Pediat., Univ. Bologna.]

Riboflavin was estimated in the urine of 4 premature infants from 16 to 39 days old and of 3

full-term infants from 25 days to 5 months old. The amount, in μg. excreted in 24 hr., ranged from 30 to 300 for the premature and from 142 to 330 for the full-term babies, but the amount excreted by the same infant on different days varied widely, 206 and 111, for instance, for a premature infant, and 142 and 290 for a full-term one.

E. M. Hume.

3653

HIRASHIMA, H. **[Studies on angular stomatitis in Tokushima prefecture. 1. Angular stomatitis in children under 5 years of age.]** *Shikoku Acta Med.*, 1955, **7**, No. 5, 9–13. In Japanese: English summary. [Dept. Paediat., Sch. Med., Tokushima Univ.]

Between 1952 and 1954 children under 5 years of age to the number of 7733 were examined, 1519 in 2 towns, and 2604 in 8 agricultural, 2434 in 8 mountain, and 1176 in 4 fishing, villages. The percentage incidence of angular stomatitis was, for the regions in that order, 4·7, 7·7, 9·2 and 6·7 and for the whole population 7·5. The results are tabulated in English to show also the distribution of cases according to age and sex and to ranges for the Kaup Davenport index [no reference in English]. Of the 577 children affected only 15 were among 1758 examined while under 1 year of age; of the 15, 6 were breast fed and 5 had been partly fed on dried milk fortified with vitamins. The condition was much commoner after 3 years of age, among malnourished than among well nourished children, and among boys than among girls. (From summary.)—D. Harvey.

3654

KERPPOLA, W. **The content of riboflavin and riboflavin-containing coenzymes in the blood in health and in various diseases, in particular schizophrenia, neurocirculatory asthenia and tuberculosis.** *Acta med. scand.*, 1955–56, **153**, 33–48. [1. Dept. Med., Univ. Helsinki.]

Total and esterified riboflavin, containing riboflavin-5-phosphate and flavin adenine dinucleotide, were estimated in the blood of 60 normal subjects and 445 patients. Details of the methods are given. In the normal series the mean blood value in μg. per 100 ml. was for total riboflavin 6·68 with range 4·9 to 10·4 and for esterified riboflavin 5·51 with range 4·3 to 7·1. In schizophrenia, neurocirculatory asthenia (neurasthenia) and disseminated sclerosis, total riboflavin was not reduced except in about 20 per cent. of the patients with neurasthenia, but esterified riboflavin was significantly reduced in many; the mean values were 3·17, 3·58 and 3·69, respectively. There was a smaller, but significant, reduction of esterified riboflavin in gastric and duodenal ulcer, bronchial asthma and chronic colitis, all of them psychosomatic diseases, and in rheumatic diseases and tuberculosis. In some patients with obesity associated with hypertension and diabetes esterified riboflavin was reduced. In all other conditions studied there was no significant change except in myeloid leucaemia with high white cell counts when total and particularly esterified riboflavin were high because of the riboflavin content of the leucocytes. Treatment with riboflavin raised low riboflavin values but had no appreciable effect on clinical condition. The findings and the fact that in most of the individuals studied there was no clinical sign of riboflavin deficiency are considered evidence for the absence of any appreciable deficiency of riboflavin in Finland.—L. Wills.

3655

KOKIL, S. Über die Anaemie bei Dermatitis seborrhoides und ihre Beeinflussung durch Biotin. **[Anaemia in seborrhoeic dermatitis and the effect on it of biotin.]** *Ann. paediat.*, 1956, **186**, 79–82. [Kinderabt., Zentralkrankenhaus, Afula, Israel.] English and French summaries.

A moderate degree of normocytic or macrocytic but not of megaloblastic anaemia was found in 10 infants, aged from 2½ weeks to 3½ months, with seborrhoeic dermatitis. After oral treatment for from 14 to 21 days with 5 mg. biotin daily the dermatitis cleared and the anaemia improved in all but 2 patients with complications.—L. Wills.

3656

ZARAFONETIS, C. J. D., CURTIS, A. C. and SHAW, J. M. **Treatment of pemphigus with potassium para-aminobenzoate.** *Amer. J. Med. Sci.*, 1956, **231**, 30–49. [Dept. Int. Med., Sch. Med., Temple Univ., Philadelphia, Pa.] Interlingua summary.

Eighteen patients with pemphigus were treated with potassium *p*-aminobenzoate, 18 to 24 g. daily, usually given by mouth; in some cortisone or ACTH was given also. The cases are described in detail. Anorexia and hypoglycaemia developed in some patients, but treatment could be renewed when appetite returned. Some improvement was obtained in 15 patients treated for long periods, none in 3 treated for a short time; in 8 patients there was complete suppression of the skin lesions. There was some evidence of a synergic relation between potassium *p*-aminobenzoate and cortisone.

L. Wills.

3657

MARQUEZ, L. R., CHESLOCK, K. E. and REYNOLDS, M. S. **Interrelationships of methionine and vitamin B_6 in human subjects.** *Proc. Soc. Exp. Biol. Med.*, 1955, **90**, 352–355. [Dept. Food. Nutrit., Sch. Home Econ., Univ. Wisconsin, Madison.]

Four normal adult women took part in 2 metabolic experiments each lasting 21 days, with an

interval of 3 months between them. The basal diet low in vitamin B_6 was the same in both except that nicotinic acid was used in the first and nicotinamide in the second. The subjects took the basal diet alone for 9 days, then with a supplement of 8 g. *dl*-methionine daily for 6 days and finally with 8 g. *dl*-methionine and 10 mg. pyridoxine for 6 days. The methionine supplement did not affect the amount of vitamin B_6 and its metabolites excreted in the urine. Methionine alone did not increase the amount of N^1-methylnicotinamide excreted, but with pyridoxine as well excretion of methyl derivatives increased when nicotinamide but not when nicotinic acid was included in the diet.—A. M. Copping.

3658

BENHAMOU, E. and TIMSIT, M. Les polynévrites de l'isoniazide. [**Polyneuritis produced by isoniazid.**] *Presse méd.*, 1956, **64,** 199–202. [Algiers.]

Of 18 adults with uncomplicated tuberculous meningitis treated for from 6 to 10 weeks with from 15 to 25 mg. isoniazid per kg. bodyweight together with streptomycin and *p*-aminosalicylic acid, 8 developed severe polyneuritis which responded to reduction or withdrawal of the dose of isoniazid and administration of pyridoxine and vitamins B_1 and B_{12}. Treatment with isoniazid could be renewed if large amounts of pyridoxine were given at the same time. The signs of polyneuritis were associated with digestive troubles, erythema and glossitis, psychoses and sometimes convulsions. The syndrome was similar in all respects to that in experimental deficiency of vitamin B_6 due to the antagonist deoxypyridoxine, and the conditions are believed to be identical.

L. Wills.

3659

LAWSON, D. F., DEGARIS, C. N. and BOLTON, J. H. **Folic acid and reproductive efficiency.** *Med. J. Austral.*, 1953, i, 848. [Women's Hosp., Melbourne.]

With a lymphocyte count of less than 1500 per c.mm. as an index of folic acid deficiency, 77 women, 21 primigravidae and 56 multigravidae, were selected for investigation.

Among the 56 multigravidae thus selected, the outcome of 145 pregnancies untreated with folic acid, and of 53 during which treatment with folic acid was given for the whole or greater part of gestation, was compared with the outcome of 138 pregnancies of 56 apparently normal multigravidae.

From the 145 pregnancies without folic acid treatment the number of full-term normal children was 41, and from the 53 pregnancies with folic acid treatment and the 138 normal pregnancies, the respective numbers were 42 and 106. It is, therefore, considered probable that some relationship exists between a low lymphocyte count and presumed folic acid deficiency, and the inability to carry a pregnancy successfully to term.

M. H. Pierce.

3660

TITOV, K. G. and RYZHIK, D. L. Primenenie folievoi kisloty pri zabolevaniyakh u detei. [**The use of folic acid in children's disorders.**] *Pediatriya*, 1955, No. 1, 49–54. [Detskoi Klin., Med. Inst., Tashkent.]

Fifty children from 3 months to 9 years old were selected for treatment with folic acid; infants up to a year old received 1 or 2 mg. twice daily, those of 2 to 4 years 2 mg. 2 or 3 times daily and those of 5 years or more 2 mg. 3 or 4 times daily. Most of the children were dystrophic and 16 of them were severely anaemic. The causes were different; 2 children were tuberculous, 1 had sprue, others had pellagra, active rickets or other nutritional disorders.

Most of the children with anaemia showed a good response to treatment, with increase in circulating Hb and red cells and improvement in appetite and weight gain. Children with toxic dyspepsia, rickets and multiple vitamin deficiencies gave little or no response. Some dystrophic children showed very rapid improvement in appetite and weight.

It is concluded that folic acid may have a wide use in children's disorders.—D. Duncan.

3661

LEAR, A. A. and CASTLE, W. B. **Supplemental folic acid therapy in pernicious anemia: the effect on erythropoiesis and serum vitamin B_{12} concentrations in selected cases.** *J. Lab. Clin. Med.*, 1956, **47,** 88–97. [Thorndike Mem. Lab., Boston, Mass.]

The 35 patients selected had pernicious anaemia, diagnosed on the presence of achlorhydria, macrocytes with abnormal bone marrow, and a characteristic haematological response to purified liver extract or vitamin B_{12}. All had been maintained in remission for at least 2 years by that treatment, but had had Hb values below 12·5 g. per cent. for a year or more. All continued to receive their normal maintenance treatment, but the doses were increased; 24 of the patients received 30 μg. crystalline vitamin B_{12} by intramuscular injection every 2 weeks for up to a year, and the other 11 had at similar intervals Liver Injection U.S.P. supposed to contain 20 μg. vitamin B_{12}. After the first 6 months at those levels of dosage each patient took in addition for the second 6 months 5 mg. folic acid daily by mouth.

Of the patients given more vitamin B_{12}, 5 had a significant and sustained rise in Hb at the end of 6 months. None of the others had a significant

change in either direction during the year, except one who responded to Fe and proved to have associated Fe deficiency. Initially 20 patients had serum vitamin B_{12} values below 100 $\mu\mu$g. per ml., but only 2 continued to do so after 6 months and none at the end of the year. There was wide variation. In 18 of 27 patients, for whom serum vitamin B_{12} was estimated throughout the experiment, there was a fall after administration of folic acid, and in 16 of them the fall was of more than 20 per cent.

Folic acid deficiency was considered not to be important in patients receiving adequate treatment with vitamin B_{12}, and a supplement of folic acid might even be inadvisable because of its effect in lowering serum vitamin B_{12}.—D. Duncan.

3662

DAS GUPTA, C. R., CHATTERJEA, J. B. and RAY, R. N. **Role of citrovorum factor in nutritional macrocytic anaemia.** *J. Indian Med. Assoc.*, 1956, **26,** 85–91. [Dept. Haematol., Sch. Trop. Med., Calcutta.]

Seven patients aged from 24 to 54 years, all with nutritional megaloblastic anaemia, were treated with leucovorin. The diets of all were poor in animal protein. Four showed a good initial response to 18 mg. and one to 36 mg. when those amounts were divided into 6 consecutive daily doses. One showed fair improvement and one gave no response. The response was sustained in only 2 patients; the others subsequently required folic acid, a high-protein diet or crude liver extract.

D. Duncan.

3663

LOWENSTEIN, L., PICK, C. and PHILPOTT, N. (with LALONDE, M.) **Megaloblastic anemia of pregnancy and the puerperium.** *Amer. J. Obstet. Gynecol.*, 1955, **70,** 1309–1337. [Dept. Med., Royal Victoria Hosp., McGill Med. Sch., Montreal.]

Megaloblastic anaemia was discovered by tests of the bone marrow in 18 patients between 1949 and 1952; in 9 it was detected during pregnancy and in 9 after delivery. The diet of 12 patients was said to be deficient, usually in animal protein, fruit and vegetables; for 2 other patients diet was said to be satisfactory, and for the other 4 details were not available. Only 2 patients complained of sore mouth or tongue and 14 of excessive fatigue; otherwise signs and symptoms were not specific. One patient was overweight, most of them "seemed underweight". Smoothness of the tongue was present in 6, ulcers of the tongue in 1, gingivitis in 2 and perlèche in 2. Gastric analysis with histamine showed achlorhydria in 1 and hypochlorhydria in 2, but normal acidity in 7 of the 10 patients examined. All other signs were inconstant. Most of the cases were found early in the period of study, and the use of polyvitamin supplements increased; from 1953, when vitamin B_{12} and folic acid were added to the supplements, no case was seen.

The peripheral blood showed no constant picture and variations of it were seen from macrocytic to microcytic and from hypochromic to hyperchromic, but the bone marrow always contained intermediate megaloblasts and macrogranulocytes. Such changes in the bone marrow were never found in normal women in pregnancy or the puerperium, or in other forms of anaemia.

One patient responded to vitamin B_{12} given by mouth and 2 failed to respond. Two responded to vitamin B_{12} given by intramuscular injection, one gave a partial response and 4 failed to respond. Four responded well and 1 less well to folic acid and 3 failed to respond, but 6 responded to folinic acid and none failed. Six needed Fe before recovery was complete, and 3 showed spontaneous remission after delivery. The view is not supported that megaloblastic anaemia of pregnancy and the puerperium has a different etiology in tropical and temperate regions; it is considered that a deficient diet is responsible in both instances, although the specific deficiency may differ. The deficiency may be of vitamin B_{12}, folic acid, or perhaps an unknown substance. The best therapeutic response was obtained with folic or folinic acid.

There are 114 references.—L. Wills.

3664

COLLINS, I. S. **The pathogenesis of pernicious anaemia.** *Med. J. Austral.*, 1954, i, 114–117. [Red Cross Blood Diffusion Serv., Sydney.]

A review.

3665

WELBOURN, R. B., NELSON, M. G. and ZACHARIAS, F. J. **Megaloblastic anaemia following gastric resection: report of ten cases.** *Brit. J. Surg.*, 1955–56, **43,** 422–428. [Dept. Surg., Queen's Univ., Belfast.]

Histories are given of 10 patients who were found to have megaloblastic anaemia from 1 to 10 years after total or partial removal of the stomach. Of 6 patients studied for 4 years after total gastrectomy and given no prophylactic treatment, 2 of the 4 surviving after 3 years had megaloblastic anaemia and by the fourth year all 3 survivors had it. Besides the 3 there were 2 patients operated on elsewhere, in whom the anaemia was found after 5 and 6 years. In the 5 patients with only part of the stomach removed it was never possible to incriminate the operation as the sole or even the main cause of the anaemia, and 3 of them ate grossly deficient diets. Macrocytes were sometimes found in the peripheral blood before the anaemia developed, and are to be

regarded as an early warning sign. Seven of the patients were treated with vitamin B_{12} parenterally: 4 gave a satisfactory response, 1 died, 1 responded when folic acid was given also and the seventh responded to liver extract, folic acid and Fe. Three of the patients were treated parenterally with liver extract, to which 2 responded well, but one of them had persistent macrocytes, and the third was not followed up.

It is considered that all patients who have all or most of the stomach removed should receive vitamin B_{12} parenterally.—D. Duncan.

3666

TÖTTERMAN, G. and AHRENBERG, P. **The age distribution in pernicious tapeworm anemia and Addisonian pernicious anemia.** *Acta med. scand.*, 1956, **153,** 421–426. [Med. Dept., Maria Hosp., Helsinki.]

The age distribution curves of 930 patients with pernicious anaemia and of 400 with tapeworm pernicious anaemia were compared; the former showed a slow rise to the fourth decade followed by a steep rise to a maximum at the sixth decade followed by a slight fall, and the latter a similar curve with a less steep rise to the sixth decade and a steeper fall after it. The degree of infestation with tapeworm is highest in the fourth decade, though the maximum incidence of anaemia is in the sixth decade. It is argued that the findings show that in subjects with tapeworm a latent period is required before anaemia develops.

L. Wills.

3667

JESSBERGER, I. Perorale Therapie der perniziösen Anämie. Erfahrungen mit einem neuen Präparat. [**Treatment of pernicious anaemia. Experience with a new preparation.**] *Münch. med. Wochenschr.*, 1956, **98,** 240–242. [1. Med. Abt., Allg. Krankenhaus St. Georg, Hamburg.] English and French summaries.

3668

MEYER, L. M., JIMINEZ-CASADO, M. and ARKUN, S. N. **Further observations on the oral administration of Co^{60} vitamin B^{12} to normal persons, patients with pernicious anemia, and subjects with various medical disorders.** *Acta med. scand.*, 1955–56, **153,** 153–158. [Third (New York Univ.) Med. Serv., Goldwater Mem. Hosp., Welfare Island, N.Y.]

^{60}Co was estimated in the stools after oral administration of 0·5 μg. ^{60}Co vitamin B_{12} (220 μC. per μg.). In 6 normal subjects excretion was within the usually accepted range of up to 50 per cent. of the intake, and showed the usual variation from person to person and in repeat tests. Similar results were obtained for 36 of 39 patients with disorders other than pernicious anaemia, but for 3 of them with cirrhosis of the liver, idiopathic thrombocytopenic purpura and colectomy the excretion exceeded 50 per cent. of the test dose. There was no apparent relation between age or presence of free HCl in the gastric juice and the amount of ^{60}Co excreted. The findings in 11 cases of pernicious anaemia confirmed those of other workers. Administration of 2 mg. folic acid with the test dose reduced the excretion of ^{60}Co in 1 only of the 11 cases.—L. Wills.

3669

ARIAS, I. M., APT, L. and POLLYCOVE, M. **Absorption of radioactive vitamin B^{12} in nonanemic patients with combined-system disease.** *New Engl. J. Med.*, 1955, **253,** 1005–1010. [Radioisotope Unit., Veterans Admin. Hosp., Boston, Mass.]

Absorption of vitamin B_{12} was measured from the uptake of radio-activity by the liver after an oral test dose of 0·5 μg. radio-active vitamin B_{12} with a specific activity of 0·786 mC. per μg. In 4 non-anaemic patients with combined-system disease and no free acid or intrinsic factor in the gastric juice, the liver count after the oral test dose varied from 0 to 19 per cent. of the count obtained after the same dose given parenterally; the count increased to from 59 to 63 per cent. of that after the parenteral dose when the oral dose was combined with normal human gastric juice. None of the 4 patients had received folic acid, though 3 had previously received vitamin B_{12}. In 11 other subjects, 5 with histamine-resistant achlorhydria, the liver count after the oral dose ranged from 40 to 68 per cent. of the count after the parenteral dose. It is suggested that the uptake by the liver of radio-activity after an oral test dose of radio-active vitamin B_{12} might serve as a useful diagnostic test of combined-system disease.—L. Wills.

3670

HALSTED, J. A., LEWIS, P. M. and GASSTER, M. **Absorption of radioactive vitamin B^{12} in the syndrome of megaloblastic anemia associated with intestinal stricture or anastomosis.** *Amer. J. Med.*, 1956, **20,** 42–52. [Veterans Admin. Centre, Los Angeles, Calif.]

A male patient had had numerous operations resulting in fistulae connecting loops of the small bowel, but their anatomical arrangement was obscure. He had 2 episodes of pronounced anaemia, macrocytic and hyperchromic, which responded well to parenteral treatment with vitamin B_{12}. A second patient had extensive diverticulitis of the stomach and intestines, and a blind pouch of the ascending colon as a result of anastomosis of the ileum to the transverse colon. Parenteral treatment with vitamin B_{12} was successful in his first episode of anaemia; folic acid failed

to maintain the remission, and vitamin B_{12} was again required.

Each of the patients was given by mouth vitamin B_{12} labelled with ^{60}Co, and absorption of the vitamin was estimated from the amount of radio-activity present in the faeces. The test was repeated when the vitamin was given with intrinsic factor or with antibiotics, aureomycin, neomycin, achromysin or gantrisin. Intrinsic factor did not decrease the amount of vitamin B_{12} recovered from the faeces of either patient, but aureomycin improved absorption in both, especially in the first patient. Achromycin caused some improvement, neomysin and gantrisin little or none. In the second patient aureomycin and achromysin reduced the diarrhoea from which the patient suffered, but diarrhoea was not the cause of the impaired absorption, because gantrisin also improved the diarrhoea but not the absorption. The results support the concept that the development of an abnormal bacterial flora in the intestine may be the cause of the failure by such patients to absorb enough vitamin B_{12}.

An addendum states that the favourable effect of achromysin was confirmed in another patient with megaloblastic anaemia after resection of the intestine.—D. Duncan.

3671

BADENOCH, J., BEDFORD, P. D. and EVANS, J. R. **Massive diverticulosis of the small intestine with steatorrhoea and megaloblastic anaemia.** *Quart. J. Med.*, 1955, **24**, 321–330. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

The article includes information on the absorption of vitamin B_{12}.—L. Wills.

3672

MOLLIN, D. L., PITNEY, W. R., BAKER, S. J. and BRADLEY, J. E. **The plasma clearance and urinary excretion of parenterally administered ^{58}Co B_{12}.** *Blood, J. Hematol.*, 1956, **11**, 31–43. [Dept. Pathol. (Haematol.), Postgrad. Med. Sch., London.] Interlingua summary.

Serum concentration of vitamin B_{12} was normal in a group of 3 normal subjects, 3 patients with acute leucaemia and 1 with chronic lymphocytic leucaemia. Of 6 patients with low serum vitamin B_{12}, 5 had pernicious anaemia and 1 had nutritional megaloblastic anaemia. Two other patients with chronic myelocytic leucaemia had very high serum vitamin B_{12} concentrations.

In the 7 subjects with normal serum vitamin B_{12}, given injections of vitamin B_{12} labelled with ^{58}Co, 50 per cent. of the radio-activity had disappeared from the plasma in from 0·3 to 0·9 hr. After 24 hr. from 3 to 25 per cent. of the radio-activity remained in the plasma, and 2 subjects still had measurable activity after 7 days.

Clearance of injected vitamin B_{12} from the plasma was slow in the 3 patients with pernicious anaemia in relapse; 50 per cent. of the radio-activity had not disappeared in from 3 to 5 hr., and from 29 to 41 per cent. remained after 24 hr. In the 2 patients with less severe pernicious anaemia, clearance was normal, and in the patient with nutritional megaloblastic anaemia it was at the lower limit of the normal range. Clearance was much slower in the 2 patients with chronic myelocytic leucaemia than in any other; more than half the original radio-activity was present in the plasma after 24 hr., and in 1 patient 21 per cent. was present after 7 days. The other patient received massive doses of non-radio-active vitamin B_{12} for several days, after which clearance of another dose of labelled vitamin was faster than before, but still slower than in normal subjects.

There was good correlation between the concentrations of plasma vitamin B_{12} as calculated from the radio-activity and as estimated with *Euglena*.

Serum vitamin-B_{12}-binding capacity was tested in 1 subject from each group. The degree of unsaturation was 225 $\mu\mu$g. per ml. in the normal subject, 750 in a patient with pernicious anaemia and 1090 in a patient with myelocytic leucaemia.

There was no significant difference between the groups in the amount of radio-activity excreted in the urine in the 24 hr. after the injection.

D. Duncan.

3673

MEYER, L. M., BERLIN, N. I., JIMINEZ-CASADO, M. and ARKUN, S. N. **Vit. B_{12} distribution, determined by surface body counting following parenteral administration of Co^{60} vit. B_{12}.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91**, 129–131. [New York Univ. Serv., Goldwater Mem. Hosp., New York.]

Radio-activity was measured over different organs of 14 subjects after intramuscular injection of 1 μg. vitamin B_{12} containing ^{60}Co. Activity was at a maximum over the liver, spleen and left kidney in that order, and was negligible in other regions. Activity appeared in the liver, spleen and left kidney within 30 min. of the injection and disappeared from the site of injection within from 3 to 4 hr. It persisted for varying periods up to 315 days in the liver of one subject. That and the great variation in time before maximum activity was reached made no clear pattern in healthy subjects or in patients with different chronic diseases. Injection of $^{60}CoCl_2$ into 6 subjects gave a very different pattern of absorption as indicated by radio-activity in the liver, spleen and kidney. It is suggested that in the present studies the amounts of vitamin B_{12} in the liver, spleen and kidney were related to the degree of radio-activity over those organs.

A. M. Copping.

3674

GAUTHIER, C. A. and COULOMBE, M. De l'emploi de la cyanocobalamine en thérapeutique neurologique. Note préliminaire. [**Use of cyanocobalamin for treating neurological conditions. Preliminary note.**] *Laval méd.*, 1955, **20,** 1359–1365. [Serv. Neurol. Psychiat., Hôp. Enfant-Jésus, Quebec.]

In a small number of patients with peripheral and central neurological syndromes, many of them very severe, treatment with short courses of daily intravenous injections of from 1000 to 1800 μg. vitamin B_{12} produced very marked improvement or apparent cure which was maintained for the period of observation, extending for some to from 6 to 7 months. The nature of the improvement did not suggest a spontaneous remission.

L. Wills.

3675

CAMERA, A. and BAFFI, V. Sull'impiego della vitamina B_{12} in alcuni emofilici. [**Use of vitamin B_{12} for certain haemophiliacs.**]*Boll. Soc. ital. Biol. sper.*, 1955, **31,** 612–614. [Ist. Semeiot. Med., Clin. Pediat., Univ. Naples.]

Four patients with haemophilia were given doses of from 50 to 100 μg. vitamin B_{12} daily by intramuscular injection for from 7 to 20 days. The coagulation time in min. of the 4 subjects was reduced from 27 to 4, from 150 to 14, from 120 to 80, and from 35 to 12. In only one patient was there a slight modification of the prothrombin time.

E. M. Hume.

3676

GALEOTTO, E. and RIZZI, R. La vitamina B_{12} nel trattamento del dolore postoperatorio. [**Vitamin B_{12} in the treatment of post-operative pain.**] *Acta vitaminol.*, 1955, **9,** 253–259. [Osp al Mare, Lido, Venice.] French, English, German and Spanish summaries.

Vitamin B_{12} was given by injection to 91 patients aged from 7 to 73, after different operations, as a total of from 3000 to 4000 μg. in 3 or 4 spaced doses within 24 hr., beginning 12 hr. before operation, or as a single dose of 5000 μg. given at the moment when the last stitches were put in. The investigation was incapable of quantitative treatment or control, but the results were considered satisfactory, the second mode of administration being superior. Besides the reduction of pain, general wellbeing was greater, and post-operative complications less, when vitamin B_{12} was given. Results were best of all when the treatment was combined with infiltration of the wound by delayed-action anaesthetics.—E. M. Hume.

3677

ADEZATI, L. and LOTTI, G. Effetto della vit. B_{12} sull'iperazoturia nella sindrome surrenometabolica. [**Effect of vitamin B_{12} on excess of nitrogen in the urine in the adrenometabolic syndrome.**] *Boll. Soc. ital. Biol. sper.*, 1955, **31,** 671–672. [Clin. Med. Gen., Univ. Genoa.]

In 3 patients with the syndrome of adrenal hyperactivity, the urinary output of N in 24 hr. was from 23 to 27 g. When they were given 1 mg. vitamin B_{12} by subcutaneous injection, the loss in the 3 subjects was reduced to 12, 10 and 12 g.—E. M. Hume.

3678

PLANCHART, A. Evolución de la glutationemia y de la glucemia de obesos y de diabéticos durante la sobre-carga de glucoso después de la administración de B_{12}. [**Behaviour of blood glutathione and blood sugar in obese subjects and diabetics during a glucose tolerance test after administration of vitamin B_{12}.**] *Arch. venezol. Nutricion*, 1955, **6,** 23–33. [Inst. Nac. Nutrición.] English and German summaries.

There were 41 subjects, obese or diabetic [number of each not stated] ; most of the diabetics were controlled by diet or insulin. Blood sugar and glutathione were estimated at intervals after an oral test dose of 100 g. glucose. The test was repeated after 1000 μg. vitamin B_{12} had been given by vein daily for 10 days. The results are presented in tables and graphs.

In the obese subjects the blood sugar curve was considered to be " diabetoid ", but after treatment with vitamin B_{12} it became normal. In diabetic subjects the blood sugar began to rise later after treatment with vitamin B_{12}, but the level at the third hour was equally high before and after treatment.

In obese subjects blood glutathione reached a peak after 2 hr. and then fell ; the peak was lower and the fall steeper after vitamin B_{12}. In diabetics, blood glutathione showed a similar, but much lower, peak before treatment, but after treatment the value was initially higher and rose in the course of the blood sugar tolerance test.

It is suggested that it may be the effect of vitamin B_{12} on glutathione in the blood that is the cause of the difference in the blood sugar curve.

D. Duncan.

3679

SPRAY, G. H. **An improved method for the rapid estimation of vitamin B_{12} in serum.** *Clin. Sci.*, 1955, **14,** 661–667. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

Modifications of media and method are described for rapid estimation of vitamin B_{12} in serum with *Lactobacillus leichmannii*. The values obtained were higher than those reported by other observers ; this was attributed to the use of cyanide for extracting vitamin B_{12} from serum. For 111 normal subjects the values in $\mu\mu$g. per ml. serum

ranged from 150 to 860 and for 16 of 17 patients with pernicious anaemia in relapse the values were less than 100; the value for one patient was 140.
A. M. Copping.

3680

KARLIN, R. Variation du taux de vitamine B_{12} dans le lait de femme. Effet de l'administration de B_{12} sur ce taux. [**Vitamin B_{12} content of human milk, and the effect on it of giving vitamin B_{12}.**] *Pédiatrie*, 1956, **11**, 111–115. [Inst. Pasteur, Lyons.]

The vitamin B_{12} content of the milk of 10 mothers fell from about 330 mμg. per 100 ml. in the colostrum on the day of delivery to under 50 on the 4th day. Estimations on pooled samples of milk showed that the mean value fell from between 25 and 50 to under 25 during 8 months of lactation. Vitamin B_{12} given by mouth, alone or with intrinsic factor, had little or no effect on the vitamin B_{12} content of the milk, but a single intramuscular injection of 100 μg. raised the value to about 270 mμg. per 100 ml.—L. Wills.

See also Abst. 3579.

Vitamin C

3681

STEELE, B. F., LINER, R. L., PIERCE, Z. H. and WILLIAMS, H. H. **Ascorbic acid nutriture in the human. 2. Content of ascorbic acid in the white cells and sera of subjects receiving controlled low intakes of the vitamin.** *J. Nutrition*, 1955, **57**, 361–368. [Dept. Food Nutrit., Cornell Univ., Ithaca, N.Y.]

For part 1 see Abst. 2265, Vol. 23.

After 38 or 42 days of a diet providing about 10 mg. ascorbic acid daily the partly depleted subjects, 10 men and 3 women, received in the diet successively 20, 30 and 40 mg. ascorbic acid daily for 14, 11 or 14, and 7 or 11 days, respectively; the experiments lasted from 73 to 78 days. Ascorbic acid was estimated frequently in the white cells and blood serum.

The average ascorbic acid content of the white cells increased and then decreased during the time when 20 and 30 mg. ascorbic acid were given; that of the serum decreased. There was a significant increase of ascorbic acid in both white cells and serum on changing from 30 to 40 mg.
A. Hepburn.

3682

NAMYSŁOWSKI, L. and DESPERAK-SECOMSKA, B. Stan wysycenia witaminą C wybranej grupy młodzieży akademickiej w latach 1952–1953. [**The vitamin C content of the blood in a selected group of students during 1952 and 1953.**] *Rocz. Państwowego Zakł. Hig.*, 1955, **6**, 289–301. Russian and English summaries.

Vitamin C was estimated in the blood of 100 students attending the Higher School of Physical Culture. Two-thirds showed values ranging from 0·03 to 0·30 mg. per cent. Loading tests showed that 21 of them required 10 days and 19 required 8 days to reach saturation. Changes in the gums were noted in 79 per cent. of the students. It is concluded that the diet was deficient in vitamin C and that the strenuous exercise had produced a state of vitamin C deficiency. (From summary.)
J. S. Thomson.

3683

BONOMOLO, A., CRESTA, M. and FIORENTINI, M. Consumi di acido ascorbico, ascorbinemia e fragilità vasale in un gruppo di 88 famiglie. [**Intake of ascorbic acid, blood ascorbic acid and vascular fragility in a group of 88 families.**] *Arch. Fisiol.*, 1955, **55**, 182–186. [Ist. Nazionale Nutriz. C.N.R., Rome.]

As part of a dietary survey in the province of Salerno, the ascorbic acid intake of 88 families with 480 persons was investigated. The economic condition of the families was classified as bad for 44, moderate for 23, and good for 21. The ascorbic acid content of the diets recorded in the survey was calculated from tables of food composition, 50 per cent. loss being allowed for cooking. The percentage of families receiving less than the Recommended Dietary Allowances (1953) [presumably U.S.] was for those classed on an economic basis as bad 22·8, moderate 21·8, and good 4·7. Ascorbic acid was estimated in the blood of 151 persons from 36 of the families. The values bore no relation to the intakes. The mean value, in mg. per 100 ml. serum, was for those with a deficit of from 50 to 90 per cent. of the recommended allowance $0·78 \pm 0·10$; with a deficit of from 49 per cent. to an excess of 10 per cent. $0·75 \pm 0·08$; and with an excess of from 11 to 80 per cent. $0·67 \pm 0·15$. The corresponding values for 267 persons, amongst whom all the 88 families were represented, were $0·67 \pm 0·09$, $0·75 \pm 0·02$, and $0·69 \pm 0·09$. No sign of deficiency was seen, and measurement of capillary resistance was considered to have no value.—E. M. Hume.

3684

CLEIN, N. W. **Acerola juice—the richest known source of vitamin C. A clinical study in infants.** *J. Pediat.*, 1956, **48**, 140–145. [Dept. Paediat., Sch. Med., Univ. Washington, Seattle.]

Juice from the acerola or Puerto Rican "cherry" (*Malpighia punicifolia*, L.) is one of the richest sources of ascorbic acid, containing on the average 1700 mg. per 100 ml., with a range from 1200 to 4000 mg. A clinical test over 12 months is reported with 30 newborn infants given from 25 to 50 mg. ascorbic acid from acerola juice mixed

with apple juice. All showed better than average growth and after 4 months values for blood ascorbic acid ranged, with 1 exception, from 1·5 to 2·7 mg. per 100 ml. Sensitivity tests on 100 children showed that while some were allergic to orange juice, none was allergic to acerola juice.

J. S. Thomson.

3685

CZINA, G., KÖZÉPESY, L. and BIRÓ, L. Der Vitamin-C-Haushalt bei der Lungentuberkulose. [**Vitamin C metabolism in pulmonary tuberculosis.**] *Internat. Ztschr. Vitaminforsch.* 1955, **26,** 262 – 271. [Lungenkrankenabt., Komitätsspital, Gyula.] French and English summaries.

Deficiency of vitamin C was assessed by a modified saturation test in which the vitamin was given intravenously. In normal subjects and in 96 patients with tuberculosis the degree of unsaturation was greater in winter, when all the subjects showed some degree of deficiency, than in summer. The deficit was greater in active than in inactive cases ; treatment with streptomycin or by pneumothorax reduced the degree of deficiency except where there was cavity formation. Patients with tuberculous pleurisy showed a moderate deficit or none.—L. Wills.

3686

EIDELMAN, M. M. Ob izmenenii sposobnosti kolloidov krovi pogloshchat' askorbinovuyu kislotu pri nekotorykh patologicheskikh sostoyaniyakh. [**Changes in the ability of the blood colloids to take up ascorbic acid in some pathological conditions.**] *Vop. Pitan.*, 1956, **15,** No. 1, 32–37. [Ukrain. Inst. Endocrinol., Kharkov.]

3687

SELIGER, H. Der Einfluss der Askorbinsäure auf die Biosynthese der Kortikosteroide und dessen klinische Bedeutung. [**Influence of ascorbic acid on the biosynthesis of corticosteroids and its clinical significance.**] *Ztschr. ges. inn. Med.*, 1955, **10,** 1060–1063. [Schmiedefeld am Rennsteig.]

Studies have been reported showing the stimulating effect of ascorbic acid on biosynthesis of corticosteroids, so tests were made on 4 patients with proved adrenal insufficiency. By giving from 200 to 300 mg. ascorbic acid daily it was possible to increase the production of corticosteroids so that doses of adrenocorticotropic hormone lower by from 30 to 40 per cent. were sufficient. The reduction helped to prevent undesirable side-effects of treatment.—A. M. Copping.

3688

LIMBOS, P. and COURTOIS, G. Un nouveau cas d'onyalai observé à Stanleyville. [**A new case of onyalai observed at Stanleyville.**] *Ann. Soc. belg. Méd. trop.*, 1955, **35,** 187–191. [Hôp. Congolais, Stanleyville.] Flemish summary.

An account was previously given of a case of onyalai in Stanleyville, treated with ascorbic acid (Abst. 3461, Vol. 23).

A second case is now described. The patient, a well nourished native of 30, showed the typical blood bullae in the mouth but no other clinical signs. Deficiency of blood platelets and prolonged bleeding time confirmed the diagnosis. The blood ascorbic acid value was 0·7 mg. per cent. The only treatment was with 2 g. ascorbic acid daily in 4 intravenous injections, and the patient was discharged within a week. He was seen at intervals subsequently. He never relapsed and his blood ascorbic acid value fluctuated from 0·8 to 1·35 mg. per cent. The attack had always been recognised as benign, and it is not considered possible to conclude whether the treatment with ascorbic acid played any significant part in the quick recovery.

E. M. Hume.

See also Absts. 3089, 3700.

Other Vitamins

3689

HARKINS, H. P. **Prevention of postoperative adenotonsillectomy bleeding with vitamin K and vitamin C.** *Ann. Otol. Rhinol. Laryngol.*, 1955, **64,** 1137–1145. [Dept. Otolaryngol., Hahnemann Med. Coll., Philadelphia, Pa.]

When 100 children were given 10 mg. vitamin K and 400 mg. vitamin C daily in divided doses for 5 days before and 5 days after removal of adenoids and tonsils there was a highly significant reduction in the incidence of post-operative bleeding compared with the incidence among 100 similar untreated children. Administration of acetylsalicylic acid did not affect the incidence of bleeding. There was no significant difference between the average bleeding and coagulation times for the groups and no sign of toxicity from the vitamins.

L. Wills.

3690

DOUGLAS, A. S. and DAVIES, P. **Hypoprothrombinaemia in the newborn.** *Arch. Dis. Childhood*, 1955, **30,** 509–512. [United Oxford Hosp.]

Factor V activity in 4 specimens of plasma from 3-day-old infants was the same as in normal adult plasma. Factor VII and prothrombin values in cord blood from 42 infants were low compared with normal adult standards. In 21 infants who received no treatment the values had fallen still further by the third day of life. In the remaining 21 infants who were given 10 mg. vitamin K when the cord blood was taken, the initial values were maintained ; normal adult values were never attained.—L. Wills.

3691

HAUPT, H. Die Blutgerinnung beim Neugeborenen. (Physiologie, Pathologie und Therapie). [**Blood coagulation in the newborn. Physiology, pathology and treatment.**] *Monatsschr. Kinderheilk.*, 1956, **104,** 1–6. [Kinderklin., Univ. Bonn.]

A general article.

3692

THEDERING, F. and BÖWING, G. Der Verminderung der Blutungsgefahr bei der Antikoagulantien-Behandlung mit Cumarinderivaten durch Vitamin K. [**Diminution by means of vitamin K of the danger of haemorrhage during anticoagulant treatment with derivatives of coumarin.**] *Münch. med. Wochenschr.*, 1956, **98,** 340–344. [Med. Klin., Univ. Tübingen.] English and French summaries.

A clinical article.

3693

NAEYE, R. L. **Plasma thromboplastin component : influence of coumarin compounds and vitamin K on its activity in serum.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 101–104. [Dept. Pathol., Coll. Phys. Surg., Columbia Univ., New York.]

DENTAL DISEASES

3694

PHILLIPS, P. H. **Recent progress in dietary research and dental caries.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 110–114. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

3695

DAVIES, G. N. **Dental conditions among the Polynesians of Pukapuka (Danger Island). 1. General background and the prevalence of malocclusion.** *J. Dent. Res.*, 1956, **35,** 115–131. [Dept. Prevent. Dent., Univ. Otago Dent. Sch., Dunedin.]

3696

SAVARA, B. S. and SUHER, T. **Dental caries in children one to six years of age as related to socioeconomic level, food habits, and toothbrushing.** *J. Dent. Res.*, 1955, **34,** 870–875. [Dent. Sch., Univ. Oregon, Portland.]

After more careful evaluation of the socioeconomic status of the parents of 279 of the 650 children previously studied (Title 2289, Vol. 23), it was found that caries incidence was not correlated with parents' income or frequency of toothbrushing, eating between meals, or consumption of cake, pie, ice-cream, jelly, cookies, candy or fresh fruit. There was a small correlation ($r = + 0{\cdot}2$) between caries incidence and frequency of eating canned fruit. Children of more highly educated parents tended to have less caries.—W. M. Deans.

3697

HADJIMARKOS, D. M. **Geographic variations of dental caries in Oregon. 7. Caries prevalence among children in the Blue Mountains region.** *J. Pediat.*, 1956, **48,** 195–201. [Dept. Pub. Health, Dent. Sch., Univ. Oregon, Portland.]

The numbers of decayed, missing and filled (DMF) teeth were recorded for 139 and 172 children aged from 14 to 16 years in Baker and Union counties, respectively. For the combined age groups the rates were 10·5 and 11·2. When the data were assembled with those for other districts (see Abst. 4043, Vol. 19 and earlier parts 5, *Amer. J. Pub. Health*, 1951, **41,** 1052 and 6, *New York Dent. J.*, 1955, **21,** 11) it was seen that in Oregon DMF rates were lower to the east than to the west of Cascade Range. For possible explanation the Weather Bureau's records of sunshine and the F content of water supplies were investigated. The prevalence of caries was related inversely to the amount of sunshine ; the amount of F in drinking water was without effect. Further studies of the first of these and of the effects of selenium (see Abst. 2892, Vol. 22) are suggested.

D. Harvey.

3698

CARTER, W. J., HOERMAN, K. C., ENGLANDER, H. R. and SHKLAIR, I. L. **Oral phosphatase levels and caries activity.** *Science*, 1956, **123,** 325–326. [Sch. Dent., Univ. Kansas City, Mo.]

Phosphatases were estimated in saliva from 100 naval recruits and from 2 other groups each of 26 subjects in whom caries was absent or active. The mean values for acid phosphatase were 4·72, 5·65 and 7·61 units and for alkaline phosphatase 0·57, 0·58 and 0·68 unit, respectively. The differences between the means for the caries-free and caries-active groups were not statistically significant. It is suggested that the enzymes may be present in so many of the organisms normally occurring in the mouth that a connection between them and the occurrence of caries may be masked.

D. Harvey.

3699

JACOBSON, F. L., ESSELBAUGH, N. C. and HARD, M. M. **Dental caries experience among Washington-born and -reared freshman students at the State College of Washington in 1950.** *J. Dent. Res.*, 1956, **35,** 132–136. [Washington Agric. Exp. Stat., Pullman.]

The main purpose of the study was to find an area of high and one of low dental caries for further study of the nutritional and dental state of adolescents.

The method of examination was by bite-wing X-ray survey and in 699 students 20 teeth were examined per student. The average count of decayed, missing and filled (DMF) teeth was 14·64 with the average for women slightly higher than for men. The results were classified on a geographical basis and areas with DMF counts of 16·2 and 13·4 were selected for further study.

F. C. Aitken.

3700

ODLAND, L. M., PAGE, L. and DOHRMAN, S. T. **Dental caries experience of Montana students.** *J. Amer. Dietetic Assoc.*, 1955, **31,** 1218–1222. [Dept. Home Econ. Res., Montana Agric. Exp. Stat., Bozeman.]

Two sets of data are dealt with, the first referring to students of both sexes aged from 16 to 28 years who were natives of and had been brought up in Montana, the second to 2 groups of 15-year-old schoolchildren who had lived their lives at Bozeman and whose drinking water had negligible amounts of F, or at Great Falls with 0·9 p.p.m. F in their water supply.

Scores for decayed, missing and filled (DMF) teeth are tabulated for the students according to sex and age by single year from 16 to 20 +. The average total DMF rate for all 294 subjects was 13·4, for the 170 men 12·0 and for the 124 women 15·2. When the subjects were grouped according to the F content of their water supplies the mean rate was 15·6 for 137 subjects with from 0·0 to 0·2 p.p.m. F and 5·7 for 7 with from 1·2 to 1·7 p.p.m.

Among the children the difference was striking with mean rates 12·2 and 6·3 for DMF teeth at Bozeman and Great Falls, respectively. They were higher for girls than for boys in each place, 13·2 and 11·1 at Bozeman and 6·9 and 5·6 at Great Falls; 7-day diet studies showed that, in general, nutrient intakes were better for boys than for girls. The intake of total carbohydrate was not related in either place to the scores, and from analyses of blood serum there was no evidence that intake of F interfered with utilisation of ascorbic acid.—D. Harvey.

3701

GOLDSWORTHY, N. E. **Observations on the use of fluorine for the partial control of dental caries.** *Med. J. Austral.*, 1953, i, 281–285. [Inst. Dent. Res., United Dental Hosp., Sydney.]

The incidence of chronic endemic dental fluorosis and the addition of fluorine to domestic water supplies are reviewed in relation to the occurrence of dental caries. The advantages and disadvantages of adding fluorine to drinking water are discussed and compared with those of applying fluoride directly to erupted teeth. The mode of action of fluoride in controlling caries is discussed and considered to be different in the two procedures.

Reference is made to the absence of precise information on the incidence of caries in Australia and to the apparent lack of interest among medical men and dentists in the disease and in measures for its prevention.—M. H. Pierce.

3702

AMIES, A. B. P. and PINCUS, P. **Fluorine and dental caries.** *Med. J. Austral.*, 1953, ii, 41–44. [Dent. Sch., Univ. Melbourne.]

A general article discusses the arguments for and against addition of fluorine to drinking water, in its biochemical and socio-economic aspects. Tea drinking on the scale usual in Australia and New Zealand may with some waters make a very important contribution to F intake. The effect of F may be only to postpone and not permanently to prevent the onset of caries. The incidence of caries in Australia is not accurately known and should be ascertained before any large-scale addition of F to water is undertaken.

E. M. Hume.

3703

SULLIVAN, H. R. and GOLDSWORTHY, N. E. **A discussion of dietetic and nutritional factors in relation to dental caries and of difficulties in effecting changes in food habits.** *Med. J. Austral.*, 1954, ii, 136–139. [Inst. Dent. Res., United Dent. Hosp., Sydney.]

The freedom from dental caries of children living in a large home on a diet low in refined carbohydrates (see Abst. 3730, Vol. 24) is used as the text for a general article. The prejudices connected with tradition and social position and the genuine preference for certain foods, especially sweet things, that would have to be overcome before any abandonment of refined carbohydrates could be achieved, are stressed. In addition, in world conditions as they are to-day, there seems to be little place for the raw, unprocessed foodstuff. Concentrated and processed foods that can be stored are necessary.

In attempting to assess the extent to which intake of refined carbohydrate must be reduced in order to decrease dental caries, it is considered that exclusion of snacks and confinement to 3 good meals daily would go a long way in the right direction. It is recognised that preservation of health as such and not for any special purpose is not a strong enough motive to make people change pleasant habits for less pleasant ones.

E. M. Hume.

3704

CLEMENTS, F. W. **The teeth and food.** *Med. J. Austral.*, 1955, i, 297 – 302. [Inst. Child Health, Sydney.]

In a lecture the history of dental caries, modern developments supporting the chemico-parasitic theory of its cause, and the effects of systemic nutrition on tooth structure are discussed. Special reference is made to the importance of sugar in the etiology of caries, and to the influence of social and intellectual environment. Doubt is expressed as to the readiness of the community as a whole to accept any limitation of its sugar intake for the purpose of combating caries.—M. H. Pierce.

3705

MINISTRY OF HEALTH, CANBERRA. **Measures for the partial prevention of dental caries.** *Med. J. Austral.*, 1955, i, 329–330. [Canberra.]

A report on the influence of climate, age and body size on water consumption in reference to fluoridation was accepted by the National Health and Medical Research Council. It was concluded that temperature is the only important climatic factor to be considered. For climatic zones of Australia with normal maximum temperatures from 45° to 100° F. fluorine is recommended to be added to water in p.p.m. from 1·4 to 0·4, decreasing by 0·1 p.p.m. for each 5° rise of temperature.

M. H. Pierce.

3706

HARRIS, R. and CLEMENTS, F. W. **Problems associated with the implementation of restricted carbohydrate diets.** *Dent. J. Austral.*, 1955, **27,** 209–215. [Dept. Prevent. Dent., United Dent. Hosp., Sydney.]

An education programme aimed at control of dental caries through limitation of carbohydrate intake must take account of existing views on the subject held by parents, especially mothers. Some of these views were obtained in group discussions with mothers of pre-school and teen-age children.

F. C. Aitken.

3707

ZIEGLER, E. Kritische Betrachtungen über die Fluordosierung bei den verschiendenen Methoden der Cariesbekämpfung mit Fluor. [**Critique of fluorine dosage in the several methods of combating caries with fluorine.**] *Schweiz. med. Wochenschr.*, 1956, **86,** 252–254. [Konradstrasse 7, Winterthur.]

In a general article recent work is discussed and it is concluded that for children the addition of fluoride to milk assures the correct intake of F, but if water is the vehicle, the intake of F varies with seasonal variations in the intake of water.

L. Wills.

3708

KNAPPWOST, A. Zur Fluor-Prophylaxe der Karies. Magnesiumfluorid und Calciumfluorid als physiologische und hochwirksame Kariesprophylaktika. [**Prevention of caries with fluorine. Magnesium fluoride and calcium fluoride as physiological and effective preventives of caries.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 92–94. [Abt. Phys. Chem., Zahnärztl. Inst., Univ. Tübingen.]

This article includes brief references to work by the author on the mechanism of the prevention by fluorine of caries in the Syrian hamster (*Deutsch. zahnärztl. Ztg.*, 1952, **7,** 670, 681). It is deduced that F has 3 different effects: (1) it favours mineralisation of the teeth, (2) it favours, through its effect on the saliva, re-mineralisation of areas which have begun to be affected by caries, (3) by ion exchange hydroxylapatite is changed into the more resistant fluorohydroxylapatites. Fluoridation of the supply to a single household is advocated, with fluoride tablets, as in Switzerland, where, as, *e.g.*, for people in the country, it is not feasible on a larger scale. Since sodium fluoride tablets do not provide as regular a supply of F throughout the day as does fluoridated water, tablets of the relatively insoluble calcium or magnesium fluoride are recommended. Successful experiments on the prevention, by means of tablets of magnesium fluoride, of caries in hamsters given a cariogenic diet of sugars and white bread will be reported elsewhere.—W. M. Deans.

3709

PETERSON, J. K. and JORDAN, W. A. **Relative caries-inhibiting value of sodium silicofluoride and sodium fluoride.** *J. Dent. Res.*, 1956, **35,** 54–58. [Sect. Dent. Health, Minnesota Dept. Health, Minneapolis.]

In 1953 children in school grades 3 to 7, 610 in all, had topical applications, 4 of sodium silicofluoride on one side of the mouth and 4 of sodium fluoride on the other, or 2 of silicofluoride on one side and nothing on the other, or 1 of silicofluoride on one side and 4 of fluoride on the other. On examination in 1954, silicofluoride seemed to have had some effect in reducing incidence of caries, but less than fluoride; the differences were not significant, and less than half of the children had developed fresh lesions during the year.—W. M. Deans.

See also Abst. 3365.

POISONS: PATHOGENIC ORGANISMS: FOOD LAWS

3710

TIMMERMAN, W. A. Voedselvergiftigingen. [**Food poisoning.**] *Voeding*, 1956, **17,** 92–108.

A chapter for the Jansen textbook on nutrition (see Abst. 3588, Vol. 24).

3711

CUNNINGHAM, R. M. W. **Chemical additions to food as factors possibly contributing to disease.** *Med. J. Austral.*, 1954, i, 819–822. [Dept. Health, Canberra.]

In a general article the toxic nature of certain chemicals, particularly dyes, commonly added to processed foods is discussed in relation to the increased incidence of diseases such as leucaemia and cancer.

It is recommended that food legislation should be examined with a view to banning the addition to food of synthetic substances containing known toxic groupings, and that the possibility of using naturally occurring pigments or compounds chemically similar to them should be further investigated.—M. H. Pierce.

See also Abst. 3365.

IMMUNITY

3712

De Toni, E. (Jr.) and Mitolo, G. R. La sensibilizzazione alle proteine del latte nel lattante. [**Sensitisation to milk proteins in the infant.**] *Lattante*, 1955, **26,** 562–572. [Ist. Clin. Pediat. G. Gaslini, Univ. Genoa.] English summary.

Intradermal tests with injection of 0·10 ml. milk, human and cow's, were made on 130 babies, not perceptibly allergic; 46 were on the breast and 84 were fed on cow's milk. They were in hospital recovering from different diseases, chiefly digestive disturbances. A reaction was classed as positive when within a few minutes a bleb at least 1 cm. in diameter was produced lasting for more than 15 min. All the breast-fed babies gave a negative response to both milks. Of the 84 babies fed on cow's milk, only 24 could be tested with human milk, and all gave a negative response. With cow's milk 10 out of 84 gave a positive result; some of those giving a positive reaction had digestive disturbances, but others had not. The observation is accepted as strong evidence for the superiority of human milk for the human infant.

E. M. Hume.

3713

Collins-Williams, C. **The incidence of milk allergy in pediatric practice.** *J. Pediat.*, 1956, **48,** 39–47. [Allergy Clin., Hosp. Sick Child., Toronto.]

The incidence of cow's milk allergy was 9 in 3000 or 0·3 per cent. Patients seen because of major allergy or referred by doctors as possibly allergic and infants brought for treatment because of suspected milk allergy of the mother were excluded because of the undue proportion of such cases in the practice. The 9 case reports are presented.

F. C. Aitken.

THERAPEUTIC AND PREVENTIVE DIETETICS

GENERAL

3714

Orlandi, E. I regimi senza latte. [**Diets without milk.**] *Lattante*, 1955, **26,** 406–411. [Clin. Pediat., Parma.]

A review.

3715

Schlegel, L. Die Saftfastenkur. [**The juice and fasting cure.**] *Schweiz. med. Wochenschr.*, 1956, **86,** 91–93. [Minervastrasse 17, Zürich.]

Treatment with juices from raw fruit and fresh vegetables and no other food is described for obesity, for heart disease with thrombosis, for high blood pressure and for some forms of generalised dermatitis and eczema. The fasting period with only raw juices could be continued for a few days or even for 2 or 3 weeks. It was not possible to define strictly the duration of treatment because patients differed greatly in response. Best results were obtained with 200 ml. juice 4 times daily with due attention to the physiological state of the patient and care in choice of diet at the end of the fasting period.—A. M. Copping.

3716

Brodsky, W. A. **Problems of dehydration and starvation in postoperative care.** *Amer. J. Surg.*, 1955, **90,** 919–923. [Dept. Paediat., Inst. Med. Res., Sch. Med., Univ. Louisville, Ky.]

3717

Hallman, N., Kauste, O. R. and Wallgren, G. R. **Fat infusions as a source of calories in the postoperative care of surgical pediatric patients: preliminary report.** *Ann. Paediat. Fenn.*, 1956, **2,** 62–68. [Dept. Paediat. Surg., Child. Clin., Univ. Helsinki.]

The problem of achieving a high energy intake in children unable to take sufficient food, if any, by mouth is discussed. A 20 per cent. emulsion of olive oil, with an estimated energy value of 2065 Cal. per litre, has been given intravenously to such children and preliminary results in 15 cases are presented. The results are encouraging and further observations are being made.

F. C. Aitken.

3718

Shafiroff, B. G. P. and Mulholland, J. H. **Effects of intravenous infusion of experimental "instant" fat emulsion into volunteer subjects.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 111–113. [Lab. Exp. Surg., Coll. Med., Univ. New York.]

The preparation of a fat emulsion for immediate intravenous administration is described. The

special emulsifiers obviate the need for homogenisation by pressure. The emulsion was tested in 10 dogs and 46 human subjects. It was fairly well tolerated in 29 of the patients; reactions occurred in the others.—F. C. Aitken.

See also Abst. 3268.

DIABETES

3719

COHEN, A. S. **Current concepts in diabetes mellitus.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 102–109. [U.S. Pub. Health Serv., Dept. Health, Educat. Welfare, Boston, Mass.]

3720

LAWRENCE, R. D. **Three types of human diabetes.** *Ann. Int. Med.*, 1955, **43,** 1199–1208. [London.]

3721

WAGNER, A. **The fallibility of the glucose tolerance test in the aged.** *Geriatrics*, 1955, **10,** 588–594. [Northwestern Univ. Med. Sch., Evanston, Ill.]

Tolerance curves were available for 108 women between 65 and 85 years of age with repeat examinations after 1 year for 82 and after 2 years for 27. They were examined clinically and were free from diabetes, liver disease and thyroid disorder. There was a wide variety of high and prolonged curves. The incidence of certain conditions which might be associated with diabetes was considered in relation to the occurrence of glycosuria, which appeared in 22 subjects during the tests; these conditions were myocardial infarction, albumin and casts in urine, over- or underweight, gain in weight and positive family history of diabetes. No correlation was found between their occurrence and the type of curve. It is concluded that aberration of the tolerance curve should not be taken alone in the diagnosis of diabetes; a complete clinical examination is essential and a persistently high fasting level is better than a high peak as a prognostic.—D. Harvey.

3722

RECHENBERG, H. K. v. Diabetesbehandlung in der heutigen Praxis. **[Treatment of diabetes in practice today.]** *Schweiz. med. Wochenschr.*, 1956, **86,** 274–279. [Med. Poliklin., Univ. Basle.]

3723

VIJAYAKAR, V. A. **Dietetic treatment of diabetes mellitus.** *Antiseptic*, 1956, **53,** 41–44. [Vijaya Villa, 144 Shivaji Park, Dadar, Bombay 28.]

3724

WOODHILL, J. M. and LOGAN, J. L. **Diabetic diets simplified: the core diet.** *Med. J. Austral.*, 1955, i, 960–962. [Royal Newcastle Hosp., N.S.W.]

The system of diets presented, called the core diet, is an extension of the line-ration scheme of R. D. Lawrence (The Diabetic Life, J. and A. Churchill, Ltd., London) and a simplification of that sponsored by the American Dietetic Association and the U.S. Public Health Service (Caso, Abst. 4285, Vol. 20). The two core diets provide 1800 and 2400 Cal. daily, and sample meals are given; there is a substitution sheet of equivalent portions and a list of free foods. The protein content is made as high as practicable, being determined by income as much as anything, and the fat content is as low as practicable. The core diet of 1800 Cal. provides daily about 175 g. carbohydrate, 75 g. protein and 90 g. fat, and that of 2400 Cal. proportionately larger amounts.

E. M. Hume.

3725

SHUMAN, C. R., KEMP, R. L., COYNE, R. and WOHL, M. G. **Clinical use of sorbitol as a sweetening agent in diabetes mellitus.** *Amer. J. Clin. Nutrit.*, 1956, **4,** 61–67. [Temple Univ. Hosp., Philadelphia, Pa.]

Studies were made on 38 diabetic patients from 2 hospitals in Philadelphia who were given daily either three 100-g. helpings or one 200-g. helping of a sorbitol ice-cream containing, in g. per 100 g., fat 4·0, lactose 7·3, protein 4·4 and sorbitol 18. Estimations of glucose in blood during fasting and in urine were made at intervals during sorbitol administration and again when a fat-free sherbet was given with, per 100 g., 2·8 g. lactose, 1·7 g. protein and 17·1 g. sorbitol.

Sorbitol ice-cream did not significantly alter the diurnal blood glucose values in either mild or moderately severe diabetes. It is suggested that sorbitol ice-cream may, without reference to its energy equivalent, be allowed to patients with mild diabetes or moderate diabetes which is under control but that more information is required about its laxative action and its metabolic effects over long periods.—G. F. Garton.

3726

KNOX, K. R. **Management of the overweight diabetic patient.** *Med. Clins. N. Amer.*, 1955, **39,** 1599–1606. [Div. Med., Pennsylvania Hosp., Philadelphia.]

3727

RICKETTS, H. T. **The problem of degenerative vascular disease in diabetes.** *Amer. J. Med.*, 1955, **19,** 933–945.

A review with 91 references.

3728

BERTRAM, F., BENDFELDT, E. and OTTO, H. Indikationen und Erfolge der peroralen Behandlung des Diabetes mellitus mit einem Sulfonylharnstoffderivat. Bericht über 335 Fälle. [**Indications for and results of oral treatment of diabetes mellitus with a derivative of sulphonyl urea. Report on 335 cases.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 274–278. [2. Med. Klin., Allg. Krankenhaus, Hamburg Barmbek.]

For a preliminary report see Abst. 2402, Vol. 26.

Now 335 diabetics, most of whom required insulin, have been treated with N_1-sulphanilyl-N_2-*n*-butylcarbamide, BZ 55, Nadisan (C. F. Boehringer und Söhne G.m.b.H., Mannheim-Waldhof), Invenol (Farbwerke Hoechst A.G., Frankfurt-Hoechst), and some have been under observation for up to 10 months. Studies of clinical chemistry will be reported elsewhere.

With Nadisan, generally 5, dropping to 2, 0·5-g. tablets daily for 10 or 14 days or longer, and diet, good control was achieved in 218 patients. Treatment failed in 85 and the result was doubtful in 32. Since Nadisan seems to have less effect than insulin on the rise of blood sugar after a meal, strict diet is essential. Side effects were few. In a discussion of the indications for treatment, great stress is now laid on constitutional type. The diabetes of the stocky, pyknic, possibly obese person (" Gegenregulationsdiabetes, diabète gras ") generally responded to Nadisan; among 110 patients of this type, the more recent the diabetes and the shorter the treatment with insulin, the better were the results. The amount of insulin previously required did not matter. Successes were much rarer in the more labile diabetes (" Insulinmangeldiabetes, diabète maigre ") found in thin, leptosome persons; and although some of the 41 young diabetics treated hitherto were able to do with less insulin than before, it is considered doubtful how far Nadisan will help them. In coma and pre-coma, Nadisan is useless, though it may be worth trying in mild, symptom-free acidosis.—W. M. Deans.

3729

FERNER, H. and RUNGE, W. Die Langerhansschen Inseln von Diabetikern nach Behandlung mit dem oralen Antidiabetikum BZ 55. [**The islets of Langerhans in diabetics after treatment with the oral remedy BZ 55.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 331–333. [Anat. Inst., Univ. Hamburg.]

Histological post-mortem examination by the silver method of Gros-Schultze or a modification of Gomori's aldehyde fuchsin method of the pancreas of 3 patients with diabetes who had had in all 16, 13·5 and 50 g. of the antidiabetic substance BZ 55, also known as Nadisan (see Abst. 2402, Vol. 26) not long before death from causes other than diabetes, showed no sign of damage to the alpha cells; the islets of Langerhans differed in no way from those of diabetics not treated with BZ 55. It is suggested that BZ 55 acts by inhibiting the function of the alpha cells.—W. M. Deans.

3730

HAUNZ, E. A. **Clinical evaluation of lente insulin in one hundred nine diabetic patients.** *J. Amer. Med. Assoc.*, 1955, **159,** 1611–1618. [Dept. Int. Med., Grand Forks Clin., N. Dak.]

See also Absts. 3642, 3678.

GASTRO-INTESTINAL CONDITIONS

3731

HALLMAN, N., HJELT, L. and TÄHKÄ, H. Über zerebrale Schädigungen nach Gastroenteritis im Säuglingsalter: klinische und histopathologische Untersuchungen. [**Cerebral damage after gastro-enteritis in infants: clinical and histopathological studies.**] *Ann. Paediat. Fenn.*, 1956, **2,** 31–43. [Kinderklin., Univ. Helsinki.]

The cases are discussed of 2 infants who had severe gastro-enteritis at 6 and 7 weeks of age, respectively. Both infants got over the acute illness but neither made a good recovery. Both became spastic. One died at 7½ months with a terminal respiratory infection, the other at 1 year 7 months, mentally retarded. Post-mortem examination revealed in both diffuse destruction of cortical nerve cells, considerable demyelinisation and fibrotic glial formation. It is suggested that the gastro-enteritis and its accompanying K depletion and cerebral anoxia were at least partly responsible for the damage.—D. Duncan.

3732

FREUDENBERG, E. Ist die diätetische Behandlung der Säuglings-Enteritis entbehrlich geworden? [**Is the dietetic treatment of infantile diarrhoea no longer necessary?**] *Acta paediat.*, 1955, **44,** 579–583. [Kinderklin., Basle.] English, French and Spanish summaries.

The rapid feeding programme of Jadrníček and Mores (Abst. 934, Vol. 26) and others is criticised on the grounds that intestinal lesions may be present and that early feeding may result in bulky stools containing much water and minerals.

W. M. Deans.

3733

PATERSON, J. C. S. **The sprue syndrome.** *Amer. J. Med. Sci.*, 1956, **231,** 92–108. [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

A review with 228 references.

3734

FRENCH, J. M. **The aetiology and mechanism of steatorrhoea.** *Postgrad. Med. J.*, 1955, **31,** 299–309. [Univ. Birmingham.]

A review, with references.

3735

WEIJERS, H. A., DICKE, W. K. and VAN DE KAMER, J. H. Enige beschouwingen over coeliakie. [**Coeliac disease.**] *Maandschr. Kindersgeneesk.*, 1955, **23,** 451–461. [Wilhelmina Kinderziekenhuis, Utrecht.]

A review of the toxicity of wheat gluten.

3736

BOYER, P. H. and ANDERSEN, D. H. **A genetic study of celiac disease. Incidence of celiac disease, gastrointestinal disorders, and diabetes in pedigrees of children with celiac disease.** *Amer. J. Dis. Child.*, 1956, **91,** 131–137. [New York.]

Information about the parents, their siblings and the grandparents was obtained by interviewing the parents of 50 children with coeliac disease and 50 without it. The incidence of coeliac disease and gastro-intestinal disorders, but not of diabetes, was significantly greater in the histories of these relatives of the children with coeliac disease than in the relatives of the control group.

F. C. Aitken.

3737

BOTHMA, F. Glutenvrij en eiwitarm brood. [**Gluten-free and low-protein bread.**] *Voeding*, 1956, **17,** 108–112. [Centraal Inst. Voedingsonderzoek T.N.O., Wageningen.]

Instructions were given earlier (Abst. 1727, Vol. 25) for baking buckwheat bread for patients with coeliac disease. Recipes and instructions are given here for bread from cornflour and carob bean meal and for a low-protein bread from wheat starch and carob bean meal. Both are yeast breads.—I. Leitch.

3738

ANDERSON, C. M. **Recent trends in the diagnosis and treatment of coeliac disease.** *Med. J. Austral.*, 1953, ii, 211–213. [Melbourne.]

The story of the incrimination of wheat gluten in coeliac disease is briefly sketched with an account of personal observations on the effect of withdrawing it from and restoring it to the diet of 15 patients. Instructions for a gluten-free diet and recipes for a gluten-free biscuit and loaf are given.—E. M. Hume.

3739

LINDSAY, M. K. M., NORDIN, B. E. C. and NORMAN, A. P. **Late prognosis in coeliac disease.** *Brit. Med. J.*, 1956, i, 14–18. [Brit. Postgrad. Med. Sch., Hammersmith Hosp., London, W.12.]

The condition of 25 adults who suffered from coeliac disease in childhood (Hardwick, Abst. 4885, Vol. 9) was re-assessed. None had received treatment with gluten-free diet. Four were still relapsing or had active disease and 4 showed minor degrees of malabsorption.

The findings support the view that coeliac disease is a chronic relapsing illness.

F. C. Aitken.

3740

MAFFIA, A. J. **Treatment of functional constipation with Prune-Malt.** *Arch. Pediat.*, 1955, **72,** 341–346. [Dept. Paediat., New York Med. Coll.]

The causes of constipation in infants and children are discussed.

Prune-Malt, a mixture containing prune and fig concentrate and non-diastatic malt syrup neutralised with potassium carbonate, was given to 100 constipated children aged 3 weeks to 8 years. Another group of 100 constipated children were untreated controls. As judged from the observations of the mothers during 3 weeks the proportions of children returning to normal and of children improving were greater in the treated than in the untreated group. Acceptability of the Prune-Malt was good in 32 per cent. [tabulated as 132], fair in 47 and poor in 21 per cent.—F. C. Aitken.

3741

DAWSON, A. M. **Continuous intragastric milk drip in the treatment of upper gastro-intestinal haemorrhage.** *Lancet*, 1956, **270,** 73–74. [Gastro-Enterol. Unit, Central Middlesex Hosp., London.]

From a study of 100 patients given routine treatment with, in alternate cases, 6 pints of milk in 24 hr. by intragastric drip, there was no evidence that healing of the ulcer could be hastened or that recurrence of haemorrhage could be prevented.

D. Harvey.

3742

DOLL, R., FRIEDLANDER, P. and PYGOTT, F. **Dietetic treatment of peptic ulcer.** *Lancet*, 1956, **270,** 5–9. [Gastro-Enterol. Dept., Central Middlesex Hosp.]

Thirty-two hospital patients with gastric ulcer were given the standard ulcer diet in 2-hourly feeds and a comparable group had normal hospital diet without fried food but with snacks at 10 a.m. and 9 p.m. Half the patients in each group received a full course of milk by intragastric drip. After 1 month the number of healed and nearly healed ulcers was not significantly different in the 2 groups. Gain of weight was not significantly different between the groups given milk drip, but for patients without milk drip, weight gain was

significantly greater in those on normal than in those on the ulcer diet. Patients on normal diet complained more frequently of pain but this may have been due to anxiety about the possible effect of unrestricted diet.

Two groups of outpatients with gastric and duodenal ulcers were advised in the one case to continue on ulcer diet and in the other to change to normal diet. Both were given supplies of alkaline powder for relief of pain. The percentage of patients re-admitted to hospital because of failure of treatment was higher in the first than in the second. The percentages of patients in whom ulcers were found to be healed at the end of 1 year and of patients who were free of pain during this time were about the same in the 2 groups.

It is concluded that dieting with bland foods does not increase the rate of healing of peptic ulcers.

F. C. Aitken.

3743

DOLL, R., PRICE, A. V., PYGOTT, F. and SANDERSON, P. H. **Continuous intragastric milk drip in treatment of uncomplicated gastric ulcer.** *Lancet*, 1956, **270**, 70–73. [Statistical Res. Unit, Med. Res. Counc.]

There were 164 patients, all of whom were given standard basic medical treatment and half of whom received the milk, some with and others without added alkali as sodium bicarbonate. In 2 patients the amounts of alkali were 80 and 140 g. daily. Effects were measured objectively by the rate of healing of the ulcer, which was studied radiographically (see Abst. 2771, Vol. 25), and subjectively by the patients' descriptions of symptoms. The number of ulcers which healed completely and the extents to which others improved were the same in patients with and without milk. There was evidence that relief of pain was quicker in those with than in those without milk and that the giving of alkali was advantageous. Average gain in bodyweight in the milk group, 7 lb. 0 oz., was greater than in the group without milk, 3 lb. 8 oz., and the advantage was found to persist nearly 3 months after the date of discharge from hospital.—D. Harvey.

3744

CROWE, P. J. and GOULSTON, S. **Post-gastrectomy dietary management.** *Med. J. Austral.*, 1954, ii, 430–433. [Clin. Res. Unit, Royal Prince Alfred Hosp., Sydney.]

The importance of diet in the prevention or reduction of post-gastrectomy syndromes, malnutrition and debility is discussed. The types of food recommended, and detailed menus for the 3 months after operation, are given, with the proximate composition and energy value of the diet. Six small meals are given daily; the aims are an early introduction of sufficient protein and energy to combat the loss of N and K which follows operation and a gradual increase in food intake each week.—M. H. Pierce.

3745

MORIN, M., GRAVELEAU, J., LAFON, J., LABET, R. and PÉROL, R. À propos des syndromes multicarentiels des gastrectomis pour ulcères. [**Multiple deficiency syndromes in patients gastrectomised on account of ulcers.**] *Presse méd.*, 1955, **63**, 1798–1801. [Serv. Méd. Gén., Centre Méd.-Chirurg. Foch, S.N.C.F., Suresnes.]

3746

MORETTI, G. and GEYER, A. Le syndrome carentiel complexe post-gastrectomie. Étude clinique, biologique et histochimique. [**The complex deficiency syndrome after gastrectomy. A clinical, biological and histochemical study.**] *Presse méd.*, 1956, **64**, 226–231. [Chaire de Clinique, Bordeaux.]

This complex nutritional deficiency, a late sequel to gastrectomy, was first described by Lambling and Conte (*Bull. et Mém. Soc. méd. Hôp. Paris*, 18 February 1949, 151); it is quite distinct from the "dumping syndrome". Detailed case histories are given for 4 patients, all men, of whom 3 were edentulous and addicted to alcohol and 2 had tuberculosis; post-mortem findings are given for 2 of them. The main signs, which developed from 3 months to 6 years after operation, were diarrhoea, emaciation combined with oedema of the legs, anaemia with normal colour index, low blood protein and, in some, skin and mouth lesions suggestive of vitamin deficiencies. Two recovered on a regime of frequent small feedings of a diet mainly of skimmed milk fortified with synthetic amino acids and other nutrients, coupled with other measures. The etiology is discussed and it is considered that, in essence, the causes are mechanical disturbance due to overloading of the small intestine with unprepared food, and diminished production of pancreatic enzymes; a vicious circle is produced, leading to changes which unless promptly treated are irreversible.

W. M. Deans.

See also Absts. 2787, 3133, 3618.

THYROID DISEASE

3747

CLEMENTS, F. W. **The problem of endemic goitre.** *Med. J. Austral.*, 1953, ii, 251–254. [Inst. Child Health, Sydney.]

See Abst. 5292, Vol. 24.

3748

CLEMENTS, F. W. **A thyroid blocking agent as a cause of endemic goitre in Tasmania: preliminary communication.** *Med. J. Austral.*,

1955, ii, 369–371. [Inst. Child Health, Univ. Sydney.]

Two surveys of schoolchildren with an interval of 5 years between them supported the view that something other than deficiency of I in the diet was responsible for the occurrence of a significant amount of goitre in Tasmania. Tablets of KI were distributed to the children after the first survey, and the second survey showed a lower incidence among older age groups and in some districts, but in the younger children and in other districts it was higher. Between the two surveys there had been an increase in milk consumption and in the production of a forage crop, Chou Moellier or thousand-headed kale, one of the Brassicae.

The influence on the rate of accumulation of ^{131}I in the thyroid gland, of milk from cows fed on Chou Moellier compared with that of milk from cows not given kale, was studied for 10½ hr. after administration in single doses of 10 μC. to each of 5 girls aged 10 years and of 20 μC. to one adult subject, during which time they drank from 1½ to 3 pints milk. This and other tests showed that the milk from cows fed on Chou Moellier interfered significantly with the uptake of ^{131}I, suggesting that it contained an antithyroid substance, the nature of which is being investigated.

M. H. Pierce.

3749

Muñoz, J. A., Perez, C. and Scrimshaw, N. S. El bocio endemico en Guatemala. [**Endemic goitre in Guatemala.**] *Bol. Ofic. sanit. panamer.*, 1955, **39**, 458–463. [Inst. Nutric. Centro Amér. y Panama, Guatemala.]

Clinical examination of 39,484 subjects in 3 areas of Guatemala showed an average of 38·5 per cent. with simple goitre. Seventy per cent. of the subjects examined were schoolchildren, 2 per cent. were under school age and 28 per cent. were adults. The sample included 1·4 per cent. of the population. The highest incidence of goitre was 65 per cent. in one island mountainous region, and incidence was high in other inland areas. Endemic goitre appears to be a serious public health problem in Guatemala and addition of iodine to salt is recommended. Since much of the salt used is unrefined, and the climate is damp, the use of potassium iodate is suggested.—A. M. Copping.

3750

Stuart, A. E. **The pathology of goitre in Tasmania.** *Med. J. Austral.*, 1955, i, 920–922. [Dept. Pathol., Launceston Gen. Hosp., Tasmania.]

Thyroid glands taken at 204 consecutive autopsies of 132 males and 72 females were weighed and examined histologically. Colloid and parenchymatous types of nodule were found. Of the females 18 and of the males 15 had multinodular glands, of which only about half were large enough to constitute a goitre when 70 g. was taken as the upper limit of weight of a normal gland. The histological appearance of what were considered to be early stages in goitre formation is described. Goitre material from Tasmania appeared not to differ from that from America or Switzerland. Experience with iodine prophylaxis led to the conclusion that simple dietary deficiency will not account for the prevalance of goitre in Tasmania. The occurrence of a natural goitrogenic agent is suspected.

E. M. Hume.

3751

Greenwald, I. **Observations on the history of goiter in Ohio and in West Virginia.** *J. Hist. Med.*, 1955, **10**, 277–289. [Coll. Med., Univ. New York.]

This study, one of a series on the history of goitre, deals with aspects of the disease in Ohio, particularly along the shores of Lake Eire, and in West Virginia. The view that goitre was caused by a change from coarse unpurified salt to a more refined product has been re-examined and found to be untenable. It is claimed that goitre has almost disappeared and that there is no evidence that iodised salt had anything to do with this.

B. W. Simpson.

3752

Turner, H. H. and Howard, R. B. **Goiter from prolonged ingestion of iodide.** *J. Clin. Endocrinol.*, 1956, **16**, 141–145. [Univ. Oklahoma Sch. Med., Oklahoma City.]

Seven boys and 6 girls between 5 and 17 years of age were treated for asthma with iodine as HI, KI or Lugol's solution for from 2 to 5 years. At the end of that time all had enlarged thyroid glands. When these drugs were replaced by desiccated thyroid the size of the thyroid decreased and signs and symptoms of hypothyroidism were less.

During treatment with I there was a slow uptake of ^{131}I. The uptake approached normal when iodides were omitted, although protein-bound I (PBI) in serum sometimes remained high. After 60 mg. desiccated thyroid had been given daily for 90 days there was a slight fall in ^{131}I uptake, but when desiccated thyroid had been discontinued for 5 weeks both the uptake of ^{131}I and the level of PBI were normal. It is suggested that this effect of iodides on thyroid size is a response peculiar to the thyroids of asthmatics. Three case histories are given.—B. W. Simpson.

3753

Bongiovanni, A. M., Eberlein, W. R., Thomas, P. Z. and Anderson, W. B. **Sporadic goiter of the newborn.** *J. Clin. Endocrinol.*, 1956, **16**, 146–152. [Dept. Endocrinol., Child. Hosp., Philadelphia 46, Pa.]

Case reports of 3 newborn infants are given. The possibility is discussed of the neonatal goitre being caused by iodides, sulpha drugs or thiouracil derivatives taken by the mother and transmitted across the placenta. In the absence of respiratory difficulties, the goitres of the infants diminished within a few days or weeks. If there was risk of death from asphyxia, subtotal thyroidectomy was preferable to tracheotomy.—B. W. Simpson.

3754

HOSTOMSKÁ, L., HORÁČKOVÁ, M., HRUBCOVÁ, M. and MALÝ, V. **Studies of the treatment of goiter in children without functional disturbances.** *Ann. paediat.*, 1955, **185,** 333–347. [2. Paediat. Clin., Charles Univ., Prague.] German and French summaries.

Children numbering 1931, between the ages of 3 and 15 years and without functional disturbance, were given thyroglobulin in amounts supplying from 250 to 1000 μg. organic I daily. Treatment lasted for from 1 to 5½ years, average 3 years. The results of treatment did not depend on sex or on the age at which it was begun; its duration was of much more importance. More goitres were cured or improved and fewer deteriorated the longer the period of treatment.

To assess its effects, children who had taken thyroglobulin for 4 years were compared with others who did not take it; all had iodised salt providing between 120 and 180 μg. I daily. For small goitres cure or improvement occurred in 70·6 and no change or worsening in 29·4 per cent. of the treated group with 194 children; corresponding values for the untreated group of 131 were 32·8 and 67·2 per cent., respectively. The findings for medium goitres were similar; the numbers with large goitres were too small to allow comparison.

There was evidence that the proportion of small goitres which remained unchanged was smaller in Prague than in the mountainous district of Sušice. The more numerous changes in Prague were both for better and for worse.—B. W. Simpson.

3755

LEVY, R. P., KELLY, L. W. and JEFFERIES, W. M. **The effects of thyrotropin and desiccated thyroid upon hypothyroidism with goiter.** *Amer. J. Med. Sci.*, 1956, **231,** 61–68. [Dept. Med., Sch. Med., Western Reserve Univ., Cleveland, Ohio.] Interlingua summary.

3756

FRAWLEY, T. F., MCCLINTOCK, J. C., BEEBE, R. T. and MARTHY, G. L. **Metabolic and therapeutic effects of triiodothyronine.** *J. Amer. Med. Assoc.*, 1956, **160,** 646–652. [Subdept. Endocrinol., Albany Med. Coll., N.Y.]

Fourteen patients with myxoedema were studied to compare the therapeutic effects of DL-triiodothyronine hydrochloride, L-triiodothyronine, sodium L-thyroxine and desiccated thyroid. Each was effective in raising body temperature, accelerating pulse, increasing rate of oxygen consumption, decreasing bodyweight and reducing levels of cholesterol and carotenoids in blood. L-Triiodothyronine was about twice as active as DL-triiodothyronine and from 1½ to 2½ times as active as sodium L-thyroxine. The advantages and disadvantages of triiodothyronine are discussed.—F. C. Aitken.

See also Abst. 2825.

ANAEMIA

3757

WATSON, R. J. and LICHTMAN, H. C. **The anemias.** *Med. Clins. N. Amer.*, 1955, **39,** 735–749. [Dept. Med., State Univ. New York Coll. Med., Brooklyn.]

3758

WOLFF, J. A. and GOODFELLOW, A. M. **Haematopoeisis in premature infants with special consideration of the effect of iron and of animal-protein factor.** *Pediatrics*, 1955, **16,** 753–762. [Dept. Paediat., Coll. Phys. Surg., Columbia Univ., New York.]

Two groups of premature infants of birthweight less than 1200 g. and between 1200 and 1500 g. were subdivided into control and treated groups. In all, 81 infants were studied. Treatment consisted daily of 1 or 16 mg. Fe or 3 capsules of animal-protein factor, containing aureomycin 5, vitamin B_{12} 1·5 and Fe 0·3 mg. Treatment with Fe was begun within the first 10 days of life and with animal-protein factor before the 21st day.

Estimations of Hb, total counts of red cells, reticulocytes and platelets and differential counts of leucocytes were made and are tabulated for the first 12 weeks of life. In both groups, irrespective of birthweight, the lowest Hb value occurred about the eighth or ninth week; there was no evidence that degree of anaemia was related to birthweight. No treatment prevented or reduced the degree of anaemia during the first 3 months, but limited data for later months suggested that treatment with Fe prevented the occurrence of anaemia at 1 year of age.—F. C. Aitken.

3759

WINTER, S. T., MUNDEL, G. and SALOMON, H. **Intravenous iron therapy in anaemia in children.** *Ann. paediat.*, 1955, **185,** 362–368. [Rambam Govt. Hosp., Haifa, Israel.] German and French summaries.

Ten children with Fe-deficiency anaemia were successfully treated with a single massive dose of

saccharated iron oxide given by slow intravenous drip in a large volume of isotonic glucose solution. Side effects were slight.—F. C. Aitken.

3760

JHATAKIA, K. U. **Cobalt with iron in the treatment of iron deficiency anaemias.** *J. Indian Med. Assoc.*, 1956, **26,** 126–129. [Sir J. J. Hosp., Bombay.]

Twenty-five patients with anaemia, judged to require Fe, were treated with Fe and Co by vein. The types of anaemia, etiology, red cell count and Hb before and after treatment, the amounts of Fe and Co given during treatment and side reactions are tabulated. In most cases anaemia was microcytic hypochromic; in some it was normocytic hypochromic or macrocytic normochromic. The response to Fe with Co was better than in a previous series given Fe alone.

F. C. Aitken.

3761

GRUNBERG, A. and BLAIR, J. L. **Treatment of hypochromic anemia with an intramuscular iron-dextran complex.** *Arch. Int. Med.*, 1955, **96,** 731–733. [St. Catherine's Hosp., Birkenhead.]

Thirty patients were treated. No difficulty was met in administration or from side effects, and treatment, as judged by haematological studies, was successful. Five case reports are presented.

F. C. Aitken.

3762

SCHLAGETTER, K. Die Bedeutung der Knockenmarksuntersuchung für die Diagnose der Anämien in der Geburtshilfe. [**The importance of study of the bone marrow for the diagnosis of anaemia in obstetrics.**] *Arch. Gynäkol.*, 1954–55, **185,** 641–674. [Frauenklin., Akad. Med. Forsch., Justus-Liebig-Hochsch., Giessen.]

A plea is made that, whenever the peripheral blood picture does not allow a clear differential diagnosis in anaemia of pregnancy and the puerperium, sternal puncture should be made. This should be a routine procedure in severe anaemia when Hb is 8 g. per 100 ml. or less.

The normal picture of the bone marrow in the last month of pregnancy is described. Descriptions and some illustrative case histories are given of the findings in Fe deficiency, infections, haemolytic icterus and megaloblastic anaemia of the puerperium. There are many references.

D. Duncan.

3763

RAINER, O. and ZOLLNER, S. Die Anämien nach totaler Gastrektomie. (Versuche zur Prophylaxe und Behandlung.) [**Anaemia after total gastrectomy. (Attempts at prevention and treatment.)**] *Langenbecks Arch. klin. Chirurg.*, 1955–56, **281,** 371–381. [2. Med. Abt., Landeskrankenhaus, Klagenfurt.]

Anaemia occurred in 59 patients up to 4 years after total removal of the stomach. All had vitamin B_{12}, 30 μg. intramuscularly every fortnight, and the only patient who developed pernicious anaemia had omitted this treatment for 2 years. The others had hypochromic or normochromic anaemia of different degrees of severity, and a clinical picture of Fe deficiency. Absorption of Fe from Ferrogluconate in 5 patients, as estimated from the increase in serum Fe, was adequate. In patients with enteritis Fe was not absorbed in sufficient quantity and parenteral Fe was necessary. The signs of Fe deficiency appeared in the first year after operation in 35 of the patients; it is suggested that early treatment with Fe would have prevented most of this anaemia. Prophylactic doses of vitamins C and B complex are advised.—D. Duncan.

3764

DURÁN SACRISTÁN, H. Anemias e hipoproteinemias en los enfermos cancerosos. [**Anaemia and hypoproteinaemia in cancer.**] Tratamiento de las anaemias e hipoproteinemias de los enfermos cancerosos. [**Treatment of anaemia and hypoproteinaemia in cancer.**] *Rev. clín. española*, 1955, **59,** 353–375; 414–420. [Cát. Patol. Quirúrg., Fac. Med., Madrid.]

A review with clinical examples and 121 references.

3765

WYATT, J. P. **Patterns of pathological iron storage. 1. The nature and significance of transfusional siderosis and its relationship to idiopathic hemochromatosis and allied conditions. 2. Exogenic siderosis in chronic anemia due to prolonged oral iron medication.** *Arch. Pathol.*, 1956, **61,** 42–55; 56–61. [Dept. Pathol., Sch. Med., Univ. St. Louis, Mo.]

2. Post-mortem examination was made of 4 elderly subjects, aged 76 to 81 years, who had received large doses of Fe by mouth for from 2½ to 11 years; one had received Fe also by vein. All showed much Fe in the liver parenchyma and pancreas and had hypercellular bone marrow without much stainable Fe. Gastric mucosa was normal. The total Fe load was not as great as in patients with idiopathic haemochromatosis.

D. Duncan.

See also Absts. 3661-72.

OTHER CONDITIONS

3766

HEPNER, R., FLETCHER, M. C., DESMOND, M. M., HUNT, H. and BRANDON, S. **Retrolental fibroplasia. Influence of reduced electrolyte**

intake on the incidence and severity of the disease. *J. Pediat.*, 1956, **48,** 34–38. [Dept. Paediat., Univ. Texas Med. Branch, Galveston.]

Groups of premature infants weighing 1700 g. or less at birth were fed on human milk or on cow's milk mixtures with the electrolyte content either of cow's or of human milk. The incidence of retrolental fibroplasia in the whole sample of 142 infants was 36 per cent. The incidence and severity of the disease were not influenced significantly by the diet.—F. C. Aitken.

3767

MARSHAK, M. S. Organizatziya lechebnogo pitaniya v nochnykh sanatoriyakh promyshlennykh predpriyatiyakh. [**Organisation of therapeutic diet in industrial night sanatoria.**] *Vop. Pitan.*, 1956, **15,** 48–52. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

Some 75 to 85 per cent. of the patients in night sanatoria are active workers and the daily requirements are estimated to be 3500 to 4000 Cal., 120 to 140 g. protein, 115 to 135 g. fat and 500 to 550 g. carbohydrate. The special needs of the tuberculous worker are plenty of milk protein, methionine, calcium salts, some vegetable oil for lipotropic substances, Cu and vitamins. General principles for constructing diets suitable for these sanatoria are discussed.—D. Duncan.

3768

MONAT, H. A. **Nutrition of aged cardiac patients.** *Geriatrics*, 1955, **10,** 581–582. [Washington, D.C.]

3769

MORRISON, L. M. **A nutritional program for prolongation of life in coronary atherosclerosis.** *J. Amer. Med. Assoc.*, 1955, **159,** 1425–1428. [Crenshaw Hosp., Los Angeles, Calif.]

The two groups of patients with atherosclerosis, one given a diet low in fat and cholesterol and the other unrestricted in food, whose condition had been reviewed at the end of 3 years (see Abst. 5441, Vol. 21), were re-examined after 8 years. The survival rates were 56 per cent. in the treated and 24 per cent. in the untreated group. There was no further significant change of weight in the treated subjects.—F. C. Aitken.

3770

MCDERMOTT, W. V. (Jr.), WAREHAM, J. and RIDDELL, A. G. **Treatment of "hepatic coma" with L-glutamic acid.** *New Engl. J. Med.*, 1955, **253,** 1093–1102. [Surg. Serv., Massachusetts Gen. Hosp., Boston.]

The treatment, which aimed at control of the associated ammonia intoxication, was unsuccessful where the encephalopathy was acute and spontaneous, but resulted in improvement in some patients in whom it was acute and exogenous or chronic.—F. C. Aitken.

3771

SCHULZE, E. Über mögliche Gefahren einer eiweissreichen Kost bei Leberkrankheiten. [**Possible dangers of a protein-rich diet for patients with liver disorders.**] *Deutsch. med. Wochenschr.*, 1955, **80,** 1915–1916. [Bad Kissingen.]

An editorial review.

3772

WAHI, P. N. **Nutritional liver disease and its therapeutic considerations.** *J. Indian Med. Assoc.*, 1955, **25,** 558–561. [Dept. Pathol., S.N. Med. Coll., Agra.]

3773

DAVIDSON, C. S. **Cirrhosis in alcoholics—protein nutrition and hepatic coma.** *J. Amer. Med. Assoc.*, 1956, **160,** 390–391. [Boston, Mass.]

3774

HUMPHREY, D. C. **Treatment of chronic renal failure.** *Med. Clins. N. Amer.*, 1955, **39,** 1035–1040.

3775

CAREY, L. S. **Obesity.** *Med. Clins. N. Amer.*, 1955, **39,** 1701–1709. [Dept. Med., Jefferson Med. Coll., Philadelphia, Pa.]

3776

FLÓREZ-TASCÓN, F. J. and SANZ FERNÁNDEZ, P. Consideraciones clinico-terapeuticas sobre la obesidad y el sindrome hiperostosico endocraneal neuroendocrino. [**Clinical and therapeutic discussion of obesity and the syndrome of neuroendocrine endocranial hyperostosis.**] *Rev. clín. española*, 1955, **59,** 229–249. [Serv. Med. Int., Hosp. Militar. Central, Madrid.] English, German and French summaries.

"Endogenous" causes of obesity are discussed. Case histories are given of 25 women and 4 men aged from 14 to 73 years. Nearly all had disturbed sexual function and nervous symptoms, and X-rays revealed a high incidence of hyperostosis in the cranium. Treatment was by diet, drugs which modified appetite, such as 2-phenyl-3-methyl-tetrahydro-1 : 4-oxazine, exercise, diuretics and psychiatric methods.—D. Duncan.

3777

VAGUE, J. **The degree of masculine differentiation of obesities : a factor determining predisposition to diabetes, atherosclerosis, gout, and uric calculous disease.** *Amer. J. Clin. Nutrit.*, 1956, **4,** 20–34. [Fac. Méd., Marseilles.]

3778

WEIL, M. H. **Polycythemia associated with obesity.** *J. Amer. Med. Assoc.*, 1955, **159,** 1592–1595. [Dept. Med., Med. Sch., Univ. Minnesota, Minneapolis.]

A form of polycythemia (defined by Hb value persistently above 19 g. per 100 ml.) occasionally found in obese persons is described, with 3 case histories. It differed from *polycythemia vera* in that there was no increase of immature cells, white cells or platelets in the peripheral blood, and the bone marrow was normal. Arterial oxygen saturation was only slightly depressed and cyanosis was absent. As weight was reduced by diet treatment, the Hb and haematocrit values returned to normal. The condition is considered to be secondary polycythemia produced by inadequate pulmonary ventilation resulting from deposits of fat in or about the thorax.—W. M. Deans.

3779

TEREPKA, A. R. and WATERHOUSE, C. **Metabolic observations during the forced feeding of patients with cancer.** *Amer. J. Med.*, 1956, **20,** 225–238. [Dept. Med., Sch. Med., Univ. Rochester, N.Y.]

Nine patients with growing cancers underwent studies of energy, N, P, Ca, K, Na and Cl balance before, during and after periods of forced feeding with concentrated preparations by mouth, sufficient to raise energy intakes to the previously determined levels of energy expenditure.

Large gains of weight occurred during forced feeding, due in the main to accumulation of large quantities of intracellular fluid; afterwards loss of weight was rapid. There was transient benefit in a few, but in about half of the patients forced feeding did harm, as judged by significantly higher energy expenditure and basal metabolic rate and by clinical data.

The significance of the metabolic changes found is discussed.—F. C. Aitken.

3780

SWANK, R. L. **Treatment of multiple sclerosis with low-fat diet: results of five and one-half years' experience.** *Arch. Neurol. Psychiat., Chicago*, 1955, **73,** 631–644. [Div. Neurol., Med. Sch., Univ. Oregon, Portland.]

In continuation of a study of 47 patients treated with low-fat diet (Abst. 5131, Vol. 23), results are summarised of the effects of 4 to 6 years' treatment. Control of diet appeared to lessen the severity of the disease, especially in patients treated in the early stages. The hypothesis is discussed that in multiple sclerosis there is a basic defect in the suspension stability of the blood which is upset by the hyperlipaemia which follows heavy fat meals. Diet instructions are appended.—F. C. Aitken.

3781

SCHÖNENBERG, H., SCHMIDT, D. and WÖNCKHAUS, I. Der Phenylbrenztraubensäure - Schwachsinn. 12 eigene Beobachtungen. [**Mental deficiency and phenylpyruvic acid. Twelve new studies.**] *Ztschr. Kinderheilk.*, 1955, **77,** 363–383. [Kinderklin., Univ. Münster, Westf.]

Case histories are given of 12 patients with phenylpyruvic oligophrenia, aged from 1 to 52 years; 11 were found among over 3000 inmates of mental hospitals and 1 among over 2000 children in special schools. Only 8 of them were blond, and other physical pecularities were such as are common in other types of mental defect; the only distinctive sign was the high phenylalanine content of blood and urine. Excretion of other amino acids was not remarkable and varied greatly between individuals. There was no mental improvement in 2 treated with large amounts of vitamin C, daily for 4 weeks 2 ml. Cebion forte intramuscularly or 5 ml. Vitamin C forte intravenously; in 1 of these *l*-tyrosine, 30 mg. per kg., was likewise of no effect, nor did it reduce the phenylalanine content of blood or urine.—W. M. Deans.

3782

MARTÍNEZ PÉREZ, F. Oligofrenia fenilpiruvica. [**Phenylpyruvic oligophrenia.**] *Rev. española Pediat.*, 1955, **11,** 577–580. [Elda, Alicante.]

Report of a case.

3783

CIFUENTES DELATTE, L. and CANOA, E. Cristaluria, litiasis urica y gota. Estudio fisiopatológico. [**Urinary crystals, uric acid lithiasis and gout: physiopathological study.**] *Rev. clín. española*, 1955, **59,** 139–152.

A review with 82 references.

3784

COLBOURNE, M. J. (with SOWAH, E. M. A.) **Does milk protect infants against malaria?** *Trans. Roy. Soc. Trop. Med. Hyg.*, 1956, **50,** 82–90. [Gold Coast Med. Serv., Accra.]

African infants born in Accra were studied closely for the first 6 months of their lives during the malaria season. There were 2 groups, one of 27 given a yeast tablet with 3 mg. *p*-aminobenzoate daily to test its efficacy in preventing infection and the other of 28, intended as a control group and given 0·5 ml. cod liver oil daily as a placebo. Treatment began at age between 2 and 4 weeks. Records were kept of the times at which the change from breast to mixed feeding was made; over the 6-month period records were complete for 39 infants, 17 in the yeast and 22 in the control group. Of these, 23 acquired malaria, 12 in the yeast and 11 in the control group.

In the control group positive slides were found in 7 before mixed feeding began. An early beginning to it did not, from the small numbers available, appear to increase susceptibility.

In the yeast group slides were positive in 9 before the start of mixed feeding and, from the fourth to the sixth months, it seemed that this group was the more susceptible. Estimations of *p*-aminobenzoate in samples of milk from 10 mothers showed, on the average, only minute amounts, free 44·6 μg. and total 92·6 μg. per litre. In these infants the yeast with its *p*-aminobenzoate seemed to have facilitated rather than prevented infection.—D. Harvey.

See also Absts. 3254, 3326, 3344, 3345, 3636-39, 3648, 3656, 3660, 3674-76, 3685, 3686, 3688, 3752.

6. FEEDING OF ANIMALS

GENERAL, INCLUDING DIGESTIBILITY TRIALS

3785

DUCKWORTH, J. **The feeding of livestock.** *J. Roy. Agric. Soc. Engl.*, 1955, **116,** 126–137. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

3786

BROUWER, E. Voeding van huisdieren. [**The feeding of domestic animals.**] *Voeding*, 1956, **17,** 50–72.

A chapter for Jansen's textbook on nutrition (see Abst. 3588, Vol. 24).

3787

CRASEMANN, E. Über die Wirkung des Nahrungseiweisses beim landwirtschaftlichen Nutztier. [**Effect of diet protein on farm animals.**] *Schweiz. Landwirtsch. Monatsh.*, 1955, Nos. 9/10, pp. 11. [Inst. Haustierernährung, Eidg. Techn. Hochsch., Zürich.]

A general discussion.

3788

ENGLER, H. Versuchstätigkeit auf dem Gebiete der Haustierernährung, auch eine Hilfe für technisch unterentwickelte Länder. [**Research in stock feeding, an aid to technically underdeveloped lands.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag Prof. Crasemann, 10–12. [FAO, Rome.]

A short article with special reference to the possibility of improving the diet in rice-eating countries by increasing the production of eggs, at present on the average only 60 per hen annually, except in Japan, where it is over 120.

W. M. Deans.

3789

KLEIBER, M. Rückwärts oder vorwärts vom Stärkewert? [**Backwards or forwards from starch equivalent?**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag Prof. Crasemann, 6–9. [Div. Animal Husb., Univ. California, Davis.]

It is contended that the "Kellner unit" based on net energy, suggested by Fuchs and modified by Nehring (Abst. 2816, Vol. 25), is not an improvement on starch equivalent and the name is misleading. Net energy is useful for comparing the efficiency of different processes, *e.g.*, of fattening cattle with that of fattening pigs; starch equivalent for comparing the nutritive value of one feed with that of another. For the second purpose, going back to net energy represents a failure to recognise Kellner's advance on Armsby's method, and a misguided striving after "absolute" standards. On the other hand, as has been shown by the present author and colleagues (Title 4978, Vol. 16; *Hilgardia*, 1945, **16,** 511) for chickens and dairy cows, the principle of equivalents can be extended by using as reference, instead of starch or barley, a mixture of glucose and casein adjusted so as to have the same protein ratio as the feed under test. For example, for milk production 1 kg. barley is equivalent to 1 kg. glucose plus 90 g. casein.—W. M. Deans.

3790

GEERING, J. and BACHMANN, F. Beitrag zur Rauhfutterbewertung. [**Estimating the value of roughage.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag Prof. Crasemann, 32–36. [Eidg. Landwirtsch. Versuchsanst., Zürich-Oerlikon.]

This is a preliminary report on work it is hoped to publish in fuller detail later. In the hope of finding useful correlations between the starch equivalent of a roughage and some chemical constituent, 22 samples of hay, aftermath and dried grass of very varied quality, which had been used in digestibility experiments with sheep at the *Institut für Haustierernährung*, and the corresponding faeces, were analysed.

The best inverse correlations ($r^2 = 0{\cdot}88$, 0·87) were with material insoluble in hot dilute (1·75 per cent.) HCl and with the lignin content of the dry matter; the next best was with crude fibre by

the Weende method. The corresponding regression equations are given. Close inverse correlations ($r^2 = 0{\cdot}92$, $0{\cdot}87$) were also found between lignin content and percentage digestibility of organic matter or of crude protein, and the regression equations are given. A test with pea pods and millet chaff indicated that the regression equation for starch equivalent on lignin, but not that on crude fibre, might be applicable to other types of roughage, but further investigation is required.—W. M. Deans.

3791

HÜNI, K. Die näherungsweise Berechnung des Futterwertes von Mischfutter. [**Estimation of the approximate feeding value of a mixed ration.**] *Schweiz. Landwirtsch. Monatsh.*, 1955, No. 6, pp. 4. [Eidg. Agrikulturchem. Versuchsanst., Liebefeld-Berne.]

Calculation of the approximate composition was possible when mixed rations were made up according to certain principles: a mixture must contain no component feedingstuff not digestible by the species for which it was intended; components with good digestibility but a high crude fibre content should not make up more than 10 per cent. of the ration; oilseed residues should be used as extraction products, except that 10 per cent. linseed cake could be used; supplements such as cod liver oil and minerals were not included in the calculation; and a good range of crude fibre contents allowed most accurate calculations.

For 165 mixed rations the protein content, digestible crude protein, crude fibre and value in starch units (or for birds the total nutrients) were calculated from the latest Swiss tables of composition, and by the method of multiple regressions was obtained the formula

$$VK_E = 78{\cdot}8 + 0{\cdot}39\ E - 0{\cdot}44\ Rfs,$$

where VK_E is the coefficient of digestibility of crude protein, E the crude protein and Rfs the crude fibre as percentages of the mixture. This formula applied to mixtures within the ranges of 10 to 34 per cent. crude protein and 3 to 15 per cent. fibre.

Regressions are tabulated for the relations between starch units or total nutrients and crude fibre for rations intended for different classes of stock.—D. Duncan.

3792

HÜNI, K. Die Verdaulichkeit und der Futterwert von Weizen und Roggen und der davon anfallenden Müllereinebenprodukte. [**Digestibility and feeding value of wheat and rye and their milling offals.**] *Landwirtsch. Jahrbuch Schweiz*, 1955, **69**, 961–964. [Eidg. Agrikulturchem. Versuchsanst., Liebefeld-Berne.] French summary.

The results of 138 digestibility trials, namely, 60 with wheat products on ruminants and 39 on pigs and 30 with rye products on ruminants and 9 on pigs, were examined statistically.

The regressions of digestibility of crude protein (VK_E) on crude fibre content on a 12 per cent. moisture basis (Rfs) did not differ significantly for ruminants and pigs or for wheat products and rye products, and the "mean" regression equation

$$VK_E = 89{\cdot}4 - 1{\cdot}52\ Rfs,\ r = -0{\cdot}670,$$

is considered satisfactory for general use.

No connection between crude fibre content and digestibility of fat or of crude fibre was found; respective mean values of 70 and 34 per cent. may be used. Digestibility of N-free extract fell as crude fibre content rose; the "mean" regression equation was

$$VK_E = 97 - 2{\cdot}66\ Rfs,\ r = -0{\cdot}860.$$

No connection was found between crude fibre content and Kellner's "value" (*Wertigkeit*); until the position is cleared up, the use of Axelsson's formula (Abst. 2915, Vol. 8)

$$\text{"value"} = 99{\cdot}0 - 0{\cdot}515\ Rfs - 0{\cdot}026\ (Rfs)^2$$

is suggested.

From these results the regression equation for starch units (StE) is derived, namely,

$StE = 82{\cdot}8 - 3{\cdot}29\ Rfs + 0{\cdot}034\ (Rfs)^2$, $r = 0{\cdot}997$.

For crude fibre contents between 3 and 12 per cent. the linear equation

$$StE = 81{\cdot}5 - 2{\cdot}78\ Rfs$$

suffices.—W. M. Deans.

3793

HÜNI, K. Beziehungen zwischen dem Rohnährstoffgehalt und der Verdaulichkeit von Mais und Nebenprodukten der Maisvererbeitung. [**Relation between content of nutrients and digestibility of maize and maize milling offal.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag Prof. Crasemann, 29–31. [Eidg. Agrikulturchem. Versuchsanst., Liebefeld-Berne.]

On the basis of 34 digestibility trials with maize and maize products on ruminants reported in Schneider, "Feeds of the World, their Composition and Digestibility" (Abst. 4061, Vol. 17), equations like those in the preceding Abst. were derived.

Digestibility of crude protein (VK_E) rose with crude protein content on 10 per cent. moisture basis (E); the regression equation was

$$VK_E = 45{\cdot}6 + 2{\cdot}27E - 0{\cdot}03E^2,\ r = 0{\cdot}795,$$

or, for crude protein contents between 5 and 35 per cent.,

$$VK_E = 57{\cdot}0 + 0{\cdot}94\ E,\ r = 0{\cdot}764.$$

In maize no connection was found between digestibility of crude protein and crude fibre content.

Digestibility of fat depended on the fat content (F) and the regression equation was cubic:

$$VK_F = 12{\cdot}4 + 25{\cdot}20\ F - 2{\cdot}64\ F^2 + 0{\cdot}09\ F^3;$$

but for maize itself and maize products with 5 per cent. crude fat or less, a mean digestibility coefficient of 74 per cent. can be used.

No connection was found between digestibility of crude fibre and content of any nutrient; the mean value was 49 per cent.

Digestibility of N-free extract satisfied the regression equation

$$VK_{Nfr} = 91{\cdot}8 - 0{\cdot}79 \text{ Rfs}, r = 0{\cdot}626.$$

Finally, starch units were given by the formula

$$StE = 75{\cdot}0 + 1{\cdot}40 F - 1{\cdot}49 \text{ Rfs}.$$

W. M. Deans.

3794

JONES, A. R., BEZEAU, L. M., OWEN, B. D. and WHITING, F. **The effects of mould growth on the digestibility and feeding value of grains for swine and sheep.** *Canad. J. Agric. Sci.*, 1955, **35,** 525–532. [Div. Animal Husb., Exp. Farms Serv., Canada Dept. Agric., Ottawa, Ont.]

In digestibility studies with pigs each weighing 60 to 70 lb., the organic matter, protein, N-free extract and gross energy of No. 1 feed oats were digested to a greater extent than those of 2 samples of mouldy oats. There were 65 per cent. total digestible nutrients (T.D.N.) in No. 1 feed oats, but only 54 and 59 per cent. in the mouldy oats. The mouldy oats weighed less per bushel, had slightly less protein and 4 to 5 per cent. more crude fibre than the feed oats. The organic matter, protein and gross energy of mouldy wheat were more highly digestible than in No. 5 wheat, and the T.D.N. rose from 76 to 79 per cent. The mouldy wheat contained 1 per cent. more protein and 0·5 per cent. less crude fibre than the non-mouldy sample and doubt is expressed whether the 2 lots would have been of the same quality before mould growth took place.

In a feeding trial with pigs, growth rate and efficiency of feed conversion were not affected when mouldy oats replaced feed oats included as 25 and 36 per cent. of rations given before and after 110 lb. bodyweight, respectively. It was considered that the differences in feeding value of mouldy and non-mouldy oats may have been masked by other ingredients in the ration. The replacement of No. 5 wheat with mouldy wheat did not affect rate of growth or efficiency of feed conversion in the feeding trial.

The organic matter, protein and energy content of No. 1 feed oats were digested better than those of mouldy oats by 9-month-old lambs. The feed oats and mouldy oats yielded 71 and 64 per cent. T.D.N., respectively.

No. 1 feed oats or mouldy oats were given along with hay in a feeding trial with 45 lambs. Average daily gains and efficiencies of conversion were less when mouldy oats constituted 50, 75 or 100 per cent. of the grain ration.

In the experiments reported mouldy oats and mouldy wheat were both palatable.—I. A. M. Lucas.

3795

SOLUN, A. S. Kukuruza-vazhneishaya kormovovya kul'tura. [**Maize as fodder.**] *Veterinariya*, 1955, **32,** No. 10, 69–73. [Moscow Vet. Akad.]

3796

AMBO, S., MASUBUCHI, T., HASHIZUME, T., ABE, M. and KURATA, Y. [**Digestion trials of feeds with Japanese native cattle.**] *Bull. Nat. Inst. Agric. Sci., Chiba, Japan* [*G*], 1955, No. 11, 233–245. In Japanese: English summary, 246–247.

Digestion trials with mature Japanese native cows are reported. Cocksfoot and red clover hay, 2 samples of wild grass hay, rice bran oil feed, rice straw and a mixture of wild grass hay 3 parts, rice straw 2 parts and wheat bran 1 part were investigated. Tables are presented of the composition, percentage digestibilities of the constituents, and total digestible nutrients of the feeds. The rice bran oil feed had 19 per cent. crude protein of digestibility 62 per cent. Rice straw had a low feeding value. The mixture of feeds had 4·01 per cent. digestible crude protein and 42·28 per cent. total digestible nutrients. In digestible crude protein and total digestible nutrients it was inferior to the hays.—T. D. Bell.

3797

LENNERTS, L. Steigende Gaben von Stroh als Ersatz für Heu in ihrem Einfluss auf die Verdaulichkeit des Gesamtfutters nach Versuchen an Schafen. [**Increasing amounts of straw as substitute for hay and their effect on the digestibility of the whole ration in experiments with sheep.**] *Arch. Tierernährung*, 1955, **5,** 348–367. [Inst. Tierernährungslehre, Humboldt. Univ., Berlin.]

With a view to elucidating the effect of straw, given as a substitute for hay, on the digestibility of the ration, 6 preliminary 10-day trials were made with 2 Merino wethers of mutton type weighing between 85 and 90 kg. In successive trials they were fed on hay alone, straw alone or 3 : 1, 1 : 1, 2 : 3 or 1 : 3 mixtures. The hay was of medium quality; the dry matter contained organic substance 93·6, crude protein 10·8, crude fat 2·1, crude fibre 31·3, N-free extract 49·4 per cent. The straw was mainly oat with a little rye: organic substance 91·3, crude protein 5·4, crude fat 1·5, crude fibre 43·9, N-free extract 40·3 per cent. Both were chopped. The sheep were fed twice daily; the total amount given in all the trials was 1000 g., an amount previously found

suitable (Abst. 5744, Vol. 25), but sheep 1 failed to eat it all, especially straw. Water was always available.

The results are tabulated, analysed and discussed in detail, but were not all concordant for the 2 animals. In sheep 1, digestibility of crude protein was reduced by admixture of straw, but not significantly until 750 g. straw was given; sheep 2 showed a non-significant reduction at this level. The effect on digestibility of crude fibre was small. Results for crude fat were inconclusive. Digestibility of N-free extract was reduced in sheep 1, but not in sheep 2, by admixture of straw.—W. M. Deans.

3798

HORN, V. and ESAT-KADASTER, I. (with KANSU, S.) Futterwert der Vicia ervilia in grünem Zustand und als Heu, Stroh und Samen. [**Feeding value of *Vicia ervilia* in the green state, as hay, straw and seeds.**] *Turk. Gen. Kim. Kurumu Dergisi* [*B*], 1952, **6**, 31–46. [Inst. Agric. Chem., Landwirtsch. Fak., Ankara.]

This paper consists largely of tables of the composition and feeding value for sheep of *Vicia ervilia* (bitter vetch, in Turkish, burçak), as green plant, hay, silage, seeds and straw, based on experiments of which some date back before the war. The plant is probably a native of Anatolia. It is less sensitive to drought and frost than the common vetch (*Vicia sativa*) and occupies nearly 30 per cent. of the land devoted to leguminous plants in Turkey, 3 times as much as the common vetch. Annual statistics of production are given for the years 1928 to 1954. The seeds are an important concentrate, especially for working oxen and buffaloes. When not irrigated the plant is so low that it is harvested by pulling out by the roots, and average yield is low, 700 to 800 kg. seeds per hectare.

In experiments [scale not stated] the green plant or hay gave about 380 kg. crude protein per hectare, and almost twice as much when grown as a catch crop on irrigated land; seeds gave 235 and straw 53 kg. crude protein per hectare. The hay was almost as digestible as the green plant; it contained as much protein as alfalfa hay and had a considerably higher starch equivalent. The straw, on the other hand, was a poor feed. Silage, made under makeshift conditions in petrol containers, was not entirely satisfactory and the sheep took some time to get used to it, but was sufficiently promising to justify further investigation. No ill effect occurred, but the literature suggests that for non-ruminants caution is required. As with bitter lupins, the risk can be avoided by steaming and washing the seeds with hot water.

W. M. Deans.

3799

DAS, B. K., MUKHERJEE, N. C. and SEN, B. **Studies on black gram as a concentrate cattle feed.** *Indian J. Vet. Sci.*, 1955, **25**, 329–334. [Animal Nutrit. Res. Scheme, Gauhati, Assam.]

The seeds of black gram (*Phaseolus radiatus*) had the following percentage composition on a dry matter basis: crude protein 23·6, ether extract 1·3, ash 4·2, crude fibre 5·8, N-free extract 65·0, Ca 0·2, P 0·55. In trials with Assam bullocks, digestibility coefficients were: dry matter 65, crude protein 57, ether extract 52, crude fibre 82, N-free extract 67, total carbohydrate 68. Digestible protein was 12·5 lb. and starch equivalent 55·77 lb. per 100 lb. During the experiment the bullocks were in positive P and N balance but showed a negative Ca balance.—J. S. Thomson.

3800

OLSSON, N. and OLOFSSON, N. E. Försök rörande fiskprodukternas tillvaratagande och användbarhet som foder. [**Investigations concerning preservation of fish products and their use for feeding.**] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Medd.* No. 59, 1955, pp. 38. English summary.

Wet conservation of fish with acid or molasses is described. Fish should be fresh and should be crushed or milled before the preserving fluid is added; the mixture should be stirred daily till fermentation stops (about 14 days); the temperature should not rise above 15° C. Per 100 kg. fish the quantity of acid to be added increases with the ash content of the fish from 4·5 litres A.I.V. fluid or 1·35 litre formic acid, 23·5 *N* [for corrected quantities refer from p. 7 to inside front cover]; the amount of molasses required is independent of the ash content of the fish and is 20 kg. per 100 kg. fish.

Experiments were made in which fish silage was compared on a dry matter basis with fishmeal made from the same raw fish, and with skimmed milk (pigs only) as a supplement to the usual cereal rations for chicks and pigs. Chicks with 7 per cent. fishmeal grew faster and made more economic weight gains than those with fish silage; formic acid silage came next with male birds and A.I.V. silage with hens. Results were similar with pigs. Fish in either form gave softer back fat than skimmed milk; a tasting panel was not agreed on fishy taste in the bacon.

Silage making is recommended only where the catch of fish is small and the distance from a drying plant too great to justify the cost of transport. Maximum daily quantities [inside front page] are given as 0·5 kg. white fish or 0·3 kg. fat fish, fresh or ensiled, or 0·15 kg. fishmeal for pigs and 25 or 5 g. for laying hens. Fattening pigs should have no fish after 40 kg. weight and

table poultry none during the last 2 weeks before killing, or 4 weeks for ducks and turkeys.

I. Leitch.

3801

FÉBRIER, R., FRANÇOIS, A., MICHEL, M., PÉRO, R. and SALMON-LEGAGNEUR, E. Les antibiotiques et la croissance. [**Antibiotics and growth.**] *Proc. Acad. Agric. France*, 7 December, 1955, pp. 11. [Centre Nat. Recherches Zootech., Jouy-en-Josas.]

See Absts. 3997, Vol. 25 and 2542, Vol. 26.

3802

MAGLIANO, A. L'impiego dei grassi animali come integrativo di mangimi concentrati. L'uso di ormoni per l'accrescimento degli animali da carne. [**Animal fats in concentrated feeding-stuffs. The use of hormones for growth of animals for meat.**] *Riv. Zootec.*, 1956, **29,** 46–49.

3803

FERRANDO, R. L'urée dans l'alimentation des ruminants. [**Urea in the feeding of ruminants.**] *Rev. Méd. vét., Toulouse*, 1956, **107,** 10–21; 96–108.

A review.

3804

BERRY, W. T. (Jr.), RIGGS, J. K. and KUNKEL, H. O. **The lack of toxicity of biuret to animals.** *J. Animal Sci.*, 1956, **15,** 225–233. [Dept. Animal Husb., Texas Agric. Exp. Stat., College Station.]

In trials with rats, poultry, lambs and steers no ill effect resulted from the feeding of biuret. Lambs given biuret appeared to drink more water than lambs given urea. Lambs and steers given biuret had poorer appetites and steers made poorer gains than those fed on urea and feed protein, but this could be overcome by adding adequate protein from cottonseed meals or higher levels of urea to the biuret ration. It is concluded that biuret is not a dependable source of nitrogen for ruminants.

J. C. Gill.

3805

JUON, P. Il Pervesider. [**The "pervesider".**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag Prof. Crasemann, 16–22. [Inst. Haustierernähr., Eidg. Tech. Hochsch., Zürich.]

Some notes on traditions of management and the feeding value of alpine pastures and hay.

D. Duncan.

3806

KOPLAND, D. V., POST, A. H. and STITT, R. E. **Irrigated pasture investigations, Huntley Branch Station, Huntley, Montana.** *Montana Agric. Exp. Stat. Bull.* No. 496, January 1954, pp. 46.

A general review of investigations made at the Station since 1919. The stock-carrying capacities of different types of pasture are given.

J. L. Corbett.

3807

FRANKLIN, M. C., BRIGGS, P. K. and MCCLYMONT, G. L. **The utilisation of low-quality pasture.** *J. Austral. Inst. Agric. Sci.*, 1955, **21,** 216–228. [McMaster Lab., Div. Animal Health and Prod., C.S.I.R.O., Sydney.]

Low-quality pasture is defined as that which fails to maintain production of livestock at a satisfactory level. Deficiencies of vitamin D, energy and protein are considered. The effects of different supplements on the incidence of mortality or deficiency disease, liveweight changes in sheep and cattle and wool production are described.

J. L. Corbett.

3808

WATKINS, W. E. and KEARNS. J. V. (JR.) **The nutritive value of various grasses and grass-legume mixtures.** *J. Animal Sci.*, 1956, **15,** 153–162. [New Mexico Agric. Exp. Stat., State College.]

Data are given for the chemical composition, digestibility and total digestible nutrients, determined with wethers, of western wheat grass, crested wheat grass, coastal Bermuda, and mixtures of coastal Bermuda and alfalfa, and Alta fescue with ladino clover. Some of the grasses were at different stages of growth. All the grasses and mixtures when harvested immature provided palatable and nutritious fodder, high in digestible nutrients. Coastal Bermuda, alone or with alfalfa, when harvested mature, was not so palatable and had a lower content of digestible nutrients. There was a correlation of + 0·84 between the lignin and crude fibre contents of the grasses. Negative calcium balances were obtained with a mixture of old and new crested wheat grass and with Bermuda grass, and negative nitrogen balances with coastal Bermuda mixed with alfalfa. Data are given also for vitamin A, Ca and inorganic P in blood plasma.

J. S. Thomson.

3809

DIJKSTRA, N. D. and VAN DER SCHAAF, D. Onderzoek naar de voederwaarde van gebroeid hooi. [**The feeding value of heated hay.**] *Versl. Landbouwk. Onderzoek.*, 1955, No. 61·15, pp. 33. English summary.

Sixteen samples of hay, normal or heated, from 6 stacks were analysed, digestibility was estimated *in vitro* with pepsin and HCl or with wethers, and the degree of heating was estimated in terms of "heating colour" (broeikleur) as follows: 1 g. of finely ground or cut hay was boiled under reflux for 5 min. in a 5 per cent. solution of sodium carbonate. After cooling the extract was filtered,

diluted with 4 parts of water and compared in a Beckman spectrophotometer with a blank solution of 1 per cent. soda. The optical density × 1000 is the index of colour. The results are presented in tables and shown in diagrams. Digestibility of organic matter was not much affected but that of protein decreased greatly and in close relation to the heating colour. Loss of starch equivalent, too, was closely related to colour. The difference between digestibility *in vitro* and *in vivo* also changed with colour.—I. Leitch.

3810

ORGANISATION FOR EUROPEAN ECONOMIC CO-OPERATION. **Pasture and fodder production in North-West Europe.** *Technical Assistance Mission*, No. 123. 2, Rue André-Pascal, Paris 16, 1954, pp. 177.

The countries covered in this report are Austria, Belgium, Denmark, France, Western Germany, Ireland, Northern Italy, the Netherlands, Norway and the United Kingdom. In part 1 the geographical and climatic features of the area are surveyed. Grassland is of great importance for the large livestock population and to maintain soil fertility. The total net productivity of the grasslands has been estimated from the difference between the calculated total feed requirements of all farm livestock and the total feed supplied by all other categories of feedingstuffs. Estimated outputs expressed as thousand fodder units per hectare (1 fodder unit = 0·7 kg. starch equivalent) vary from 2·0 for France through 3·0 (16·7 cwt. starch equivalent per acre) for the United Kingdom to 4·7 for the Netherlands. Target figures are given to provide " a realistic picture of the magnitude of the increased productivity which can be expected through the improvement of the existing area under grass, clover and lucerne in Western Europe ". The increases suggested vary from 17 to 18 per cent. for the Netherlands and Norway, through 33 per cent. for the United Kingdom to 50 to 60 per cent. for France and Ireland with a mean increase of 42 per cent., equivalent to 44 million tons fodder units. General recommendations are made for obtaining these increases. They include studies of fertiliser practice and irrigation, herbage species and seeds mixtures, methods of grazing management, conservation methods, estimation of nutritive values, conditions influencing animal health, advisory work and international cooperation for the exchange of technical information and workers. The report stresses that there is " a general need for the awakening in each country of a proper appreciation of the value of grasslands and for a realisation of the importance of grassland improvement work in promoting the general economic wellbeing and in raising general living standards ". In part 2 the countries are considered individually, their particular features are discussed and specific recommendations are made.—J. L. Corbett.

3811

RINEY, T. **A zooecological approach to the study of ecosystems that include tussock grassland and browsing and grazing animals.** *N.Z. J. Sci. Technol.* [*B*], 1956, **37,** 455–472.

3812

HAMILTON, R. A. **Utilisation of grassland.** *Outlook on Agriculture*, 1956, **1,** No. 1, 5–11.

3813

MOORE, H. I. **Silage on the farm. Experience and experiment.** *J. Roy. Agric. Soc. Engl.*, 1955, **116,** 60–67. [Seale-Hayne Agric. Coll., Newton Abbot, Devon.]

3814

FURRER, O. J. Silagebereitung und Silagefütterung in der Schweiz. [**The making and use of silage in Switzerland.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag Prof. Crasemann, 89–92. [Inst. Haustierernährung, Eidg. Tech. Hochsch., Zürich.]

Statistics are quoted from an inquiry in the winter of 1954–55 covering 1400 farms all over Switzerland, made by the *Institut für landwirtschaftliche Betriebe* of the Eidgenössische Technische Hochschule, Zürich (Furrer, *Agrarpolitische Revue*, 1955, **11,** 330).

On about 44 per cent. of the farms the use of silage was not permitted because cheese was made all the year round. Among the others, silage was more often made on large farms than on small and for the Pied Mountain than for the Swiss Brown breed. The commonest crops ensiled were grass and clover and mixtures, followed by maize and beet leaves and slices, and the commonest preservatives were formic acid and A.I.V. fluid ; fruit and fruit residues were sometimes added. The amounts given varied greatly, average 11·8 kg. daily for Brown cows and 15·1 for Pied cows. It is estimated that 320,000 tons a year are made in Switzerland, enough for the production of 150 million kg. milk, and that, compared with ordinary haymaking, about 15 million starch units, worth 10 million francs, are saved.—W. M. Deans.

3815

ONEGOV, A. P. Bierezho khranit i pravilno ispolzovat korma. [**Careful preservation and good use of feedingstuffs.**] *Veterinariya*, 1955, **32,** No. 9, 10–13. [Kirovskii Selskokhozyaistvennyi Inst.]

See also Absts. 2888, 3224.

HORSES

3816

DENISLOV, N. O kormovykh ratsionakh dlya loshadei. [**Feed rations for horses.**] *Konevodstvo*, 1955, **25,** No. 10, 34–40.

For stud mares succulent rations containing considerable amounts of silage and potatoes were more efficient than dry rations, which usually consisted of 96 to 97 per cent. coarse and concentrated foods and only 3 to 4 per cent. of succulent fodder.—H. Scherbatoff.

See also Absts. 2983, 3084.

CATTLE

GROWTH AND FATTENING

3817

NELSON, A. B., BRATCHER, G., HUMPHREY, R. D. and MACVICAR, R. W. **Creep-feeding spring calves.** *Oklahoma Agric. Exp. Stat. Bull.* No. B-462, November 1955, pp. 20.

Trials made over 3 years with 197 Hereford calves showed that calves which were creep-fed gained on the average 30 lb. more in liveweight up to weaning than those which were not creep-fed. When creep feeding was followed by dry-lot fattening it proved to be less profitable than feeding in the normal way. The addition of molasses to a creep feed consisting of yellow maize, oats and cottonseed meal improved consumption but reduced profit.—J. N. Aitken.

3818

MEREGALLI A. Ancora sul problema dell'alimentazione, di velli di razza lattifera con limitati quantitativi di latte e miscela bilanciata asciutta. [**More about feeding dairy calves with limited amounts of milk and a dry balanced ration.**] *Riv. Zootec.*, 1956, **29,** 55–56. [Lab. Zootec., Fac. Agrar., Florence.]

See Abst. 5802, Vol. 25.

3819

FLUX, D. S. and PATCHELL, M. R. **The use of dried buttermilk as a feed for dairy calves.** *N.Z. J. Sci. Technol.* [*A*], 1956, **37,** 451–457. [Dairy Res. Inst. (N.Z.), Palmerston North.]

Reconstituted buttermilk, prepared from 2 types of dried buttermilk containing 16 and 8 per cent. fat, was given to 32 calves at the rate of 10 and 12½ per cent. of bodyweight. Whole milk was given until the calves were 4 weeks old and then gradually replaced with reconstituted buttermilk so that only the latter was given from 6 to 10 weeks of age. The calves grazed high-quality pasture throughout the experiment. The weight gains from 4 to 10 weeks were significantly higher ($< 0{\cdot}05$) for calves on the high level than in those on the low level of milk consumption; differences between weight gains of calves given the 2 types of dried buttermilk were in favour of the high-fat diet but were not significant.

T. R. Preston.

3820

PRESTON, T. R. **Dry feeding of calves.** *Agriculture, J. Minist. Agric. Engl.*, 1956, **62,** 462–466. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

In a small-scale experiment, 6 Ayrshire bull calves given 13 gal. whole milk and weaned to a dry meal mixture, hay and water when between 3 and 4 weeks old made liveweight gains of nearly 1½ lb. daily. No digestive disturbance was noted.

T. R. Preston.

3821

ALIKAEV, V. A. Kormlenie i soderzhanie telyat v poslemolochnyi period. [**Feeding and management of calves in the weaning period.**] *Veterinariya*, 1955, **32,** No. 2, 82–87. [Viev.]

A regular supply of drinking water is of particular importance for calves during the weaning period, also succulent fodder of silage, beet and potatoes. A mineral supplement is necessary when silage is given.—H. Scherbatoff.

3822

DAVIS, H. P. **Growth comparisons for Holstein, Ayrshire, Guernsey and Jersey males for the first six months of life.** *Zootec. Vet.*, 1956, **11,** 65–69. [Univ. Nebraska.]

Records of monthly measurements of all male calves born into the University of Nebraska herd during 20 years are presented. The measurements include weight, heights at withers, hooks and pin bones, length of body and rump; widths at hooks, chest and pin bones; depths of chest and barrel and skin thickness at the fore and last rib. The numbers of animals were: at birth, Holsteins 220, Ayrshires 58, Guernseys 25 and Jerseys 95: at 6 months, Holsteins 104, Ayrshires 12, Guernseys 8 and Jerseys 31. Holsteins were heavier at birth and the difference was still apparent after 6 months. The overall growth rate of Ayrshires was slower and that of Jerseys faster than that of the other breeds.—J. N. Aitken.

3823

EISMA, W. A. and TERPSTRA, J. I. Ziekten van het jonge kalf en veulen. [**Disorders of the young calf and foal.**] *Tijdschr. Diergeneesk.*, 1956, **81,** 24–30. [Lab. Rijksseruminrichting.] English, French and German summaries.

For the health of the calf the supply of vitamins A and D to the mother is important, as is also the early encouragement of the calf to eat hay of good quality. Colostrum should always be given to supply specific antibodies except where it contains haemolysins due to sensitisation of the mother while the calf is *in utero*. Infections are treated with the usual antibiotics.—I. Leitch.

3824

DELAGE, J., POLY, J. and VISSAC, B. Étude de l'efficacité relative des diverses formules de barymétrie applicables aûx bovins. [**The relative efficiency of different barymetric formulae applicable to cattle.**] *Ann. Zootech.*, 1955, **4,** 219–231. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

The value of coefficients which enable the bodyweights of cattle to be estimated from measurements is discussed. Measurements were made on 201 cattle of 3 breeds, Norman, French Friesian and Eastern Red Pied. For bulls of all 3 breeds the highest correlations with bodyweight were obtained with chest girth and spiral girth. The spiral girth is measured from the tip of the sternum, the tape passing to the back in the lumbar region and over the opposite side of the rump to below the perineum. The regression coefficients of bodyweight on these measurements and their arithmetic mean were higher in males than in females in all 3 breeds. Standard deviations in estimation of liveweight from these regression lines were from 3·9 to 8·6 per cent. The chest girth gave the greatest precision. Regression values for liveweight and chest girth are given for all 3 breeds and both sexes, on the basis that all the cattle weighed at least 450 kg. and were in show condition. A linear equation was more accurate for cows and a curvilinear equation for bulls. The accuracy in each case was about 5 or 6 per cent. With larger numbers of animals the error may be reduced.—D. Duncan.

3825

EKTOV, V. A. Vliyanie urovnya pitaniya na izmenenie kreposti kostei u molodnyaka krupnogo rogatogo skota. [**Influence of nutritional standards on changes in bone strength in young cattle.**] *Zh. Obshchei Biol.*, 1954, **15,** 188–191. [Dept. Breeding Agric. Animals, Timiryazev Agric. Acad.]

One of the principal indices of a strong constitution in animals is a strong, well developed bony skeleton. An investigation was initiated into the changes in the bone structure of cattle in relation to age and nutritional standards. There were 3 groups in the experiment: "ample", "poor" and "transitional" feeding. This last group after being fed on the ration of the second group for 6 months was transferred to the first group. During the experiment, from birth to 18 months, the first group received in all 2653 feed units and 297 kg. digestible protein, the second 1720 feed units and 147 kg. digestible protein and the third 2403 feed units and 260 kg. digestible protein. During the same period the first group received 26·87 kg. Ca and 15·53 kg. P, the second 19·06 kg. Ca and 7·45 kg. P and the third 24·38 kg. Ca and 14·53 kg. P.

With improved feeding it was found that strength of bone increased greatly, particularly of the shoulder-blade, metatarsus and metacarpus, but the strength of bone in the lower jaw was less than in animals on poor feeding, particularly on coarse fodder. In animals in the third group bone strength was somewhat restored by transfer to a more ample ration, but did not attain the level of bone of animals on ample rations from birth.

H. Scherbatoff.

3826

AMSCHLER, J. W. Historisch-genetische Untersuchungen über die Züchtung von Leistungsherden in der Höhenviehzucht. [**Historical-genetical studies of the breeding of high-yielding herds of hill cattle.**] *Züchtungskunde*, 1956, **28,** 28–33. [Inst. Tierzucht, Hochsch. Bodenkultur, Vienna.]

3827

NORDFELDT, S. Försök med uppfödning av gödkalvar. [**Experiments in the feeding of veal calves.**] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 112, 1955, pp. 16.

Tests were made between 1952 and 1955 with Holstein, SRB and SKB calves, given ordinary milk for the first 4 days and then increasing quantities to age 31 (Holstein) or 37 days of milk of reduced fat content, with a concentrate mixture of grain, linseed cake meal and dicalcium phosphate and some hay. Those given skimmed milk got 10 g. cod liver oil daily from 31 days to slaughter at 85 kg. liveweight. At one centre 3 SRB and 3 SKB calves were given ground linseed in skimmed milk.

The Holstein, bull, calves were heavier at birth, about 46 kg., the SRB were about 37 kg. and the SKB 32 to 34 kg. Rate of weight gain and grading for fat decreased with the fat in milk and loss at slaughter increased. Feed units per kg. gain in weight also fell with percentage fat in milk. *e.g.*, from 2·59 for Holsteins getting milk with 3·8 per cent. fat to 2·16 for those getting milk with 1·8 per cent. fat.

The economics of such production are discussed in detail in relation to type of calf, prices for veal in south, middle and north Sweden and type and cost of milk. At prices ruling when the tests were made the Holsteins on skimmed milk (with some whole milk to 30 days of age) were most profitable and those on 1·8 per cent. milk next. Production was least profitable in north Sweden where milk prices were highest, and SKB calves were less profitable than SRB.—I. Leitch.

3828

KIDWELL, J. F. and MCCORMICK, J. A. **The influence of size and type on growth and development of cattle.** *J. Animal Sci.*, 1956, **15,** 109–118. [Dept. Animal Husb., Univ. Nevada, Reno.]

Growth, feed efficiency and carcase characteristics of Holstein and Hereford steers were compared, the two breeds being reared under different dietary regimes. The Holstein steers made weight gains faster and more efficiently, and at slaughter produced carcases having more bone, more muscle and less fat, than did Hereford steers. On the basis of these data, the validity of using rate and economy of gain as selection criteria for beef cattle is discussed in relation to type and size of such animals at maturity.—T. R. Preston.

3829

NELSON, A. B., GALLUP, W. D., ROSS, O. B. and DARLOW, A. E. **Supplemental phosphorus requirement of range beef cattle in north central and southeastern Oklahoma.** *Oklahoma Agric. Exp. Stat. Tech. Bull.* No. T-54, July 1955, pp. 29.

Trials were made over 4 years on 2 areas in Oklahoma; one in the north central area (Stillwater) where there was borderline deficiency of P in soil and the other in the south-east (Wilburton) where the soils were definitely deficient. Both areas were stocked with 30 in-calf Hereford heifers and 30 weaned calves. On each location both age groups of cattle were divided into 3 groups of 10 animals each. The only source of P for cattle of both ages in group 1 was native grass hay and a protein supplement in winter and pasture grass in summer. The cattle in group 2 were given dicalcium phosphate in amount to provide 1·5 g. P per 100 lb. liveweight. In summer those at Wilburton were allowed access to a mineral mixture. Those at Stillwater received no additional P in summer. The animals in group 3 received P at the rate of 2·5 g. per 100 lb. liveweight in winter and were allowed access to a salt lick in summer. Winter feed for all consisted of grass hay grown on land adjoining the experimental areas.

Results from the Stillwater area (marginal P deficiency) showed that there was some benefit from the P supplements as measured by growth of the calves, weight changes of the cows, reproductive performance and plasma P values. It was estimated that the minimum requirement of P for cows managed in the way described was 7 g. daily in winter, 9 g. in early summer and 6 g. in late summer. It is recommended that in this area in years in which there is poor growth of grass additional P should be provided. In the Wilburton area (P deficiency) P supplements greatly improved growth of calves and heifers. Benefit to the cows could not be clearly demonstrated because of other unknown complications. It was estimated that the minimum P requirement of cows in this area is 7 g. daily. It is recommended that P supplements should be given at all times to cattle in this area.—J. N. Aitken.

3830

BENTLEY, O. G., KLOSTERMAN, E. W. and ENGLE, P. **The use of urea to increase the crude protein content of corn silage for fattening steers.** *Ohio Agric. Exp. Stat. Res. Bull.* No. 766, November 1955, pp. 20.

Urea mixed with maize as the silo was filled increased the N and digestible crude protein content of the silage, as estimated by chemical analyses and digestibility studies with sheep. Most of the added N was retained, generally as ammonium salts of the organic acids normally present in maize silage. Feeding trials with young fattening cattle showed that silage made with urea was a safe and palatable feed and produced more economical liveweight gains than conventional rations of maize silage and soya bean oilmeal.

T. R. Preston.

3831

MEYER, J. H., LOFGREEN, G. P. and ITTNER, N. R. **Further studies on the utilization of alfalfa by beef steers.** *J. Animal Sci.*, 1956, **15,** 64–75. [Dept. Animal Husb., Univ. California, Davis.]

In 2 experiments to compare beef production from alfalfa in 5- to 7-day rotational grazing, strip grazing, haymaking or soiling (cut and given green), similar liveweight gains were made on forage grazed or given as soilage; significantly lower gains were made on forage given as hay. More dry matter was consumed per 100 lb. gain when alfalfa was given as hay then as soilage; consumption was least for alfalfa grazed *in situ*. Amounts of beef produced per acre, expressed as percentages of the soilage group, were 77, 79 and 85 in experiment 1 and 64, 68 and 79 in experiment 2, for rotational grazing, strip grazing, and haymaking, respectively. There was a greater incidence of bloat among strip-grazed steers than in any of the other groups.—T. R. Preston.

3832

SYLVESTRE, P. E. and MERCIER, E. **The feeding of grass silage to beef cattle.** *Canada Dept. Agric. Publ.* No. 955, June 1955, pp. 11.

A review.

3833

KIRK, W. G. and DAVIS, G. K. **Citrus products for beef cattle.** *Florida Agric. Exp. Stat. Bull.* No. 538, January 1954, pp. 16.

The citrus products are described, and trials in which they have been successfully used in combination with hay or pasture and cottonseed meal for fattening beef cattle are briefly reported.

Fresh grapefruit unsuitable for market are readily eaten by cattle, but oranges are not so palatable, a difficulty partly overcome by grating the fruit. Most of the waste from the canning industry is now processed into feeds, the most important of which are dried citrus pulp, citrus molasses and citrus meal. These are energy feeds, which must be balanced with roughage and protein feeds. They are high in Ca, and minerals must be supplied to adjust the Ca : P ratio. A mixture of 3 per cent. urea with citrus molasses gives a product with 11 to 12 per cent. crude protein. Rations embodying citrus products for beef cattle are suggested.—T. D. Bell.

3834

CHAPMAN, H. L. (Jr.), KIDDER, R. W. and PLANK, S. W. **Comparative feeding value of citrus molasses, cane molasses, ground snapped corn and dried citrus pulp for fattening steers on pasture.** *Florida Agric. Exp. Stat. Bull.* No. 531, December 1953, pp. 16.

The following rations were compared in a feeding trial with 5 lots of 10 Brahman steers : grazing plus cane molasses free choice ; grazing plus citrus molasses free choice ; grazing plus both types of molasses free choice ; grazing plus 5 lb. ground snapped maize [cereal with attached husk] daily ; grazing plus 5 lb. citrus pulp daily. Average daily gains ranged from 0·55 to 0·82 lb. When this trial, which was made between Oct. and Jan., was repeated between Feb. and June with a second batch of steers on the same grazing the average daily gains were about doubled and this was attributed to the low protein content of the pasture during the first trial. This was proved in a third similar trial from Oct. to Feb. when a supplement of cottonseed meal was given. The results of this trial were comparable with those obtained in trial 2. When the results of the 3 trials were combined there was no significant difference between groups in average daily gain. In the last 2 trials the ground snapped maize was most efficiently utilised. It is concluded that a protein supplement would be beneficial during the autumn and winter months with rations of the types used in these trials.—J. N. Aitken.

3835

O'MARY, C. C. and CULLISON, A. E. **Effects of low level implantation of stilbestrol in steers on pasture.** *J. Animal Sci.*, 1956, **15,** 48–51. [Dept. Animal Husb., Univ. Georgia, Athens.]

Stilboestrol, 24 mg. by subcutaneous implantation, significantly increased the weight gains of yearling and 2-year-old Hereford and Angus steers grazed on mixed grass and legume pasture without supplement. There was no difference in sale price per cwt. No ill effect of treatment was seen.

T. R. Preston.

3836

CLEGG, M. T. and CARROLL, F. D. **Further studies on the anabolic effect of stilbestrol in cattle as indicated by carcass composition.** *J. Animal Sci.*, 1956, **15,** 37–47. [Dept. Animal Husb., Univ. California, Davis.]

In 2 out of 3 feeding trials made in 1955–56, eight 2-year-old Hereford steers had implanted 60 mg. stilboestrol and were fed with 8 control steers for 97 days in trial 1, and 185 days in trial 2. In the third, 2 groups of 14 Hereford yearling heifers, spayed and intact, respectively, were further subdivided into stilboestrol-implanted and untreated animals and fattened for 217 days. The stilboestrol-implanted animals all made greater weight gains, more efficiently, and produced carcases of slightly poorer quality, which contained less separable fat and more lean meat, than untreated animals.

Changes in carcase composition as a result of treatment with stilboestrol were greater in the young heifers than the older steers. There was no effect on blood levels of glucose, N.P.N., Na, K or serum protein-bound iodine, but, in the steers, the weights of the kidneys and of the seminal vesicles increased. Spaying did not affect growth or carcase composition.—T. R. Preston.

3837

O'MARY, C. C., WARREN, E. P., DAVIS, T. J. and PIERCE, H. H. (Jr.) **Effects of low level implantations of stilbestrol in steers fattened on dry lot rations.** *J. Animal Sci.*, 1956, **15,** 52–58. [Dept. Animal Husb., Univ. Georgia, Athens.]

Two experiments are reported. In the first, 24 steers were used as controls, without treatment, and 25 had 36 mg. stilboestrol implanted subcutaneously in the ear for the first period of 42 days. During the next period of 63 days the controls and 15 of the experimental group had no further treatment but 10 of the latter group had a second implant of 36 mg. Over the whole period of 105 days growth rate was significantly increased

by the 36 mg. implant but the second implant at 42 days had no extra effect. The weight of the seminal vesicle was increased in the treated groups, but carcase grade and dressing percentage were unaffected as compared with controls.

In the second experiment, lasting for 140 days, 25 controls had no treatment, 15 had a 36 mg. implant, and 10 had a 12 mg. implant for the first 8 weeks followed by a 24 mg. implant. Over the whole period rate of gain was significantly higher in the group receiving the 36 mg. implant but not in the group having the double implant, although in this group the rate of growth was significantly increased after the second implant.

In both experiments there was a depression of the loin in the treated groups at 85 and 65 days, respectively.—J. S. Thomson.

3838

RAIMONDI, R. Studio dell'influenza esercitata dalla castrazione sullo sviluppo somatico e sui caratteri delle carni di vitelli " Piemontesi " all'ingrasso. 1. 2. [**Effect of castration on somatic growth and carcase character of fattening Piedmontese calves. 1. 2.**] *Ann. Sper. agrar.*, 1955, **9**, 1247–1268 ; 1453–1483. [Ist. Zootec. Piemonte, Turin.] English summary.

1. The Piedmontese breed gives a triple-purpose animal with a distinct bias to beef, and of recent years there has been a tendency to specialise ; the usual products are milk-fed calves about 3 months old, fat calves at 10 to 12 months, young bullocks sold at 18 to 20 months at weights of 400 to 500 kg., and fat animals 5 to 6 years old. Nearly all are castrated by the Burdizzo method at 2 to 3 months of age.

In April 1952, 20 Piedmontese calves of similar type about 20 days old were bought in the market. They were given 20 days to settle down and were inoculated against scours and foot-and-mouth disease. They were then divided into 2 similar groups with mean weights of 72·36 and 72·33 kg. and fed identically, at first on whole milk, concentrates and good meadow hay. At about 3 months of age the calves of one group were castrated. Feeding was based on Scandinavian estimates of requirement and rose from 2·2 feed units daily to 7·02 by the middle of December, *i.e.*, in 250 days. Milk was withdrawn at the end of July. The amount of hay was reduced towards the end of fattening. The concentrate mixtures contained bran, beans, maize, oats and minerals ; the proportion of maize increased in stages, according to the normal practice in the district.

2. After 250 days the entire calves had a mean liveweight of 340 kg., representing an increment of 1·072 kg. daily ; the castrated calves had a mean weight of 316 kg. and a mean daily increment of 0·975 kg. The difference is significant. The mean utilisation of feed, by entire and castrated calves, was 4·087 and 4·490 feed units per kg. liveweight gain and the cost was 10·48 per cent. less for the entire calves.

The bull calves were somewhat more compact and shorter than the castrated calves. Evaluation on the hoof slightly favoured the latter, and their price per kg. liveweight was 380 lire against 365 for entire calves, but the greater weight of the entire calves more than compensated for this.

The carcase weight was 61·62 per cent. of liveweight in entire and 61·53 per cent. in castrated calves. The entire calves gave 8·5 per cent. more carcase. Inspection and chemical composition showed little difference in quality of meat, but the castrated calves gave meat judged to be slightly superior in flavour and tenderness. This would not appreciably affect their commercial value.

It is estimated that if calves to be killed at not more than a year old were left entire, the output from this source in Piedmont alone would be increased by at least 20,000 tons of meat a year.

D. Duncan.

3839

MEREGALLI, A. Studio dell'influenza esercitata dalla castrazione sullo sviluppo somatico e sui caratteri delle carni di vitelli piemontesi all'ingrasso. [**Effect of castration on somatic growth and carcase characteristics of fattening Piedmontese calves.**] *Riv. Zootec.*, 1956, **29**, 13–14.

See above Abst.

3840

ANTHONY, W. B., STARLING, J. G., MARTIN, C. M., BROGDEN, C. A. and SALMON, W. D. **Fattening rations for finishing steers after summer grazing.** *Alabama Agric. Exp. Stat. Progr. Rep. Ser.* No. 59, November 1955, pp. 8.

In Alabama many beef cattle are sold lacking weight and finish. A series of trials is reported designed to test whether it would be economic to carry such cattle for an extended period on good quality pasture and finish them on homegrown feeds such as snapped maize [cereal with attached husk], groundnut hay, ground cottonseed or cottonseed meal. The results showed that it was more profitable to adopt this procedure and to sell the steers as good to choice than as commercial or utility grades.—J. N. Aitken.

3841

PAWSON, H. C. and INNES, P. **Wintering store cattle : Cockle Park trial, 1954-55.** *Agriculture, J. Minist. Agric. Engl.*, 1956, **62**, 534–539. [King's Coll., Newcastle-upon-Tyne.]

In the eighth successive and concluding trial comparing different systems of winter management

for yearling beef stores, housed bullocks fed on hay, concentrates and roots gained more weight than bullocks wintered outdoors and fed on hay and concentrates. The greater weight gains of bullocks fed on lucerne hay and heifers fed on lucerne silage than of similar animals on seeds hay and grass silage, respectively, were attributed to the higher nutritive value of the lucerne roughages. T. R. Preston.

3842

HUGHES, G. P., ALDER, F. E. and REDFORD, R. A. **The overwintering of beef stores.** *Empire J. Exp. Agric.*, 1955, **23,** 145–157. [Grassland Res. Inst., Hurley.]

Hereford type beef stores, 18 to 24 months old, were fed indoors, outdoors with hand feeding or outdoors on grass during the winters of 1950–51, 1951–52, 1952–53 and 1953–54. In each year indoor cattle made greatest gains in winter, but summer gains were always in favour of those fed outdoors. Combined winter and summer gains varied from year to year, and although generally in favour of the indoor cattle, differences between groups were small and all animals gave satisfactory results at slaughter, irrespective of winter treatment.—T. R. Preston.

3843

GERI, G. La selezione funzionale dei bovini da carne. [**Functional selection of beef cattle.**] *Riv. Zootec.*, 1956, **29,** 11–13.

Selection of lines of cattle suitable for beef production can be based on data relatively easy to obtain, such as birthweight, weaning weight, rapidity of growth and carcase quality ; a crude index of utilisation of feed is helpful.—D. Duncan.

3844

BUTLER, O. D., WARWICK, B. L. and CARTWRIGHT, T. C. **Slaughter and carcass characteristics of shortfed yearling, Hereford, and Brahman × Hereford steers.** *J. Animal Sci.*, 1956, **15,** 93–96. [Texas Agric. Exp. Stat., College Station.]

Slaughter data from 59 Hereford and 90 Brahman × Hereford yearling steers reared uniformly and self-fed in dry lot showed that the crossbreds were 40 lb. heavier at slaughter and had higher dressing percentages and longer legs and carcases. There was little difference between the groups in carcase grade or percentage yield of wholesale cuts.—T. R. Preston.

See also Absts. 2865, 2866, 3856, 3869.

MILK PRODUCTION

3845

MEHNER, A. and GRABISCH, W. Verzehr, Leistung und Futterverwertung bei der Nutzung von Dauergrünland durch Abweiden und Abmähen. [**Feed intake, production and feed efficiency in the use of permanent pasture by grazing and cutting.**] *Züchtungskunde*, 1956, **28,** 80–88. [Inst. Tierzuchtlehre, Landw. Hochsch., Hohenheim.]

From mid-May to mid-September 1954 about 1 hectare of good permanent grass, divided into 8 plots, was used in rotation by 7 to 9 Jersey cows ; 2 plots were grazed, on the average for 4 hr. daily, for 2 days, then 2 other plots were mown and the grass was given to the cows in stall, and so on, for 4 periods of 2 or 3 weeks ; owing to insufficient growth of grass a fifth rotation could not be completed. In addition to grass the cows had 2 kg. dried beet slices and 120 g. mineral mixture (Ramikal 1) daily throughout. Samples from a plot to be grazed were got by mowing strips at grazing height and used to find the amount of grass available and its composition ; after grazing, the whole plot was mown at the same height and the residue was weighed and analysed. Grass supplied liberally in stall was weighed and sampled and uneaten grass was weighed. Individual milk yields and fat contents were ascertained daily and considered in relation to the grass eaten the day before. The cows were weighed regularly. The results are given in tables.

Over the whole period the average amount of grass eaten per cow daily was the same, 40·1 kg., with both methods of feeding, but the percentage of available grass not eaten was 18·7 for grazing and 6·9 for stall feeding. Average daily milk yield, fat content and milk fat production were 9·1 and 8·9 kg., 5·65 and 5·68 per cent. and 0·514 and 0·505 kg., respectively. On the other hand, because there was less waste with stall feeding, more milk and more fat were got from a given area of pasture by cutting than by grazing, 17·2 and 0·975 kg. per are compared with 16·2 and 0·918 [misprint in paragraph 5 of summary]. The amounts of grass required to produce 1 kg. milk and 1 kg. milk fat were 4·41 and 78 kg. for grazing and 4·51 and 79·5 kg. for stall feeding. The corresponding nutrients were, for grazing, 116 g. digestible protein and 533 starch units, and 2054 g. digestible protein and 9413 starch units ; for stall feeding 129, 605, 2263, 10,641. That is, the grazed pasture was better utilised by the cows, probably owing to selective grazing habits. The results emphasise the importance of careful control of grazing.—W. M. Deans.

3846

WITT, M. Weitere Untersuchungen über die Beeinflussung des Fettgehaltes der Milch durch Beifütterung während des Weideganges. [**Further studies of the effect on fat content of milk of supplements during the grazing season.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10,**

375–378. [Max Planck Inst. Tierzucht, Mariensee, Trenthorst.] English summary.

The effects of all-day grazing without supplement on the average yield and fat content of milk of a herd of 66 cows are shown by table and graph. The fat percentage rose rapidly from 3·9 to 4·27 in the first week, then fell equally rapidly and continued to decline to 3·42 in the eighth week, after which there was a slow rise to near the initial value. Milk yield declined gradually. In a short trial with 2 groups of 70 cows, of which one was given a daily supplement of 2 to 3 kg. dried beet slices for 2 weeks in stall and 3 weeks on pasture, the supplement raised the milk yield but had no effect on the fat content. In another trial with 6 pairs of cows, even 12·8 kg. GK-beet was without effect, as were also high-protein supplements. Further investigation of the causes of the fall in the fat content is required.

It is concluded that if pasture is good and plentiful, the giving of supplements is unprofitable. Supplements are appropriate where pasture area is small, or where grass can be preserved for the winter, or where grass tetany is prevalent.

W. M. Deans.

3847

HUTH, F. W. Ergebnisse täglicher Milch- und Futterkontrolle bei Leistungskühen des schwarzbunten Niederungsrindes in Mariensee. [**Daily records of milk production and feed consumption for high-yielding cows of the Holstein Friesian breed in Mariensee.**] *Ztschr. Tiererzücht. Zuchtungsbiol.*, 1955, **66,** 173–202 ; 235–300. [Max Planck Inst. Tierzucht, Mariensee, Trenthorst.]

(a) The cows studied in 1949–50 were in 3 groups ; 11 were in the East Friesian Herdbook, 8 in the Oldenburg Herdbook, and 10 were selected from the herd of the Max Planck Institute on the basis of date of calving. In the following year 3 of the East Friesian group and 7 of the institute herd were studied for a second lactation. Each cow was studied for 365 days after calving. The study began in winter or early spring, and none of the cows calved later than the middle of February ; they were at pasture from the beginning of May until the end of October and indoors the rest of the time.

This first part of the study deals with the milk and fat yields of each cow and the course of lactation.

(b) The cows were fed twice daily, except that the East Friesian and Oldenburg cows had extra concentrates and hay in the evening when in full lactation. Feeds and uneaten feed were weighed to the nearest 100 g. Concentrates were given first, then roots or silage and finally hay. Changes in the ration were made always on Thursdays. The ration was based on maintenance allowances of 300 g. digestible crude protein and 3000 Kellner starch units (S.U.) for a cow of less than 601 kg. liveweight, 330 g. and 3300 S.U. for cows from 601 to 700 kg., and 360 g. and 3600 S.U. for cows of 701 to 800 kg. Production rations were based on 60 g. protein and 275 S.U. per kg. 4 per cent. fat-corrected milk. The rations are shown in tables. While indoors all the cows had 150 g. daily of a mixture of calcium phosphate, calcium carbonate and salts (Viehsalz), and minerals were available to them at pasture.

The intake and yield of each cow during indoor feeding are tabulated, and in another section the intakes of ballast and dry matter. Intakes of ballast and dry matter in individual cows were lowest a few days before calving and rose up to about 8 weeks after calving. Both declined with milk yield, but variations in ballast intake were greater both in the individual cow and between cows than variations in dry matter intake. The mean daily intake of ballast was less than the previously accepted value of 4·3 kg. There was a close relation between milk yield and dry matter intake, $r = + 0{\cdot}828$. A cow which ate 1 kg. more dry matter gave on the average 2·3 kg. more milk, but cause and effect cannot be distinguished. When more concentrates were given less succulent and fibrous feeds were eaten, but the greater the feed capacity of the cow the more concentrates could be taken with a given amount of roughage. Feed capacities of 20 kg. and more dry matter were found in adult cows with high yields of 28 kg. and more. In 26 of 39 lactations studied the feed intake of the cows lay between 18 and 22 kg. dry matter.

Feed utilisation was studied. At the height of lactation, between calving and going out to grass, the 19 East Friesian and Oldenburg cows used 74·2 g. digestible crude protein and 285 S.U. per kg. fat-corrected milk or 1·89 kg. protein and 7250 S.U. per kg. butterfat. The corresponding values for the institute cows were 71·2 g. and 295 S.U., 1·77 kg. and 7310 S.U. As much was needed to produce the last as for the first kg. of milk. Succulent feeds and hay provided about 32·9 per cent. of the total production requirements. The costs were studied and it was found that the most profitable level for each cow was that at which most bulky feeds could be used. Even with the cows which had the greatest capacity the daily yield could not profitably be pushed up above 35 kg. In this way the expenditure on concentrates was not excessive and the health of the cow did not suffer. [This is a selection of only the main points of this long and detailed paper.]

D. Duncan.

3848

CURTO, G. M. Notizie, considerazioni ed esperienze sull'influenza dell'alimentazione sui grassi

del latte nei ruminanti. [**Comments, views and experiments on the effect of diet on milk fat in ruminants.**] *Zootec. Vet.*, 1955, **10,** 437–450; 1956, **11,** 4–16. [Staz. Sper. Zootec., Fac. Agrar., Univ. Milan.] English summary.

The first 7 parts of this paper review and discuss published work on the effects of diet on the percentage of fat in milk (1 and 2), the mechanism of breakdown of carbohydrates in the rumen (3 and 4), the absorption of volatile fatty acids (5), their use (6) and in particular (7) the influence on milk of feeds which produce much acetic acid. The last part describes original work. Six Friesian cows aged from 6 to 8 years were studied about a month after calving. In a preliminary period of 15 days all the cows were fed on hay to cover their maintenance requirements and concentrates according to yield. After this 4 of the cows had pulverised straw added to the concentrates in increasing amounts until after 6 days each cow was receiving 4 kg. straw in addition to the basal ration; the experimental period then lasted 20 days. Two cows served as controls, receiving the basal diet all the time. There was no effect of the increase of crude fibre on the percentage of fat in milk.

The straw was then withdrawn from the ration and for 13 days the intake of hay of the same 4 cows was progressively reduced and that of concentrates increased until the crude fibre intake was for individual cows from 55 to 70 per cent. less than in the basal ration. The hay intake, initially 10 to 13 kg., was reduced to 1 to 3 kg. Milk yield fell, especially in the cow with the highest yield; this cow showed an increase in percentage of fat, the other 3 gave milk of lower fat content than before.

With the same low hay intake, pulverised straw was then again introduced for 6 days; for the next 20 days the fat content of the milk was restored to normal. Lastly, the straw was withdrawn, but the cows received for 20 days 500 g. sodium acetate in water daily. This prevented any fall of milk fat.

It is concluded that coarse forages to supply a modicum of crude fibre are important in maintaining the fat content of milk.—D. Duncan.

3849

HOLMES, W., WAITE, R., MACLUSKY, D. S. and WATSON, J. N. **Winter feeding of dairy cows. 1. The influence of level and source of protein and of the level of energy in the feed on milk yield and composition.**

HOLMES, W. **2. Dried grass produced in spring and in autumn compared with other concentrates and with spring grazing.** *J. Dairy Res.*, 1956, **23,** 1–12; 13–20. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

1. Two experiments were made each with 12 cows forming four 3 × 3 Latin squares. Each cow spent 4 weeks on each ration, but milk yields during the last 3 weeks only were used to assess the results. The basal rations were of dried grass, hay and roots in amounts sufficient for maintenance and the first 5 lb. milk in the first experiment and for maintenance and the first 7·5 lb. milk in the second. The level of rationing was about 10 to 15 per cent. above the Woodman standards.

In the first experiment 3 concentrate rations were compared. The digestible crude protein (D.C.P.) contents were 10, 15 and 17 per cent.; the starch equivalent (S.E.) content was held constant at 63·5 per cent. Statistical analysis of the results showed no difference in milk yield, milk composition or liveweight gain except that the concentrate containing 17 per cent. D.C.P. gave milk with a slightly lower fat content.

The second experiment was similar except that D.C.P. content of the 3 concentrate mixtures was held constant at 16 per cent. and the S.E. was adjusted to 59, 67 and 75 per cent. The mixtures containing the higher levels of S.E. gave significantly more milk and tended to increase liveweight. The solids-not-fat content of the milk increased when the S.E. level was raised from 59 to 67 per cent. but there was no further increase at the 75 per cent. level. The fat content of the milk was reduced at the 75 per cent. S.E. level. The ration containing only 10 per cent. D.C.P. was the most economical. It was concluded that a level of feeding from 110 to 117 per cent. of the Woodman standards would be the most economical for winter milk production.

2. Experiments similar in design to those reported above were made to compare dried autumn and spring grass as concentrates with one another and with a mixture of oats, beans and dried grass. In a second experiment dried autumn grass plus oats and dried spring grass plus oats were compared with one another and with a concentrate mixture made up mainly of imported feeds. The basal rations consisted of hay, swedes and oat straw. In the first experiment equal amounts of oats and dried grass were given as part of the maintenance ration.

In both experiments animals fed on dried spring grass gave slightly more milk than those on dried autumn grass. The yield of milk from cows given the mixture of oats, beans and dried grass was about equal to that of cows given the dried spring grass. The highest milk yields were obtained when the mixture of imported feeds was given. Cows on dried spring grass during the last period of indoor feeding showed the least increase in milk on going to grazing, and those on the mixture of oats, beans and dried grass showed the highest increase. The high yields obtained with the

imported feed mixture were thought to be due to the greater amount of nutrients supplied by this ration. It was concluded that the spring grazing stimulated yields for the same reason.

J. N. Aitken.

3850

LARSEN, L. H. and LARSEN, H. Fodringsintensitetens og fodersammensætningens indflydelse på malkekøernes rentabilitet, holdbarhed og drægtighedsforhold, 1935–1954, Favrholm. [**Effect of plane of nutrition and composition of the diet on the economic return from dairy cows, productive life and reproduction: 1935 to 1954, Favrholm.**] *Forsøgslab. København Beretn.*, 1956, No. 285, pp. 168. English, French, German and Italian summaries.

In this 19-year-long experiment, plane of nutrition was adjusted as follows: normal, 0·4 production feed unit (F.U.) and 60 g. digestible true protein per kg. 4 per cent. milk; low-plane, 0·33 F.U. and 50 g. protein; high-plane, 0·476 F.U. and 71 g. protein. Within the normal and high groups the proportion of succulent fodder was varied so that part had 4 F.U. roots and the remainder 5 F.U. roots and 2 F.U. silage. The low-plane groups had 4 F.U. roots and all had 1 F.U. each of hay and straw. A sixth high-plane group had 5 F.U. roots without silage. This plan was maintained for 10 years; thereafter all groups had in summer a supplement of silage if required and if silage was to be had. The concentrate mixtures used changed in detail over the 19 years but were always of the same type and the same for all groups in any one year. An example from 1942–43, when it was difficult to maintain the standards, is given as follows: winter mixture C: 50 parts sunflower cake, 43 mustard seed meal, 5 sesame cake, 2 cottonseed cake; winter mixture A: 20 parts C mixture, 10 coconut cake, 10 urea cake [not described], 30 oats and 30 barley. Summer mixture: 40 parts rye bran, 20 oats, 20 barley, 10 urea cake, 5 coconut cake and 5 mustard seed meal. In the above order these mixtures provided, per 100 kg., 105·1 F.U. and 311 g. digestible true protein, 90·2 F.U. and 119 g. protein and 81 F.U. and 90 g. protein. They were given according to yield of 4 per cent. milk, and, in summer, yield and quality of pasture.

The experiment began with 6 herds, each of 6 Red Danish cows, comparable in age, breeding, size, condition and time of calving. These were to be brought up to 12 either with their own calves or calves from the parent Favrholm herd. There was no interchange between experimental herds and when they reached the planned number, each was maintained by replacements within itself. At any one time, the same bull was used in all herds.

Average annual yield in kg. and fat per cent. for the 19 years were: normal plane, 4239 and 4·13; normal plane with high roots and silage, 4199 and 4·24; low-plane 3796 and 4·12; high-plane 4279 and 4·07, with high roots and silage 4198 and 4·16, with high roots without silage 4505 and 4·12. The high-plane increase of roughly 20 per cent. in both F.U. and g. protein gave only an insignificant increase in yield; the reduction of 20 per cent. reduced yield by 10 per cent.

The economics of production are analysed in detail with special reference to the use of succulents. Normal plane, high succulents gave the best returns and high plane, high succulents the second best.

There were in all 1802 services for 798 pregnancies. In the order normal plane with 2 groups, low plane, high plane with 3 groups, services per conception were 1·91, 1·72, 1·74, 1·98, 1·81, 1·92, and per cent. pregnant to first service 54·7, 61·9, 59·9, 49·2, 58·5 and 49·6. A more stringent analysis with exclusion of all disturbing abnormalities showed that in the high-plane herd, milk yield had no effect on breeding performance; in the normal and low-plane herds performance deteriorated as yield rose.

Taking the herds in the same order, the average herd life in years and number of cows, in brackets, were: 5·75 (31), 5·73 (32), 5·98 (30), 5·05 (35), 4·52 (37) and 5·72 (31). Causes of removal from the herd are tabulated for each herd in 2 lists, those that could not be associated with the plan of feeding and those that might be affected by composition of the diet or plane of nutrition. When the experiment terminated, no addition had been made for 4 years on account of a programme to eradicate abortion (see p. 8 of the report), and only 11 cows remained. Including these, there were 92 in the list of causes independent of diet and 104 in the list of causes possibly dependent on diet. Of these the chief with 69 disposals was sterility, the next with 11 old age.

There was no effect of plane of nutrition on weight of calves.

Details of these and other findings and of feed consumption are set out in 12 "main" tables. There are 24 summary tables and 37 graphs in the text.—I. Leitch.

3851

NORDFELDT, S., HELLEDAY, T. and MÅNSSON, N. C. (with HJELM, L. and SWARTLING, P.) Undersökningar över avkastningsresultaten för kor av låglandsras jämförda med resultaten för kor av jerseyras. [**Returns from Holstein-Friesian compared with Jersey cows.**] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 113, 1955, pp. 15. English summary.

The tests continued over 2 years, in the first with 7 Holstein and 10 Jersey, and in the second with 9 Holstein and 11 Jersey cows. Details are

given of feed consumption, yield and composition of milk, liveweight and cost and value of produce and some data for the feeding of the calves to 180 days of age. A special study was made to compare profits assuming a productive life of 5 years and 4·5 calves, and costing at 1953–54 prices. The Holstein cows earned more in milk, ratio roughly 5 : 4 ; calves, ratio 2 : 1 ; cows disposed of, ratio 10 : 6·5 (total ratio 11·6 : 8·6), and cost more in feed and labour, ratio 4·6 : 3·5, so that the surplus per cow in Kr. was 7005 for Holsteins and 5374 for Jerseys or less if the overprice for fat was less. The last section of the report gives average composition of Holstein and Jersey milk during stall feeding and grazing in 1953 and 1954.—I. Leitch.

3852

HOLMES, W. **Feeding grass. The use of grazing, silage, hay and dried grass in feeding dairy and beef cattle.** Dept. Agric. Scotland Advisory Leaflet No. 25 (New Ser., revised), H.M.S.O., Edinburgh, 1956, pp. 21. Price 1s. 3d. net.

The effect of season and stage of growth on the feeding value of grass, and the extent of the losses incurred in different methods of conserving it, are discussed in relation to the nutritional requirements of dairy and beef cattle. Tables have been compiled which show the approximate feeding values of different grades of grassland products, and methods of compounding rations from them.

T. R. Preston.

3853

HANSEN, K. Afkomsprøver med tyre. [**Progeny-testing of bulls.**] *Forsøgslab. København Beretn.*, 1956, No. 286, pp. 235. English and German summaries.

The test year began on 1 September. Before calving the heifers were given, in addition to grazing, 4 feed units (F.U.) roots with 172 g. digestible true protein, 1 F.U. beet tops with 120 g. protein and 2 kg. concentrates (30 cake and 70 barley) with 272 g. protein. After calving, winter feed for yields of 10·5 kg. or more was, in kg., 1·5 swedes, 3·25 beets, 1 beet-top silage, 2·5 hay, 2·0 concentrate mixture 1 and amounts of concentrate mixture 2 increasing by 0·4 kg. per kg. 4 per cent. milk above 11·5 kg. Mixture 1 was of soya bean meal 15, cottonseed cake 27, sunflower expeller meal 25, expeller rape seed meal 8, coconut cake 18, molasses 5 and dicalcium phosphate 2 per cent. Mixture 2 was of mixture 1, 35, wheat bran 15, barley 48 and dicalcium phosphate 2 per cent. On the average 0·41 production F.U. and 65 g. digestible true protein were taken per kg. 4 per cent. milk. In the grazing season a concentrate mixture of mixed grains 60, oilcake 30 and molassed bran 10 per cent. was given according to milk yield and assessed quality of pasture.

For 5167 Red Danish heifers tested between 1945 and 1955 the average milk yield was 4344 kg. with 4·42 per cent. fat ; for 675 Holsteins 4228 and 4·29 ; for 394 Jerseys 3158 and 6·18 ; and for 65 Shorthorns 3460 and 4·09. The average total feed cost in stall of 4 per cent. milk was 1·42 Kr. per F.U.—I. Leitch.

3854

BECKER, R. B., ARNOLD, P. T. D. and SPURLOCK, A. H. **Productive life-span of dairy cattle.** *Florida Agric. Exp. Stat. Bull.* No. 540, March 1954, pp. 18.

A survey of 101 Florida dairy herds showed that the productive life of dairy cows in herds maintained by purchased replacements was 3·9 years compared with 4·7 years in 14 herds in which replacements were reared at home. The main reasons for disposal were udder troubles, low milk production and infertility. An analysis of the reasons for early disposal of 2254 bulls in natural service showed that 34·5 per cent. were discarded to avoid inbreeding, 14·1 per cent. for bad disposition and 10·4 per cent. for low production of daughters.

Study of the reasons for discontinuing the use of 5177 bulls in natural service showed that 28·9 per cent. were disposed of owing to sterility. Bulls used in artificial insemination stations had an average useful period of 2·72 years.—J. N. Aitken.

3855

AURIOL, P. Influence du mois de vêlage sur la production laitière des vaches Pie rouge de l'Est, dans le Jura. 1. Premières observations. [**Effect of month of calving on milk production of Eastern Red Pied cows in the Jura. 1. Preliminary observations.**] *Ann. Zootech.*, 1955, **4**, 189–200. [Stat. Recherches Élevage, C.N.R.Z., Jouy-en-Josas.]

The region studied was selected for homogeneity of climate, insolation and mode of husbandry, and was limited to the plateau of Nozeroy. The herds were in about 20 communes situated between 750 and 850 metres above sea level and in an area with a heavy rainfall and much snow. The cattle were housed from 15 October to about the first half of May. Natural pasture, about 40 per cent. of the total area, provided most of the cattle feed as grass in summer and hay in winter ; silage was forbidden because the milk went for Gruyère cheese. All the cattle were of the Eastern Red Pied breed and most of them of the Montbéliard strain. Milk records were taken from monthly weighings, and production was expressed on the basis of the lactation and not of the year. Abnormal lactations, after abortion or with mastitis, and those in which the interval between calving and next pregnancy was more than 5 months,

were eliminated. The cows were all milked twice daily.

The 240 selected records were for cows in 20 herds in 1953 and 1954. The mean yield was a little above the average for the whole district. Feeding practice varied considerably. Few cows calved in July and August, but mean yields for the cows calving in the months from October to June are tabulated. The highest yields were from cows calving in October, November and December, and cows calving in December gave 24·8 per cent. more milk than those calving in June. The coefficient of persistence of lactation (Delage *et al.*, *Ann. Zootech.*, 1953, **2**, 225) was highest in autumn calvers and lowest in those which calved between March and May. The duration of lactation was greatest after October calving and least after May calving. There was little effect of month of calving on the maximum daily yield, and the variation with month was only about 10 per cent. It is proposed to examine next the influence of the age of the cow.—D. Duncan.

3856

BURKITT, W. H., URICK, J. J., WILLIAMS, R. M. and WILLSON, F. S. **Rapeseed oil meal and linseed meal as protein supplements for wintering cows, calves and yearlings.** *Montana Agric. Exp. Stat. Bull.* No. 499, June 1954, pp. 17.

Rapeseed oilmeal proved to be equal in value to linseed meal as a protein supplement to low-protein roughages in rations for pregnant Hereford cows, yearlings and calves.—J. N. Aitken.

3857

SIRRY, I. and HASSAN, H. A. **The effect of potassium-iodide feeding on milk production and composition, and on general condition, in the Egyptian buffalo.** *Empire J. Exp. Agric.*, 1955, **23**, 214–219. [Fac. Agric., Univ. Cairo.]

Potassium iodide, 120 mg. daily, in mid-lactation significantly increased milk and butterfat yield of buffaloes over that of similar untreated animals. Percentage solids-not-fat, sp. gr. and acidity of the milk increased, but butterfat percentage decreased. There was some indication of a greater persistency of lactation in treated animals. Body temperature and pulse rate were not affected.—T. R. Preston.

3858

NELSON, A. B., MACVICAR, R. W., CAMPBELL, W. D. and ROSS, O. B. **Supplements of different protein and vitamin-mineral content for wintering bred yearling heifers.** *Oklahoma Agric. Exp. Stat. Bull.* No. B-460, September 1955, pp. 11.

In-calf Hereford heifers outwintered on grass and given 2·5 lb. daily of a 40 per cent. protein supplement gained on the average 56 lb. per head more than similar heifers given 2 lb. of a 20 per cent. protein supplement. The difference between the groups disappeared by the end of the summer grazing season. The addition of vitamins and minerals to the supplements had little effect. The birthweights and weaning weights of the calves were not significantly different.—J. N. Aitken.

3859

BRANDSMA, S. De mineralen in de voeding van het rundvee. [**Minerals in the feeding of cattle.**] *Verslag* 1954 *Vereniging Exploitatie Proefzuivelboerderij Hoorn*, 1–12. [Rijkslandbouwproefstat., Hoorn.]

The K requirement of a milk cow of 500 kg. liveweight giving 20 kg. milk has been estimated as 55 g. daily; her intake from pasture may be as much as 10 times that. Caution is therefore required in respect of the persistent use of K fertilisers and farm manure, especially in areas where Na or Mg or both are below normal. The daily Na requirement of the same cow is assessed at 22 to 24 g. Pasture may, or may not, supply that amount. Hence the need to provide salt licks and to replace pure K fertilisers by compounds that contain Na. Requirement for Cl is at least 42 g. Most pastures and indoor rations provide plenty. Modern estimates of Ca requirement, still for the same cow, are from 56 to 84 g. Some grass pastures may provide less than this; some rich in clover or lucerne may provide too much and require supplements of P, of which the basic requirement is about 46 g. The Mg requirement of about 30 mg. is often not supplied by pasture alone. The replacement of pure K fertilisers by compounds that contain Mg should help.—I. Leitch.

3860

MCDANIEL, A. H. and ROARK, C. B. **Performance and grazing habits of Hereford and Aberdeen-Angus cows and calves on improved pastures as related to types of shade.** *J. Animal Sci.*, 1956, **15**, 59–63. [Louisiana Agric. Exp. Stat., Baton Rouge.]

In experiments made over 4 years with Hereford and Aberdeen-Angus cows and calves rate of liveweight gain, time spent grazing and time spent lying down were directly, and time spent standing indirectly, related to the amount of shade available to the animals. Calves were less affected by the different amounts of shade than were the cows.

T. R. Preston.

3861

ROLLINSON, D. H. L., HARKER, K. W., TAYLOR, J. I. and LEECH, F. B. **Studies on the habits of Zebu cattle. 4. Errors associated with recording technique.** *J. Agric. Sci.*, 1956, **47**, 1–5. [Animal Health Res. Centre, Entebbe, Uganda.]

For previous parts see Absts. 5400, Vol. 24; 4335, 5822, Vol. 25.

Five observers recorded simultaneously the grazing habits of 10 cattle during 1½- or 2-hr. periods. The standard errors of observations made at 1-min. or 4-min. intervals were 3·20 and 7·36 per cent. of the general mean, respectively. It is concluded that recording at 4-min. intervals was sufficiently accurate for the "major" activities and that differences between observers were unlikely to be important in practice.

J. L. Corbett.

3862

WALSER, K. Laktation und Abortus. Ein Beitrag zur Kenntnis der Laktationsverhältnisse nach Fehl- und Frühgeburten der Rinder. [**Lactation and abortion. Effect on lactation of abortion and premature birth in cows.**] *Ztschr. Tierzücht. Züchtungsbiol.*, 1955, **66**, 38–64. [Inst. Geburtshilfe, Tierärztl. Fak., Univ. Munich.]

The cows were all in herds whose yields were recorded by South Bavarian recording associations. The cause of abortion was usually brucellosis or trichomoniasis. The milk yields were studied in 310 cows which aborted before the completion of a previous lactation, 97 cows which were dry before they aborted and 84 heifers which aborted a first calf.

The cows of the first group gave on the average only 2280 kg. milk after aborting, against 3360 kg. in their recorded normal lactations. The variability was large. The loss was due mainly to a smaller output in the early part of the lactation; the decline was slower than normal. The difference in loss between cows which aborted before and after the end of the fifth month of pregnancy was not significant. The age of the cow had no significant effect. The normal milk yield had a significant effect; the percentage loss increased with normal yield and the means were 28·5 and 35·1 for cows giving normally less and more, respectively, than 3300 kg. Yields after autumn abortions were 15 to 20 per cent. less than those after spring abortions.

Cows which were dry before they aborted gave 20 ± 17 per cent. less than their normal milk yields; losses were slightly, but not significantly, less when the dry period was long.

Heifers which aborted their first calf gave on the average 20 per cent. less milk than the average for normal heifers in the same books. There was no effect on the subsequent lactation.

D. Duncan.

3863

MAYMONE, B. and REGENSBURGER, G. Contributo allo studio dell'azione esercitata dalla capraggine (*Galega officinalis*, L.) sulla produzione del latte nei bovini. [**Effect of goat's rue (*Galega officinalis*, L.) on milk yield of cows.**] *Ann. Sper. agrar.*, 1956, **10**, 7–24. [Ist. Sper. Zootec., Rome.] English summary.

Hay made from goat's rue is not accepted by cows, so the ground seeds were used, on the assumption that the effects ascribed to the plant are due to the alkaloid galegin, which is in highest concentration in the seeds. In a preliminary test it was found that 300 g. daily could be eaten by cattle without sign of poisoning.

Ten Friesian cows were divided into 2 groups of 5 as nearly as possible paired for age, stage of lactation, bodyweight and milk yield. After 10 days of preparation the cows of group 1 received 300 g. daily of goat's rue seeds mixed with their concentrates. This continued for 20 days, then for 10 days neither group received goat's rue, and finally group 2 received 300 g. per head daily for 20 days. The cows had a mixed basal diet of lucerne hay, dried beet pulp and a concentrate mixture.

While they were being given goat's rue the cows ate an extra 0·3 feed unit daily from the goat's rue and 0·25 feed unit of other feeds, providing together 95 g. digestible protein. There was no significant effect on bodyweight or on yield or composition of milk. It was estimated that the dose of galegin was 6·6 mg. per kg. liveweight daily.—D. Duncan.

3864

DAHM, P. A. and JACOBSON, N. L. **Effects of feeding Systox-treated alfalfa hay to dairy cows.** *J. Agric. Food Chem.*, 1956, **4**, 150–155. [Iowa State Coll., Ames.]

Systox is a proprietary insecticide containing an emulsifing agent and an organic thiophosphate, demeton. A 2·58 acre field of alfalfa was sprayed at the rate of 6·2 oz. per acre. The crop was mown 27 hr. and baled 75 hr. after treatment. The hay was used in 2 feeding trials with milking cows. The toxic effects of demeton were demonstrated in a preliminary trial with one cow, which received it in capsule in increasing amounts for 3 consecutive days as follows: first day 0·1, second day 0·51 and third 2·5 mg. per kg. bodyweight. By the end of the third day the cow showed signs of intoxication, had diarrhoea and went off feed. Milk samples taken 1 and 6 hr. after the third feeding contained substances which inhibited the cholinesterase present in plasma used for analysis. When the same cow was given increasing quantities of treated hay for 49 days no significant inhibition of cholinesterase by milk occurred. A similar result was obtained when the treated hay was given to 3 cows for 56 days. The cholinesterase activity in the red blood cells declined as the feeding of the hay was prolonged. That of 2 cows which received a normal ration remained constant

throughout the experiment. It was concluded that the detoxication did not involve the process of milk secretion.—J. N. Aitken.

See also Absts. 2952, 3229.

REPRODUCTION

3865

ROGNONI, G. Alcuni aspetti dei rapporti tra alimentazione e fertilità delle bovine da latte. Indagine sull'influenza del residuo acido basico e del rapporto Ca/P dei foraggi. [**Diet and fertility in milk cows. Effect of acid base balance and Ca : P ratio of fodder.**] *Zootec. Vet.*, 1956, **11,** 55–64. [Ist. Genetica Animale, Fac. Agrar., Univ. Cattol. Sacro Cuore.] English summary.

The study was made on a dairy herd of about 2000 cattle of several breeds, including about 1000 cows and pregnant heifers distributed in about 30 farms. Some of the cattle were imported.

The fertility of the cows between 1951 and 1954 varied from 89·63 to 78·70 per cent. For all cows the mean number of services per pregnancy ranged from 2·32 to 2·69, but for all cows got in calf within 4 months of parturition and with not more than 4 services it was 1·94. The percentages of pregnancies following only 1 service were from 37·1 to 40·9 for all cows and from 43·9 to 47·7 for the selected group. Results were worst in summer, when the cows were receiving concentrates only for milk beyond the first 14 litres. The feedingstuffs were analysed. [The results are said to be in Table 5, but this table appears to be missing.] It was concluded that the acid base balance of the fodder was too alkali-forming, that the Ca : P ratio was too high and the Mg : Ca and Na : K ratios too low and that there was a deficiency of Cl. It was therefore decided to try the effect of a mineral supplement in some groups of cows with particularly poor fertility, 243 cows in all. These cows received a mineral mixture designed to reduce the Ca : P ratio, correct the deficiency of Cl and improve the K : Na ratio. This was begun in 1953, and by 1954 there was a striking improvement in breeding results. Compared with 1951–52, the number of services per pregnancy in this group had fallen from 3·22 to 1·88 and the percentage of successful first services had risen from 24·1 to 49·7. The winter results were no longer better than those in summer.—D. Duncan.

3866

VAN OERS, J. Drachtigheidsresultaten bij de natuurlijke dekking en K.I. [**Pregnancies resulting from natural service and artificial insemination.**] *Tijdschr. Diergeneesk.*, 1955, **80,** 1170–1187. [Roermond.] English, French and German summaries.

See also Absts. 3106, 3854.

SHEEP

3867

MUNRO, J. **Observations on the suckling behaviour of young lambs.** *Brit. J. Animal Behaviour*, 1956, **4,** 34–36. [Dept. Agric., Univ. Aberdeen.]

The suckling behaviour, under natural conditions, of 2 sets of Blackface twin lambs was recorded for continuous 16-hr. periods during daylight once a week for the first 6 weeks of life. Similar observations were made of 2 single Blackface lambs for 6-hr. periods in daylight each week. Twin lambs over this period were suckled 22 times in 16 hr. and single lambs 14 times in 6 hr. Lambs were suckled less frequently and for shorter periods as they grew older.—J. C. Gill.

3868

JÓNSSON, G. Tilraunir með síldarmjölsgjöf handa beitarám um meðgögutímann 1950–1954. [**Feeding trials with herringmeal for pregnant ewes, 1950-1954.**] *Rit Landbúnaðardeildar, A-Flokkur*, 1955, No. 10, pp. 30. [Reykjavik.] English summary.

Ewes on pasture receiving 100 g. herringmeal daily did not thrive better than ewes receiving 50 g. herringmeal daily during the first 3 months of pregnancy when over 30 per cent. of maintenance requirements was met by good quality hay ; 50 g. herringmeal daily also proved sufficient during the last 2 months of pregnancy provided 50 to 60 per cent. of maintenance requirements was met by hay. When less hay was given the ewes receiving 50 g. herringmeal were in poorer condition than those receiving 100 g., which pointed to deficiency of protein or minerals or both in the pasture. In 3 of the 5 trials significantly heavier twins were produced by the ewes receiving 100 g. herringmeal. From the results the appropriate levels of herringmeal feeding for different conditions are given. (From summary.)—J. C. Gill.

3869

BURKITT, W. H., LEWIS, J. K., VAN HORN, J. L. and WILLSON, F. S. **Wood molasses compared with cane molasses for lambs and steers.** *Montana Agric. Exp. Stat. Bull.* No. 498, June 1954, pp. 18.

Over 4 years of tests, wood molasses was found to be a satisfactory part replacement, up to 20 per cent., for barley and oats in lamb rations,

causing no harmful effect and proving very palatable. Its feeding value was equal to that of cane molasses when given on an equal dry matter basis. Apparent digestibilities of individual nutrients and of total digestible nutrients of the total ration were similar whether the concentrate portion contained no molasses, cane molasses or wood molasses. The taste of the mutton was unaffected. Wood molasses was comparable with cane molasses for feeding steers, and a satisfactory pellet could be produced when it was included in the ration at a 10 per cent. level.—J. C. Gill.

3870

TILLMAN, A. D. and MACVICAR, R. **The effect of chlortetracycline upon digestion of ration components, retention of nitrogen and volume of urine excreted by sheep with observations on rectal temperatures.** *J. Animal Sci.*, 1956, **15,** 211–217. [Oklahoma Agric. Exp. Stat., Stillwater.]

In trials with over 50 sheep digestibility of the ration and N retention were not affected when chlortetracycline was given at the rate of 11·8 mg. per 100 lb. bodyweight. Digestibility of dry matter, crude protein, crude fibre, N-free extract and energy were reduced but N retention was unaffected when chlortetracycline was given at a level of 15·4 mg. per 100 lb. bodyweight. The antibiotic significantly depressed rectal temperature and slightly increased excretion of urine.

J. C. Gill.

3871

JORDAN, P. S., JORDAN, R. M. and CROOM, H. G. **Effect of chlortetracycline, stilbestrol and chlortetracycline-stilbestrol supplements on fattening lambs.** *J. Animal Sci.*, 1956, **15,** 188–192. [Minnesota Agric. Exp. Stat., St. Paul.]

Rate of gain, feed consumption and efficiency of use of feed of lambs on concentrate and roughage (35 : 65 and 45 : 55) were not affected by the addition of 21·6 mg. chlortetracycline or 2 mg. stilboestrol or both. Carcase yield was not affected by treatment or by the concentrate to roughage ratio, but carcase grade was improved by higher concentrate feeding and by the addition of chlortetracycline.—J. C. Gill.

3872

JOHNSTON, E. F., HUDSON, F., BOGART, R., OLIVER, A. W. and MCKENZIE, F. F. **The effects of injected testosterone on adult ewes.** *J. Animal Sci.*, 1956, **15,** 177–184. [Dept. Animal Husb., Oregon Agric. Exp. Stat., Corvallis.]

In a trial with 8 adult ewes 100 mg. testosterone injected weekly produced male behaviour, enlarged clitorides, smaller hearts and smaller thyroid glands but did not affect weight gain or carcase grade. Weights of liver, kidney, adrenal, pituitary and ovary were not affected. Four days after treatment ceased no active residual testosterone was found in the meat. Seventeen days after treatment the clitorides of treated ewes had partly regressed from the enlarged state.

J. C. Gill.

3873

JOHNSTON, E. F., HUDSON, F., BOGART, R. and KAUFMES, J. **Retention of injected testosterone in the meat of adult ewes.** *J. Animal Sci.*, 1956, **15,** 185–187. [Dept. Animal Husb., Oregon Agric. Exp. Stat., Corvallis.]

The bodyweight and comb length of cockerels fed on meat from 4 ewes treated with testosterone did not differ from those of cockerels fed on meat from 4 untreated ewes, but comb height of cockerels fed on meat from the untreated ewes was significantly greater. The results indicated that there was no residual testosterone in the meat of ewes 4 days after treatment ceased.—J. C. Gill.

3874

WHITING, F. and CLARK, R. D. **The concentrate to roughage ratio in the ration as it affects the performance testing of rams.** *Canad. J. Agric. Sci.*, 1955, **35,** 518–524. [Div. Animal Husb., Exp. Farms Serv., Canada Dept. Agric., Lethbridge, Alta.]

Nineteen sire groups of 4 ram lambs each representing Rambouillet, Canadian Corriedale and Romnelet breeds were used in a 2-year trial to evaluate rations for testing performance of rams. The concentrate : roughage ratios studied were 2 : 1, 1 : 1, 1 : 2 and free choice (about 5 : 1). Data were analysed for different bodyweight ranges and time intervals. Groups differed significantly in average daily gain and efficiency of use of feed, but there was no difference in variability within those groups with concentrate to roughage ratios of 2 : 1, 1 : 1 and 1 : 2. On free choice, daily gains were more variable, but not feed efficiency. Sire group differences in daily gains were significant only from 90 to 130 lb. bodyweight and in feed efficiency during the first 112 days on feed. Correlations between daily gains and feed efficiency were lower on free choice. Average correlation between initial weight and gain was not significant, but that between initial weight and feed efficiency was significant.

J. C. Gill.

3875

BOGART, R. and HEDRICK, D. W. **Managing sheep on hill pastures.** *Oregon Agric. Exp. Stat. Bull.* No. 554, November 1955, pp. 15.

Studies, over 8 years, on the better use of hill pasture for producing fat lambs off grass indicated that sheep should be grazed on both improved and unimproved pastures at the pastures' maximum productivity and that the green feeding period

should be extended by making silage from excess grass in the spring, by the use of fertilisers and by good management. Grasses and legumes should not be too heavily grazed and should be of highest quality for ewes and lambs. After weaning the ewes should be put on less luxuriant pasture. Breeding pasture should be plentiful and nutritious. Highly productive pasture should be grazed by the heavier breeds, *e.g.*, Hampshires and Suffolks, and poorer pastures by Cheviots. Long-wooled breeds can stand up to wet weather and their lambs are improved when Southdown tups are used instead of Suffolks. Pasture with $\frac{1}{2}$ lb. grain per head daily is sufficient for winter feeding in open weather, and $\frac{3}{4}$ lb. grain plus hay and silage during snow. To combat parasites and infective disease in general, rotation of grazing is recommended and a one-year plan is shown for running 200 ewes on 4 pastures.—J. C. Gill.

3876

ANGEL, H., CHARLET, P. and POLY, J. Quelques résultats sur les aptitudes zootechniques des brebis de race Lacaune. [**Productive capacity of Lacaune sheep.**] *Ann. Zootech.*, 1955, **4,** 233–239. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

In 1947 and 1948 a study was made of 73 Lacaune ewes in 6 small flocks at Montlaur in the Camarès. The flocks contained from 7 to 18 ewes; mean duration of lactation was from 158 to 180 days, milk yield from 110·34 $\pm$ 4·39 to 150·01 $\pm$ 5·59 kg., fleece weight from 1·18 $\pm$ 0·14 to 1·92 $\pm$ 0·19 kg. and chest girth 0·934 to 0·972 m. The last 3 characteristics were subjected to analysis of variance.

Chest girth did not differ more between flocks than between individuals in flocks, but the differences between flocks in milk yield and fleece weight were significant. The correlation between milk yield and fleece weight was not significant. The proportion of the body surface covered with wool bore no relation to the milk yield, but its positive correlation with fleece weight was highly significant. It was found that 51·4 per cent. of the variation in fleece weight could be explained by this variation in " covering index ".

Work is to continue with the same sheep.

D. Duncan.

3877

BOCCARD, R. and DUMONT, B. L. Étude de la production de la viande chez les ovins. 1. La coupe des carcasses. Définition d'une découpe de référence. [**Meat production by sheep. 1. Carcase cuts. Definition of a reference cut.**] *Ann. Zootech.*, 1955, **4,** 241–257. [Stat. Recherches Élevage, C.N.R.Z., Jouy-en-Josas.]

A reference cut must be based on well defined anatomical divisions, must be simple, easily reproducible and applicable to series of carcases, and should as far as possible be compatible with the chief commercial methods of cutting used in the country. The cut described here is based on the Paris cut, that most widely used in France. A full description with diagrams is given of the Paris cut and the suggested reference cut, with comparative notes on other French methods.—D. Duncan.

3878

TANEJA, G. C. **Mutton qualities in Australian Merino sheep.** *Austral. J. Agric. Res.*, 1955, **6,** 882–890. [Sch. Wool. Technol., New South Wales Univ. Technol., Sydney.]

A study of bodyweight and body dimensions of 557 Peppin Merino ewe lambs and the relationship of these measurements to mutton quality is reported, with measurements of body length, depth and width, fore cannon length, mutton score, fold score and bodyweight at 5, 11 and 17 months. Repeatability ranged from 0·46 for body length to 0·77 for body depth. Fold score was negatively correlated with mutton score, and no significant correlation was found between mutton score and cannon length; apart from these, all pairs of characters studied showed a significant positive correlation. The best measure of mutton quality was bodyweight at 11 months.—J. C. Gill.

3879

DRAGICEVIC, M. C. Contribucion al estudio de metodos de determinacion de rendimiento en lanas de ovinos. [**Methods of estimating yield of wool by sheep.**] *Bol. Inst. Nac. Invest. agron. Madrid*, 1955, **15,** 455–529. [Fac. Agronom., Univ. Chile.] English summary.

The " core test " for estimating the yield of clean wool from the unwashed fleece is described. It consists in taking a sample of wool from the centre of a number of bales of the lot of wool, weighing, washing and removing impurities. The number of samples taken depends on the size of the lot. Samples for testing are sent from the shearing sheds or warehouses and a report can be supplied within 48 hr. of arrival of the sample at the laboratory.

The method was used on 69 samples of wool from 8 farms. Yields of clean wool were from 50 to 63 per cent. of the unwashed fleece, values in which allowance is made for atmospheric humidity. Significant inverse correlations were found between fineness of wool and yield. There was no significant correlation between the estimated yields of whole fleeces, pieces or shearings from the belly, or between 3 groups of farms on which rearing and conditions were different. The difference between the yield estimated visually and that found by the

core test was statistically significant in most cases, and when this was not so it was probably because of the small number of samples available for analysis.
T. D. Bell.

3880

SCHINCKEL, P. G. **Body-weight—fleece-weight relationships in a strain of Merino sheep.** *Austral. J. Agric. Res.*, 1956, **7**, 57–75. [Agric. Coll., Roseworthy, South Australia.]

No correlation was found, except in one out of 10 groups, between bodyweight and wool production per unit area of body surface in a flock of Merino sheep examined at intervals over 7 years. A highly significant correlation was found between clean fleece weight and clean wool per unit area of body surface in the midside region. It is concluded that wool production is proportional to fleece-bearing surface, since the regression of log fleece weight on log bodyweight never differed significantly from 0·60 and 0·60 is the regression of log surface area on log bodyweight in sheep. No significant difference was found between sires in the regression of log fleece weight on log bodyweight, but highly significant differences were found between sire groups in mean log fleece weight after allowing for differences in log bodyweight. Left midside areas of lambs measured every 4 months from 4 to 28 months produced wool in amounts proportional to the area in each of the 6 periods. Differences in the amounts produced were highly significant both between periods and between sheep.—J. C. Gill.

3881

SIDWELL, G. M., JESSUP, G. L. (Jr.) and MCFADDEN, W. D. **Estimation of clean fleece weight from small side samples and from wool density, body weight, staple length and grease fleece weight.** *J. Animal Sci.*, 1956, **15**, 218–224. [Southwestern Range and Sheep Breeding Lab., Fort Wingate, N. Mex.]

The method of Neale and McFadden (*New Mexico Agric. Exp. Stat. Press Bull.* No. 1131, 1954) of estimating clean fleece weight from density, staple length, bodyweight and grease fleece weight was found to be more accurate and cheaper than that of scouring small samples. Calculations on the results from the 344 sheep studied showed that little information was lost when density and bodyweight were omitted. Multiple regression coefficients of clean fleece weight in lb. on staple length in inches and grease fleece weight in lb. were 0·61 ± 0·04 and 0·36 ± 0·01, respectively.
J. C. Gill.

3882

SHORT, B. F. **Developmental modification of fleece structure by adverse maternal nutrition.** *Austral. J. Agric. Res.*, 1955, **6**, 863–872. [Div. Animal Health Prod., C.S.I.R.O., Sheep Biol. Lab., Prospect, N.S.W.]

Bodyweight and the ratio of secondary to primary (S/P) fibres of lambs at birth were reduced but S/P follicle ratio was unaffected by severe restriction of feed intake of ewes throughout pregnancy. Lambs from these ewes made poor growth despite good feeding of the ewes during lactation, and restricted final S/P ratios and number of fibres per unit area of skin resulted. At 7 months of age there was no difference in bodyweight or clean wool production per head or per unit area of the lambs from ewes well fed and from those poorly fed during pregnancy. Longer and coarser wool fibres were grown by lambs with fewer mature follicles per unit area than by those with higher fibre densities.—J. C. Gill.

3883

DALY, R. A. and CARTER, H. B. **Fleece growth of young Lincoln, Corriedale, Polwarth and fine Merino maiden ewes grazed on an unimproved paspalum pasture.** *Austral. J. Agric. Res.*, 1956, **7**, 76–83. [Wool Biol. Lab., Div. Animal Health and Prod., C.S.I.R.O., Sydney, N.S.W.]

Liveweight and wool production of 2 Lincoln, 2 Corriedale, 2 Polwarth and 2 fine Merino maiden ewes run together on unimproved paspalum pasture for 10 months were found to depend on weather and were less than for similar ewes housed indoors and given a diet of high quality. On pasture, Lincoln, Corriedale and Polwarth fleeces lost considerable amounts of wax and suint owing to the 44½ in. of rain which fell during the trial. In Corriedale and Polwarth fleeces "canary" stain and bacterial discolouration showed during warm, wet weather. Severe weather affected the fine Merino least of the breeds studied.—J. C. Gill.

See also Absts. 2942, 3143, 3210, 3356, 3369.

PIGS

3884

ASHTON, G. C., CATRON, D. V., HOMEYER, P. G., CURRY, N. H. and CULBERTSON, C. C. **Portable units for individual experimental pig feeding on pasture.** *J. Animal Sci.*, 1956, **15**, 307–314. [Dept. Statistics, Iowa Agric. Exp. Stat., Ames.]

An easily moveable unit with separate accommodation for 3 pigs is described. For each pig a pen 16 × 5 ft. with shelter and self-feeder is

provided. Statistical designs suitable for use with a number of the units are suggested.—T. D. Bell.

3885

HAELTERMAN, E. O. **Practical isolation equipment for baby pigs.** *Amer. J. Vet. Res.*, 1956, **17,** 129–131. [Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

The equipment consisted of a galvanised can 26 in. high and 20 in. in diameter, with a wire bottom 5 in. from the base of the can. The unit was sealed with heavy cellophane and a rubber band. A feeding pan which could be filled by a tube and was covered with a hinged lid was let into the side of the can 2 in. above the wire floor and could be removed easily for cleaning. Air was changed by a fan which maintained a slight positive pressure within the unit. There was sufficient space between the wire floor and the bottom of the unit to collect excreta without changing for 2 or 3 weeks. The equipment was used for baby pigs 5 to 6 days old in studies of transmissible gastro-enteritis, and for pigs deprived of colostrum. It could hold pigs up to 3 weeks old. It was easy to clean and sterilise at the end of each experiment. Photographs show the construction and operation.

T. D. Bell.

3886

WHITEHAIR, C. K. and THOMPSON, C. M. **Observations on raising " disease-free " swine.** *J. Amer. Vet. Med. Assoc.*, 1956, **128,** 94–98. [Dept. Animal Husb., Oklahoma Agric. and Mech. Coll., Stillwater.]

In an attempt to rear disease-free pigs the litters were removed by caesarean section from 4 Chester White gilts, a few hours after the let-down of milk.

Twenty-three of the baby pigs were isolated and given a liquid milk diet until 5 weeks of age, after which a meal mixture was used. At about this time 9 pigs were fed for 28 days on the basal meal mixture supplemented with aureomycin, but their growth performances during this period were no better than those of 8 pigs given the basal meal mixture without antibiotic.

Seventeen pigs were reared successfully and grew at a rate equal to, or surpassing, the average rate of pigs reared by sows in the herd. At no time was there evidence of the diarrhoea or other disturbances which occurred at times in the foundation herd. Four ascarids were found in the intestines of 2 boars which were slaughtered, and it was believed that these had been acquired *in utero.*

Nine females were reared as breeding gilts, all farrowing one litter and 6 farrowing 2 litters. Of the first litters, 52 per cent. of the pigs born were weaned at an average weight of 27·2 lb. This poor performance was believed to be due to cold weather at farrowing, crowded farrowing quarters and possible deficiencies in the rations. Lactation results were above average for the herd. Of the second litters, 91 per cent. of the pigs born were weaned at an average weight of 30·4 lb.

I. A. M. Lucas.

3887

LEWIS, C. J., CATRON, D. V., LIU, C. H., SPEER, V. C. and ASHTON, G. C. **Enzyme supplementation of baby pig diets.** *J. Agric. Food Chem.*, 1955, **3,** 1047–1050. [Iowa Agric. Exp. Stat., Iowa State Coll., Ames.]

In 3 experiments the effects of supplementing diets containing soya bean and milk protein with proteolytic enzymes were studied using 168 pigs with initial liveweights of 6 to 7 lb. and 16 pigs with initial liveweights of 28 lb.

A purified soya bean protein (Drackett C-1) containing 83·1 per cent. crude protein was used in the basal diets in all experiments. During the first experiment the addition of 20 per cent. lactose to the basal diet was of significant benefit to growth, and this amount was included in all basal diets subsequently.

Variation in response to enzyme supplements was too great to demonstrate statistical significance within each experiment, but when results from different experiments were combined there were significant increases of both rate of liveweight gain and efficiency of feed conversion when 1 per cent. pepsin and 1 per cent. pancreatin were added to the basal diets. The growth performances of pigs on positive-control basal diets containing 40 per cent. dried skimmed milk at the expense of the soya protein were significantly better than for pigs on the basal diets containing soya bean protein, and they were also better than for pigs on these soya bean protein diets supplemented with proteolytic enzymes.—I. A. M. Lucas.

3888

ALEKSEEVA, A. A. Vydelenie DDT s molokom obzabotannykh im kozov i vliyanie etogo moloka na razvitie pozosyat. [**Excretion of DDT in the milk of treated cows and the effect of such milk on piglets.**] *Veterinariya*, 1955, **32,** No. 2, 69–73. [State Univ. Vet. Dermatol.]

Feeding piglets on milk from cows treated with either subtoxic or therapeutic doses of DDT had no harmful effect on growth.—H. Scherbatoff.

3889

JOUBERT, D. M. **An analysis of factors influencing post-natal growth and development of the muscle fibre.** *J. Agric. Sci.*, 1956, **47,** 59–102. [Sch. Agric., Cambridge.]

In each section literature is reviewed.

As a preliminary the effects on muscle fibre of fixation in formalin and of boiling, and the effect of eyestrain on the results when 100 fibres are

measured under the microscope are recorded. The effect of formalin is complete in 1 day and is less than that of heat. All the measurements described later are on formalin-fixed muscle. Measurements increased for each 20 fibres to 80 and, after a rest, dropped to the original level for the last 20. The differences from the general mean were not statistically significant, but with strain, selection of larger fibres does occur.

The muscles sampled were the longissimus dorsi, rectus femoris and gastrocnemius. The material was classified in 4 groups: (1) gastrocnemius of uncastrated males from pig, rabbit, sheep and cattle, at birth and maturity, for comparison of species; (2) from an experiment to compare steers of dairy breeds, and of the same breeds crossed with bulls of beef breed, so that breed and type could be studied with all variables associated with diet and management constant; (3) from an experiment with lambs in which plane of nutrition varied (see Abst. 3076, Vol. 22) and (4) from sheep killed at different ages and fed in different ways (see Absts. 1752, 3754, Vol. 18). Samples were procured from slaughterhouses also.

Briefly, the main results were as follows. Size of muscle fibre does not depend on size of animal species: those studied, in decreasing order of diameter of fibre, were pig, rabbit, cattle, sheep. Size at maturity increased with degree of postnatal development within the species studied. Fibre diameter was greater in Friesian steers than in crosses with beef breeds and least in purebred Dairy Shorthorn steers. There is no increase in number of fibres after birth. Sex differences are mainly referable to length, not diameter, of fibre, and muscles of wethers contain more fat than those of ewes of the same age. In lambs and mature ewes, fibre diameter rose with plane of nutrition with asymptotic limits at the upper level. Gastrocnemius had the largest fibres at birth and the smallest at maturity; longissimus dorsi smallest at birth and thickest at maturity. Fibres of low-plane animals at 290 days resembled those of high-plane animals at 60 days. Longissimus dorsi reacted most sensitively to plane of nutrition and would possibly provide the best criterion of muscle tissue in a carcase.—I. Leitch.

3890

MEADE, R. J. **The influence of tryptophan, methionine and lysine supplementation of a corn-soybean oil meal diet on nitrogen balance of growing swine.** *J. Animal Sci.*, 1956, **15**, 288–296. [Nebraska Agric. Exp. Stat., Lincoln.]

Nitrogen metabolism data are presented for 24 male castrated pigs weighing about 32 kg. on a diet of ground yellow maize, soya bean oilmeal, dicalcium phosphate and iodised salt with a supplement of vitamins, antibiotics and trace elements. The diet contained crude protein 15·9, tryptophan 0·132, methionine 0·27 and lysine 0·69 per cent. In 3 separate experiments additions of tryptophan, methionine and lysine were made to bring the final level to 0·177 per cent. available tryptophan, 0·37 per cent. methionine and 0·84 per cent. lysine. In no case did the added amino acids improve N retention. The basal diet used appeared to contain protein in excess of requirement for pigs weighing over 40 g., evidenced by the increase in urinary N of pigs over that weight.

J. S. Thomson.

3891

LENKEIT, W., GÜTTE, J. O., WARNECKE, W. and KIRCHHOFF, W. Langfristige Untersuchungen zum äusseren und inneren Stoffwechsel des graviden und laktierenden Schweines. 3. Die Beziehung der N-Retention während der Gravidität zum N-Umsatz nach der Geburt bei hoher Milchleistung und bei verhinderter Laktation. [**Prolonged studies of external and internal metabolism of pregnant and lactating sows. 3. Relation of nitrogen retention during pregnancy to nitrogen turnover after birth when milk yield is high and when lactation is prevented.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10**, 351–364. [Inst. Tierphysiol., Univ. Göttingen.] English summary.

For previous parts see Absts. 1248 and 2525, Vol. 26.

Two sows which had had a high protein intake during pregnancy were studied further: one suckled 12 piglets and her milk yield was estimated to be on the average 10·1 kg. daily for 59 days; the other sow had all 11 piglets removed at birth. Both sows received a ration (composition tabulated) rich in protein and total energy.

N retention in both sows increased during the course of pregnancy and the estimated total retention in 115 days of pregnancy was 1879·24 and 1265·78 g. The total losses at parturition were 340·98 and 289·75 g., leaving total increases of body N of 1538·26 and 976·03 g., of which 145 to 165 and 140 to 160 g. were ascribed to the enlarged uterus and mammary glands. The sow which suckled her young had a cumulative loss of N during 59 days of lactation of 1162·39 g.; the other lost in 35 days after parturition 647·46 g. N and then went into positive balance. During a period in which the young had diarrhoea and poor appetites the suckling sow secreted less milk, but lost more N in the urine; her negative N balance at this time became small. The negative N balance of the dry sow was due to a large N output in the urine, especially during the third to ninth days, when the mammary glands were regressing and appetite was poor. A castrated male pig pair-fed on the amounts of feed eaten by this sow from the 113th day of pregnancy to the 15th day

after farrowing was in negative N balance until the day corresponding to the 8th day after farrowing; initially his urine N was higher, but during the period of poor intake it was lower than that of the sow.

It is concluded that sows on protein-rich diet during pregnancy can store N in excess of that required for the products of pregnancy, and that this excess will be at least partly excreted afterwards even without production of milk.

D. Duncan.

3892

BEHM, G. and JÄGER, G. Möglichkeiten der Ersatzes tierischer Eiweissstoffe durch pflanzliche bei der Ernährung des Schweines. [**Possibilities of replacing animal by plant protein in the feeding of pigs.**] *Arch. Tierernährung*, 1955, **5**, 288–310; 311–330. [Inst. Tierernährungslehre, Humboldt Univ., Berlin.] A review.

3893

NORDFELDT, S., OLOFSSON, N. E. and MÅNSSON, N. C. Försök med kommersiella kraftfoderblandningar för gödsvin. [**Experiments with commercial concentrate mixtures for fattening pigs.**] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 110, 1955, pp. 16.

Three experiments were run with, in all, 8 groups of pigs of the Improved Swedish Landrace, totalling 102, fattened from 30 to 90 kg. liveweight. The cereal mixture was the same for both sets, the controls which had 2·5 kg. skimmed milk daily and the experimental pigs which had instead from 0·410 to 0·492 kg. of a commercial concentrate which was used according to instructions [composition not given]. In the first experiment the skimmed milk groups had chalk, salt and cod liver oil, in the second and third meatmeal, lucerne meal, chalk, salt and Deltafor D_3. The commercial concentrate provided all the supplements required with the cereal meals.

There was no significant difference in any test in rate of weight gain, loss at slaughter, feed units per kg. gain, body length, thickness of back fat or hardness of fat; 9 out of 10 in each lot reached the highest class for quality. Money cost of feed per kg. gain was slightly higher for the concentrate pigs in the second and third tests; but labour cost was greater for the milk pigs, so that there was little or no difference in cost of production.

I. Leitch.

3894

MARTIN, J. and BUYSSE, F. La pomme de terre dans l'alimentation du porc. Comparaison entre les pommes de terre étuvées et les pommes de terre crues réduites en purée. [**Potatoes in pig feeding. Comparison of cooked and raw pulped potatoes.**] *Rev. Agric., Brussels*, 1955, **8**, 1135–1158. [Stat. Recherches État, Alimentation Bétail, Melle.] English and German summaries.

Earlier comparisons of raw and cooked potatoes for pigs are described and their results are summarised. This repeat was designed to test the effect of level of protein in the meal mixture, Lehmann system, and of mechanical pulping of the raw potatoes. Two meal mixtures were used, each with the same amount of barley, maize, milling offal, fishmeal, meatmeal, lucerne meal, minerals and cod liver oil, but one mixture had 20 per cent. of manioc and 4 of groundnut meal and the other 8 of manioc and 16 of groundnut so that the percentages of digestible crude protein were 14 and 20. There were 6 groups of pigs in pairs, 4 pigs in each group; each pig had 1 kg. daily of meal and potatoes, raw, pulped, or steamed and ensiled, to appetite. Two groups had in addition 2 litres skimmed milk daily. The tests lasted for 15 weeks and then for 3 weeks all had a diet of meals without potatoes.

Of each pair the pigs getting raw potatoes put on only about two-thirds as much weight as those getting steamed potatoes; they did a little better with 20 per cent. than with 14 per cent. protein and those with skimmed milk did best with each type of potato. Total weight gains in 15 weeks in g. [not kg. as printed in Table 8] per pig daily were: 20 per cent. protein meal, 407 and 663; 14 per cent. protein meal, 334 and 590; with skimmed milk, 478 and 796. Growth of the retarded pigs improved on meal alone. Cost of production was less with steamed potatoes.

I. Leitch.

3895

BECKER, M., OSLAGE, W. and FLIEGEL, H. Versuche über den Nährwert von Johannisbrot beim Schwein, insbesondere über die Beeinträchtigung der Eiweissverdaulichkeit durch die Gerbsäure des Futtermittels. [**Nutritive value of the carob bean for pigs, with special reference to the reduction of the digestibility of protein by the tannic acid of the feed.**] *Arch. Tierernährung*, 1955, **5**, 247–256. [Inst. Tierernährung, Brunswick, Völkenrode.]

The digestibility of carob bean protein with pepsin and HCl *in vitro* was nil, compared with fishmeal protein, 87 to 88 per cent. In mixtures of the substances the digestibility of the fishmeal protein decreased with increasing proportions of carob bean.

In digestibility trials pairs of pigs received rations containing two-thirds, half and one-tenth of the total as carob meal. The larger proportions of carob meal greatly reduced digestibility of the rest of the ration, especially that of protein. With 10 per cent. carob meal the reduction of digestibility was slight.—D. Duncan.

3896

GORB, T. V., PLYUSHCH, M. G. and SARZHEVSKII, N. V. Vliyanie razlichnyk dach kukurydzy na myasosalnuyu produktziyu svinei. [**Effect of feeding maize on fat production in pigs.**] *Veterinariya*, 1955, **32,** No. 10, 74–76. [Kharkov Vet. Inst.]

Three groups of 15 young pigs of average weight 66 to 69 kg. were fed on diets similar in nutritive value. There were 2 feeding periods. Group 1 (control) derived 50 per cent. of its energy from maize in the first period ; in the second period barley was substituted for maize. Group 2 derived 50 per cent. from maize in both periods and group 3, 75 per cent. The remaining constituents of the diet were barley bran, sunflower grist, steamed potatoes, sugar beet and clovery hay, the last being given only in the first period of feeding.

The average daily gains were 623, 530 and 631 g. and the average final weights were 141·0, 139·4 and 144·8 kg. for groups 1, 2 and 3, respectively. No feed was given for 24 hr. before slaughter. The average weights before slaughter were 135·2, 133·6 and 139·6 kg., and 2 hr. after slaughter 88·8, 89·3 and 93·7 kg.

A table summarises physical and chemical characteristics of meat in the 3 groups. Group 3 had the highest fat content and the highest iodine number. The average fat contents of carcases of the 3 groups were 29·52, 26·38 and 34·46 per cent. and the iodine numbers were 48·30, 52·40 and 55·40.

It is concluded that a diet containing 75 per cent. maize has no detrimental effect on fat production ; it tends to increase rate of weight gain and so allows profitable substitution of maize for other constituents of diet.—F. Billiewicz.

3897

DIAZ, F., SPEER, V. C., ASHTON, G. C., LIU, C. H. and CATRON, D. V. **Comparison of refined cane sugar, invert cane molasses and unrefined cane sugar in starter rations for early weaned pigs.** *J. Animal Sci.*, 1956, **15,** 315–319. [Iowa Agric. Exp. Stat., Ames.]

Baby pigs were fed from 2 to 8 weeks of age on a basal starter ration without sugar or with 5, 10 or 15 per cent. refined cane sugar or 5 or 10 per cent. sugar from invert cane molasses or combinations of these not exceeding 15 per cent. total sugar. One group received 15 per cent. unrefined cane sugar. As compared with the group receiving no sugar, rate of gain and feed efficiency increased with the 2 highest levels of refined sugar and with the unrefined sugar. Invert sugar alone failed to improve the performance of the pigs, and there was no additive effect when it was combined with refined sugar. The reasons for the performance with refined, as compared with unrefined, sugar are discussed. There was no undue scouring in any of the groups.—J. S. Thomson.

3898

OOSTHUIZEN, S. A., VERBEEK, W. A. and POTGIETER, T. D. **Food intake of baconers on pasturage.** *Farming in S. Africa*, 1956, **31,** 34–36. [Div. Animal Husb., Coll. Agric., Potchefstroom.]

Trials are reported from which it was estimated that pigs of about 200 lb. liveweight, on a young oat pasture, ate about 15·1 lb. green feed daily during an experimental period of 7 days. On a similar pasture, with 3 lb. of a concentrate mixture also, given daily, intake of green feed increased to 19·5 lb. On a young lucerne pasture the intake was 20·8 lb. These amounts do not supply enough total digestible nutrients for rapid growth.

T. D. Bell.

3899

SALMON LEGAGNEUR, E. and FÉVRIER, R. Les préférences alimentaires du porcelet. 1. Influence du mode de présentation des aliments : granulés ou farine. [**Feed preference in young pigs. 1. Effect of method of feed presentation : granular or as meal.**] *Ann. Zootech.*, 1955, **4,** 215–218. [Stat. Recherches Élevage, C.N.R.Z., Jouy-en-Josas.]

The study was made with 25 litters of Large White pigs. Each litter had the choice of the same feeds given as coarse granules or as fine meal and their daily intake was found by weighing. Four different feed mixtures were used ; one was given to 10 litters, 106 piglets, from 15 days to 1 month of age, the other 3 were each given to 5 litters from a month old until weaning.

The piglets always preferred the granular form to the meal and they ate from 3 to 13, mean 6·4, times as much of the former. One litter was exceptional and preferred meal.

It is suggested that the feed intake of young piglets may be increased by offering them feed in the coarser form so clearly preferred.—D. Duncan.

3900

KLAUS, W. Untersuchungen über den Einfluss von Penicillin und Aureomycin auf die Verdaulichkeit der Nährstoffe und die N-Retention bei Schweinen. [**Effect of penicillin and aureomycin on the digestibility of nutrients and on nitrogen retention in pigs.**] *Ztschr. Tierernährung Futtermittelk.*, 1956, **11,** 1–20. [Tierzucht-Inst., Univ. Kiel.] English summary.

In the first experiment the N balances of 2 almost fully-grown littermate gilts were studied ; in 3 successive periods of 27 days, with fore-periods of 10 or 12 days, the gilts received 2 kg. daily of a basal ration, and in the middle period each received in addition 1·82 g. Propentin, containing

10 mg. procaine penicillin and 10 μg. vitamin B_{12} per g. The mean daily gains in weight in the 3 successive periods were 324, 219 and 78 g. No effect of the supplement was detectable.

In the second experiment 12 castrated males from 4 litters of Saddleback pigs were used. The 4 groups received the basal diet alone, or with Aurofac all the time, or with Aurofac until they reached 50 kg. liveweight, or with Aurofac in 2 periods of 20 days. Balances were in 10-day periods. All the pigs given Aurofac made significantly greater gains in the first stage of growth and needed less feed per kg. weight gain, but in the second stage group 4 fell behind even the pigs given no Aurofac, and over the whole experiment they showed little advantage from the antibiotic supplement. The best results were in groups 2 and 3, and there was little advantage to be gained from giving Aurofac after the pigs reached 50 kg. liveweight. In the early stage Aurofac improved the digestibility of crude protein on the average from 68 to 76·5 per cent. and that of crude fat from 52 to 60 per cent., without much affecting the utilisation of the rest of the ration. N retention increased from 11·82 to 15·65 g. daily. In the later stages of growth this advantage disappeared.

In a third experiment 3 pairs of castrated males were used for a longer trial. They received, respectively, the basal diet alone and with 10 or 50 mg. aureomycin per kg. feed. This was given alone for 49 days and then mixed for 37 days with an equal proportion of barley meal and for the last 29 days with 2·2 parts of barley meal to each part of the basal diet. Balances were studied for the last 40, 24 and 18 days of these 3 periods. Another 3 pairs of castrated males were studied on the same diets for a shorter time. The pigs given the smaller amount of aureomycin grew less well than those given none, though the difference was small. The larger dose of aureomycin produced a slight improvement in daily weight gain and utilisation of feed in all 3 periods of the study. There was better digestibility of crude protein and fat with the larger dose of antibiotic in the first period, but not later; retention of N was not improved because more was lost in the urine. (See Abst. 3129, Vol. 26.)—D. Duncan.

3901

HANSON, L. E., HILL, E. G. and FERRIN, E. F. **The comparative value of antibiotics and arsonic acids for growing pigs.** *J. Animal Sci.*, 1956, **15**, 280–287. [Minnesota Agric. Exp. Stat., St. Paul.]

The effect of chlortetracycline, procaine penicillin, erythromycin, arsanilic acid, 3-nitro-4-hydroxyphenylarsonic acid and the first 2 antibiotics each with arsanilic acid was tested on growth of pigs from weaning to a weight of 200 lb. The ration was of yellow maize, soya bean oilmeal, tankage, linseed oilmeal, alfalfa meal, bonemeal, salt and a vitamin supplement. One group received no supplement. Over the whole experiment there was no significant difference in rate of growth between the control group and the groups receiving the antibiotics or the arsonic compounds or a combination of these. This is contrary to results previously reported (see Abst. 4381, Vol. 25), and is attributed to the higher quality of the pigs used in the present experiment. Efficiency of use of feed was best in the group receiving chlortetracycline, but the difference was only 5 per cent. over the control group. The arsenic content of the tissues depended on the level in the diet and was highest in liver and lowest in muscle. It was greatly reduced by stopping the arsonic compound a few days before slaughter.

J. S. Thomson.

3902

HÖPLER, E. Aurofac in der Schweinehaltung. [**Aurofac in pig feeding.**] *Bodenkultur*, 1955, **8**, 313–319.

A trial on a high-lying farm in Styria was made in the winter of 1953–54 with 3 litters (it was planned to have 6, but owing to severe weather 3 failed to reach satisfactory weight at weaning) of 8 pigs fattened for 120 days on potatoes, cereal mixture, flowering wild grasses, grass silage, minerals, cod liver oil and a protein concentrate. One litter (control) had dried skimmed milk 100, groundnut meal 75, soya bean meal 75 and fishmeal 100 g. per pig daily; the other 2 had dried skimmed milk 100, groundnut meal 150, soya bean meal 150 and Aurofac 3 g. In the control ration 38 per cent. of the crude protein was of animal origin, in the experimental, 13 per cent.; they had almost the same crude protein content. The sows were full sisters of an inbred strain of Large White and German Edelschwein ancestry, all mated to the same unrelated boar. The dams of the litters given Aurofac had had Aurofac, 6 g. daily for 70 days during suckling, and their piglets had had 0·25 per cent. Aurofac in their supplementary feed. Details of the rations, feed consumption and costs and monthly weights are tabulated.

The fattening pigs given Aurofac outstripped the others at first, but final weights were the same for both groups; the weights of those given Aurofac showed less scatter. The pigs given Aurofac ate less, total 212 kg. against 236 kg., and more economically, 3·36 kg. per kg. weight gain against 3·72 kg. With the additional saving from the use of the cheaper vegetable protein feeds, the respective costs were 3·81 and 4·42 Schilling per pig daily and 6·27 and 7·25 Schilling per kg. weight gain. The advantage far outweighed the cost of the Aurofac. It was concluded that the use of Aurofac is well worth while. Regular supply of small amounts,

i.e., careful mixing with the ration, is important. Aurofac for sows and piglets during the suckling period is also considered useful, as the litters grew more uniformly. There were almost no losses either with or without Aurofac, but unthrifty pigs (*Kümmerer*) did occur even when Aurofac was given.

W. M. Deans.

3903

BERTL, H. and TSCHIDERER, K. Schweinemastversuch mit "Aurofac-2A" bei Getreide-Magermilchfütterung. [**Pig fattening experiments with Aurofac 2A and a cereal and skimmed milk diet.**] *Bodenkultur*, 1955, **8**, 320–326. [Schweine-Versuchsanst., Landwirtschaftskammer Niederösterreich, Schwechat.]

In a trial in 1954, 2 groups of 8 piglets of the German Edelschwein breed, offspring of 2 sister sows mated with the same boar, received from 4 weeks of age a supplement of ground barley 58, ground oats 20, dried yeast 8, fishmeal 12 and minerals 2 per cent., and those of one group each had daily a teaspoonful, from 1·5 to 2 g., Aurofac-2A (Lederle, New York : guaranteed to contain at least 8 g. aureomycin per kg., and vitamin B_{12}, amount not guaranteed, with soya bean meal as carrier). After weaning at 8 weeks the pigs were penned in pairs and fed twice daily, but after 14 weeks of age not on Sundays, on the usual stock feed : ground maize 44, ground barley 44, lucerne meal 7, dried yeast 3, minerals 2 per cent. The minerals consisted of prepared chalk 62·5, decalcified bonemeal 20, iodised salt 15, ferrous sulphate 1·6, manganese sulphate 0·6, copper sulphate 0·3 per cent. The pigs also had from 1 to 3 litres sour (clotted) milk per pig daily, and each had 5000 I.U. vitamin D_3 weekly. The pigs of the experimental group continued to have the same daily supplement of Aurofac-2A for 8 weeks; the controls got the same amount of soya bean meal.

Over the first 54 days after weaning there was no difference between the groups in weight gain or feed consumption. It was concluded that the dose of aureomycin was too small and thereafter (from 46 kg.) 3 g. Aurofac-2A, *i.e.*, 24 mg. aureomycin, was given daily. For the next 66 days the mean daily gains were 881 g. with aureomycin and 836 g. without, for the same feed consumption, *i.e.*, aureomycin reduced feed consumption per kg. weight gain by 5·1 per cent. After this the pigs were sent to the veterinary college for 18 days for other studies and had no Aurofac-2A; 7 of each group were then killed at slightly over 100 kg. and the carcases were judged. Those of the pigs given Aurofac-2A had a lower ratio of fat to lean and a higher proportion of the more valuable cuts, and the quality of fat and lean was slightly better.

It was concluded that the use of Aurofac-2A is profitable even when feeding and management are excellent.—W. M. Deans.

3904

SCHÜRCH, A. Verfütterung von Antibiotika und Futterverwertung beim Schwein. [**The use of antibiotics and feed utilisation by pigs.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag Prof. Crasemann, 37–41. [Inst. Haustierernährung, Eidg. Tech. Hochsch., Zürich.]

A litter of 12 Improved Landschwein pigs was divided into 2 matched groups and fed for 20 weeks on a thick slop of cereals, skimmed milk and slaughterhouse waste; one group had 125 g. Aurofac 2A, supplying 1 g. aureomycin and 0·193 mg. vitamin B_{12} per kg. dry feed but had its feed intake restricted to that of the other group. Neither group grew well, possibly for reasons of heredity, but aureomycin gave 10 per cent. better weight gains and hence, under the conditions of this experiment, 10 per cent. better feed utilisation.

Literature on the mechanism of action of antibiotics is briefly discussed but it is considered that experimental results are too few for anything but speculation.—W. M. Deans.

3905

GERI, G. Gli antibiotici nell'alimentazione dei suini. [**Antibiotics in pig feeding.**] *Riv. Zootec.*, 1956, **29**, 57–58. [Ist. Zootec., Univ. Florence.]

3906

JOHNSTON, E. F., ELLIS, N. R. and WINCHESTER, C. F. **The interaction of temperature and thiouracil feeding upon carcass characteristics and feeding characteristics of pigs.** *J. Animal Sci.*, 1956, **15**, 271–279. [U.S. Dept. Agric.]

In 5 experiments pigs were kept in cool environments between 45° and 68° F., or warm, 75° to 90° F., and in each temperature range 6 pigs were given a supplement of 0·15 per cent. thiouracil and 6 were untreated. In all but one experiment, in which the pigs were about 70 lb. liveweight, the liveweight was from 160 to 190 lb. The trials lasted from 28 to 32 days.

In the lower temperature range thiouracil gave thinner backfat, and increased the percentage of protein in the hams at the greater liveweights. The differences at the higher temperature were very small. Similarly, livers and thyroids were heavier in the treated animals, but less so in the warmer environment. Rate of gain and efficiency of feed use were improved by thiouracil at the lower but not at the higher temperatures, except in the experiment with pigs of 70 lb. liveweight, when the pigs untreated at the lower temperatures were better than those given thiouracil.

T. D. Bell.

3907

DAMMERS, J. Het gebruik van dikstrooisel voor varkens. [**Use of deep litter for pigs.**] *Landbouwvoorlichting*, 1955, **12**, 433–435. [Rijkslandbouwproefstat., Hoorn.] English summary.

Carse (*Agric. Gaz. N.S.W.*, December 1952) claimed that pigs on deep litter of sawdust and shavings grew faster than controls on a clean floor. Tests with 64 pigs of the Landrace type on ordinary rations of starter and fattening meals, sometimes with grain, buttermilk or whey, on deep litter of straw or on concrete, showed no difference in rate of weight gain or economy in 4 separate tests. Perhaps type of litter or environmental temperature may have affected the results.—I. Leitch.

3908

JUCKER, H. Neuzeitliche Methoden der Schweinefütterung. [**Modern methods of pig feeding.**] Repr. from *Kleinviehzüchter*, April 1955, pp. 12. [Inst. Haustierernährung, Eidg. Tech. Hochsch., Zürich.]

This general article for the pig farmer includes suggestions for compounding protein concentrates and cereal mixtures on the farm, with particulars of the amounts to be given to sows and fattening pigs according as protein feeds and cereals are given separately or together and according as skimmed milk, buttermilk or curd is available or not. A mixture suitable for young pigs before weaning is also given. Other topics discussed include artificial rearing of piglets, methods of preventing anaemia, the use of vitamins and antibiotics, and methods of preparing and giving feeds.

W. M. Deans.

3909

FLOCH, H. A propos d'alimentation en Guyane Française. Elevage de porcs et arbre à pain. [**Nutrition in French Guiana. Pig rearing and bread-fruit tree cultivation.**] *Arch. Inst. Pasteur Guyane franç. Publ.* No. 383, November 1955, pp. 6.

In this general article a plea is made for the planting of species of bread-fruit tree, *Artocarpus incisa* and *A. integrifolia*, and of the palm *Astrocaryum vulgare*. It is thought that the produce of these trees, with fishmeal and leaves such as those of *Canavalia maritima* would provide feed in amounts sufficient to keep 20 pigs per hectare. Pig diseases are unlikely to provide difficulties. The pig meat would do much to overcome the shortage of animal protein in human nutrition.—D. Harvey.

3910

KING, J. W. B. **Slaughter losses and yield of Wiltshire bacon.** *J. Agric. Sci.*, 1956, **47**, 23–28. [Animal Breeding Res. Organiz., Agric. Res. Counc., Edinburgh.]

A study was made of variations in the shrinkage from the live pig to the carcase and from the carcase to the unsmoked side of Wiltshire bacon.

Most of the variation was due to shrinkage from the live pig to the carcase. There were significant differences between litters and between breeds, Wessex and Essex Saddlebacks yielding 1·1 and 2.7 lb. more carcase weight at a given liveweight than Large Whites. To study the relations between yield of bacon and carcase characteristics, correlations were calculated between weight at slaughter, carcase weight and bacon weight and certain carcase measurements. Thickness of backfat and thickness of streak were negatively correlated with length of side and positively with each other. Carcase weight was positively correlated with all measurements, but to the greatest extent with thickness of back fat, thus indicating an antagonism between quantity and quality of bacon. This was also shown by a positive correlation between the proportion of desirable cuts and weight losses after slaughter.

There were differences between litters, but not between breeds, in shrinkage from the carcase to the bacon side. The correlations between yield of bacon and all carcase measurements except length were small and positive. There was no correlation between losses from the live pig to the carcase and losses in the curing process.

I. A. M. Lucas.

3911

HETZER, H. O., ZELLER, J. H. and HANKINS, O. G. **Carcass yields as related to live hog probes at various weights and locations.** *J. Animal Sci.*, 1956, **15**, 257–270. [U.S. Dept. Agric.]

Backfat thickness was estimated at 150, 175, 200 and 225 lb. liveweight in 140 pigs, including boars, males castrated at 98 days of age (barrows), and gilts. At 150 lb. liveweight backfat was thickest in gilts and thinnest in boars, but by 225 lb. the order of thickness was barrows, gilts, boars. As liveweight increased, for all 3 classes of pig the positive correlation between backfat thickness measured on the live beast and that measured on the carcase increased. There was a significant negative correlation between live backfat measurements at all weights and the percentage of preferred cuts of the carcase. At the heavier weights measurements taken at the middle of the back were better than those at the shoulder or loin. For estimation of fat cuts, back fat measured at 225 lb. liveweight was most satisfactory, and the best location was the loin. This weight and location also gave the best prediction of percentage lean of hams.

T. D. Bell.

3912

KLIESCH, J. and BANKWITZ, E. Untersuchungen über die Beziehung zwischen Körperlänge und Speckdicke beim Schwein. [**Relation between**

body length and thickness of back fat in pigs.] *Zuchtungskunde*, 1955, **27**, 319–322. [Inst. Tierzücht., Tech. Univ., Berlin-Charlottenburg.]

In both Danish and Swedish bacon pigs length of body and thickness of back fat are inversely related and the probable error of the correlation coefficient is small. An analysis of the length and thickness of back fat in 816 German pork pigs, 50 to 110 kg. carcase weight, gave a significant positive correlation for the whole array, but negative correlations within 10-kg. weight classes individually that were significant only for the 3 top classes. Even then the probable error was so great that selection for length would not reliably select for leanness at the same time.—I. Leitch.

3913

JUCKER, H. Über die Abhängigkeit der Speckdicke vom Endgewicht und vom durchschnittlichen Tageszuwachs beim Schwein. [**Dependence of thickness of back fat on slaughter weight and average daily weight gain in pigs.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag Prof. Crasemann, 42–46. [Inst. Haustierernähr., Eidg. Tech. Hochsch., Zürich.]

A statistical study was made of data for weight at slaughter, mean daily gains, length of carcase and thickness of back fat for 15 castrated male and 17 female pigs. When these 4 values were expressed by x_1, x_2, x_3 and y it was found that in male pigs

$$y = -3{\cdot}691 + 0{\cdot}268\,x_1 + 0{\cdot}0128\,x_2$$

and in females

$$y = +4{\cdot}317 + 0{\cdot}0200\,x_1 + 0{\cdot}0135\,x_2.$$

An equation using x_3 did not give a better result.

At all rates of growth female pigs may be expected to give a thinner layer of back fat than castrated males killed at the same weight. The results are too limited to have a general application. It is hoped to collect much more material.

D. Duncan.

3914

PEARSON, A. M., BRATZLER, L. J., DEANS, R. J., PRICE, J. F., HOEFER, J. A., REINEKE, E. P. and LUECKE, R. W. **The use of specific gravity of certain untrimmed pork cuts as a measure of carcass value.** *J. Animal Sci.*, 1956, **15**, 86–92. [Dept. Animal Husb., Michigan Agric. Exp. Stat., East Lansing.]

Carcases of 103 pigs of different breeds, not reared under uniform conditions, were examined. Sp. gr. of untrimmed loin, ham and shoulder cuts and of whole carcases was estimated. When both loins, both hams or both shoulders were considered there was a highly significant correlation between sp. gr. of any untrimmed cut and the sp. gr. of the carcase. The correlations were slightly less when a cut from only one side was taken, and then the closest correlation was found between the ham and the whole carcase. When all pigs were considered the best indication of leanness of the carcase was from sp. gr. of the whole carcase or the untrimmed ham, but in pigs under 190 lb. liveweight a more accurate prediction could be made from thickness of backfat measured on the carcase or from carcase length.—T. D. Bell.

See also Absts. 2864, 3026, 3043, 3082, 3083, 3129, 3354, 3800.

GOATS, RABBITS AND OTHER MAMMALS

3915

POTTS, C. G. and SIMMONS, V. L. **Milk goats.** *U.S. Dept. Agric. Farmers' Bull.* No. 920, revised October 1955, pp. 38.

3916

HOSKINS, L. W. and DALKE, P. D. **Winter browse on the Pocatello big game range in Southeastern Idaho.** *J. Wildlife Management*, 1955, **19**, 215–225.

For mule deer the most important plants were bitterbrush, mountain mahogany, big sage brush and juniper. In winter the elk were found mainly on high windy ridges, and depended largely on bunchgrass. There was direct competition between grazing cattle and elk, and elk and deer, but at existing controlled levels of stocking in the area investigated the competition was not serious.

T. D. Bell.

3917

MCCULLOCH, C. Y. (Jr.) **Utilization of winter browze on Wilderness big game range.** *J. Wildlife Management*, 1955, **19**, 206–215.

The vegetation and topography of the area and their history, as far as records allow, are described. Most of the browse is eaten by elk ; there are few deer. There were 10 sorts of shrubs available for browsing, but of these only 6 were eaten. The observations were complicated by the curiosity of the elk, which investigated all shrubs marked with plastic labels for the purpose of the survey, whether these types were usually eaten or not.

The available browse is now considered inadequate for the existing elk, despite the decline in their numbers in the last 20 years.—T. D. Bell.

3918

ARGUTINSKAYA, S. V. and VOROB'EV, B. L. Izuchenie kormovykh svoistv treskovykh otkhodov. [**A study of the feeding properties of cod offal.**] *Karakul. i Zver.*, 1955, **8,** No. 3, 32–39. [All-Union Sci. Res. Lab. Fur Animal Husb.]

The digestibility of cod offal by young foxes was as good as that of horseflesh, and the use of cod offal with silkworm chrysalides made it possible to rear young foxes from the age of 2 to 2½ months without meat and without impairing the quality of the fur.—H. Scherbatoff.

3919

BELYAEV, V. N. Ispol'zovanie myasa stepnoi cherepakhi dlya kormleniya serebristo-chernykh lisits. [**The use of the meat of the steppe tortoise as feed for the silvery-black fox.**] *Karakul. i Zver.*, 1955, **8,** No. 3, 56.

Feeding foxes on tortoise meat was economically efficient, as it was cheaper than beef and saved a large number of cattle.—H. Scherbatoff.

3920

NORDFELDT, S., MELIN, G. and THELANDER, B. Smältbarhetsförsök med mink. [**Digestion experiments with mink.**] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 114, 1955, pp. 14.

Part 1 of this report describes digestion experiments, each with 6 adult mink, made with the following feeds: codmeal alone or with, per cent. of the combination, 30 oatmeal, 30 wheat bran, 30 barleymeal, 60 cooked potatoes or 30 maizemeal, and offal (paunch) alone. Chromic oxide was used as indicator; there were 6 preparatory and 12 collection days with each feed. Analyses and digestibility coefficients are presented and nutritive values per kg. are given as follows, in g. digestible crude protein for fishmeal and offal and digestible true protein for the plant foods, digestible fat and digestible carbohydrate and metabolisable energy in Cal.: fishmeal 510, 106, 23 and 3170; oatmeal 74, 43, 414 and 2401; wheat bran 65, 34, 167 and 1267; barleymeal 31, 7, 501 and 2246; cooked potato —, —, 176 and 722; maizemeal 34, 31, 418 and 2142 and paunch 115, 58, — and 1011.

Part 2 deals with raw and toasted oatmeal and waste bread, their composition and digestion by 3 silver and 2 blue foxes in experiments with 7 preparatory and 14 test days. Oatmeal was heated in an electric oven at 100° and 200° C. for 45 min. and given with meatmeal and a standard ration of known digestibility. Heat significantly reduced the digestibility of crude protein and ether extract by both types of fox, 200° more than 100°. Heating at 200° C. almost completely destroyed vitamin B_1, reduced riboflavin to less than half, but did not affect nicotinic acid.

Similar experiments with 3 silver and 3 blue foxes showed that bread waste, chiefly of rye, is easily digestible and a more valuable feed than unheated oatmeal.—I. Leitch.

3921

LENSINK, C. J., SKOOG, R. O. and BUCKLEY, J. L. **Food habits of marten in interior Alaska and their significance.** *J. Wildlife Management*, 1955, **19,** 364–368. [Alaska Cooperative Wildlife Res. Unit, College.]

The food habits of the marten were found to be flexible. In the area studied the main foods were *Clethrionomys* and *Microtus*, followed by berries in the summer and birds in the winter. The choice is governed mainly by availability, and the search for food is the main activity in the marten's existence. In captivity martens accepted almost anything offered, and in traps they ignored pain and overruled fear when food was offered. The success of trapping is related to availability of food, for when not much is available the martens will always be easily attracted by bait.—T. D. Bell.

See also Absts. 2915, 2974, 3021, 3204, 3451.

POULTRY

GROWTH AND FATTENING

3922

MUELLER, W. J., BOUCHER, R. V. and CALLENBACH, E. W. **Influence of age and sex on the utilization of proximate nutrients and energy by chickens.** *J. Nutrition*, 1956, **58,** 37–50. [Dept. Agric. Chem., Pennsylvania State Univ., University Park.]

From experiments with sheep and pigs the impression has arisen that digestion does not change with age. This is not confirmed with chicks. Metabolism experiments of 5 days' duration were made at 2 and 4 weeks of age and of 4 days at 7, 11 and 26 weeks on 5 groups of 15 male and 5 groups of 15 female New Hampshire chicks at the earlier ages and on 5 groups of 10 females only at 26

weeks. The ration was of the same composition throughout, cereals, soya bean oilmeal, fishmeal, alfalfa meal, dried whey, dried yeast, minerals and vitamins. Chromic acid baked with maizemeal and uniformly mixed was pelleted with the meal. Differences in digestibility between male and female were not significant. For both sexes together digestibilities of all organic constituents except fibre were highest at 4 weeks and least at 26 weeks; as a result metabolisable energy as a percentage of gross energy also was highest at 4 weeks. Daily weight gain and retention of protein were highest at 7 weeks. Percentage retention of crude ash declined sharply from 4 weeks. From these data percentage requirements of crude protein are estimated as 20 at 2 weeks, 21 at 4, 15 at 7, 12 at 11 and 11 at 26 weeks.—I. Leitch.

3923

MÜLLER, W. J. Einfluss von Alter und Geschlecht auf die Rohnährstoff und Energieverwertung des Geflügels. [**Effect of age and sex on the use of nutrients and energy by poultry.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag Prof. Crasemann, 51–54. [Dept. Poultry Husb., Pennsylvania State Univ., University Park.] Abst. See preceding.

3924

GORDON, R. S. and SIZER, I. W. **Ability of sodium sulfate to stimulate growth of the chicken.** *Science*, 1955, **122,** 1270. [Monsanto Chemical Company, St. Louis, Mo.]

Chickens were fed on a ration of casein 15, gelatine 10, maize oil 4, a salt mixture containing sulphates of Mn, Mg and Cu 6, vitamins and glucose to 100. The addition of sodium sulphate or sulphur to this ration did not improve growth rate, but when the sulphates of the mineral mixture were replaced by the chlorides or oxides, the addition of sodium sulphate improved growth rate and feed efficiency. Better growth was obtained by the addition of methionine or hydroxy analogues of methionine, but even large additions of these did not completely satisfy the total S requirement. Cystine, in a diet free from inorganic S, appeared to satisfy the requirement, provided methionine was not a limiting factor.—J. S. Thomson.

3925

BALDINI, J. T. and ROSENBERG, H. R. **The effect of productive energy level of the diet on the methionine requirement of the chick.** *Poultry Sci.*, 1955, **34,** 1301–1307. [Stine Lab., Grasselli Chem. Dept., E.I. du Pont de Nemours and Co., Inc., Newark, Del.]

When the percentage energy in a diet for chicks is increased, the percentage methionine must also be increased for the bird to get sufficient of the amino acid, since less feed is eaten. Trials were therefore made using diets of 800, 900 and 1000 Cal. per lb. The optimum percentage of methionine in the diet with 800 Cal. per lb. was 0·350, with 900 Cal. per lb. 0·399, and with 1000 Cal. per lb. 0·497. The relationship could be expressed by the equation

$$y = 0{\cdot}000736\,x - 0{\cdot}2269,$$

where y is the percentage of methionine and x the number of calories per lb. ration.—T. D. Bell.

3926

ROSENBERG, H. R., BALDINI, J. T., SUNDE, M. L., BIRD, H. R. and RUNNELS, T. D. **The concomitant use of fat and methionine in broiler diets.** *Poultry Sci.*, 1955, **34,** 1308–1313. [Stine Lab., Grasseli Chem. Dept., E.I. du Pont de Nemours and Co., Inc., Newark, Del.]

From 7 experiments at 3 different laboratories it was shown that the growth and feed efficiency of chicks to 8 or 10 weeks of age were improved by the addition of fat and DL-methionine alone or together to a basal ration. Fat was added at from 3 to 6 per cent., and methionine at 0·05 per cent. The response to methionine alone was slight; that to fat alone was greater. In combination the response was greater than would have been obtained had the effects been simply additive. At one centre feathering was poor with fat alone, but fat and methionine gave normal feathering.
T. D. Bell.

3927

FISHER, H. **The L-phenylalanine requirement of the chick.** *Arch. Biochem. Biophys.*, 1956, **60,** 108–114. [Rutgers Univ., New Brunswick, N.J.]

Chicks fed on a diet of wheat germ, gelatine and amino acids including excess tyrosine required 0·5 per cent. L-phenylalanine for growth and efficient use of feed. The rat requires 0·6 per cent. (Abst. 5257, Vol. 25). Since previous work with DL-phenylalanine showed a requirement of 0·9 per cent. (see Abst. 4713, Vol. 17) the D-isomer apparently was not used efficiently.—A. Hepburn.

3928

GRIMINGER, P., FISHER, H. and SCOTT, H. M. **On the arginine requirement of the growing chick.** *Poultry Sci.*, 1955, **34,** 1247–1249. [Illinois Agric. Exp. Stat., Urbana.]

In view of the divergent results obtained for the arginine requirement of chickens (see Abst. 1174, Vol. 20; Title 3023, Vol. 25) an experiment was made to find whether the browning reaction between carbohydrate and protein results in partial destruction of arginine in the ration, thereby increasing the apparent requirement. Day-old chickens were

reared to 3 weeks on a basal diet (22 per cent. casein) containing Cerelose or dextrin as the carbohydrate and either 1·25 or 1·75 per cent. arginine. Two further groups had the Cerelose added to the ration immediately before feeding.

There was no statistically significant difference in growth rate between the 3 high-arginine groups, and in each case average weights were above those of low-arginine counterparts. Neither Cerelose added to the rations before feeding, nor dextrin, which has a smaller number of reactive end groups than an equivalent amount of cerelose, had any sparing effect on the arginine requirement.

J. S. Thomson.

3929

WAIBEL, P. E., MORRISON, A. B. and NORRIS, L. C. **Production of depleted chicks by feeding maternal diets deficient in unidentified growth factors.** *Poultry Sci.*, 1955, **34,** 1322–1329. [Dept. Poultry Husb., Cornell Univ., Ithaca, N.Y.]

Eggs were obtained during 10 months of 1953–54 from White Plymouth Rock pullets of meat type kept on wire-mesh floors and mated with Barred Plymouth Rock cocks, and fed on a maize and soya bean oilmeal ration with minerals and vitamins (full details given), or the same with 3 per cent. condensed fish solubles and 3 per cent. dried whole liver replacing the same amount of soya bean oilmeal, to supply unidentified chick growth factors, or a purified diet of glucose (Cerelose), alpha-protein, hydrogenated fat, ground cellophane, DL-methionine and glycine, with minerals and vitamins, believed to be adequate in known nutrients only.

The chicks were reared on wire-mesh floors in groups generally of 18 to 20 of both sexes, on a basal purified diet of the same constituents as before in slightly different proportions, given to appetite, or the same supplemented with a mixture of dried whole liver, maize distiller's dried solubles, fish solubles, dried whey product and grass juice, or a mixture with penicillin mycelia meal instead of the dried liver [errors in statements of these mixtures].

So far as the hens were concerned the purified diet did not affect fertility or hatchability of eggs, but number and weight of eggs were reduced. The hens given fish solubles and dried liver did no better than those not given this supplement.

The mean chick weights in g. at 4 weeks were : chicks from hens on purified diet, on basal purified diet 298, with supplement 407 ; from hens on maize and soya bean ration, 312·5, 422 ; from hens on maize and soya bean ration with fish solubles and dried liver, 333, 423. In the first 2 sets of chicks, but not the third, the effect of the chick supplement was much greater in male than in female chicks. Most feed per g. gain was required by chicks from hens on purified diet, on basal purified diet ; when the chick supplement was given, feed efficiency did not vary with the hens' ration.—W. M. Deans.

3930

SCOTT, H. M., MORRISON, W. D. and GRIMINGER, P. **Studies on unknown growth factors in distillers dried solubles.** *Poultry Sci.*, 1955, **34,** 1446–1447. [Illinois Agric. Exp. Stat., Urbana.]

Previous results of Norris and of Couch *et al.* (*Proc.* 10th *Distillers Feed Conference* (1955)) and of Morrison (Abst. 1290, Vol. 26) suggested that part of the growth response of chickens to distiller's solubles might be attributed to the ash content.

Experiments now reported showed that although a growth response was obtained by the addition of 10 per cent. distiller's solubles alone, or along with the ash derived from this amount, to a basal diet, there was no response to the ash alone. Reasons for the divergent results are discussed.

J. S. Thomson.

3931

EDWARDS, H. M. (Jr.), CHIN, D., NORRIS, L. C. and HEUSER, G. F. **Differentiation of unidentified chick growth factors in liver.** *J. Nutrition*, 1955, **57,** 329–343. [Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

A purified diet was used, amply supplied with minerals, including trace elements, and all vitamins known to be required. The following supplements gave increases in rate of growth : defatted dried liver, fish solubles, the 2 together (cumulative effect). Fractions of liver were then tested, a concentrated aqueous extract of fresh liver, the residue, and fractions 1 and 2, 1 prepared from the concentrate by extraction with 70 per cent. ethanol and concentration, and 2 the residue from this extraction. Residue had no effect on growth, concentrate and both fractions were active, 1 more than the others. This fraction was then extracted with phenol, the phenol was dissolved in ether and the active substance was removed by washing with water. Here the phenol-soluble fraction was active, the residue without effect. The active extract was further analysed by counter-current distribution, with equal parts of phenol and butanol against water with glacial acetic acid to give a p_H of 2·5. This showed that the original phenol extract contained at least 2 unknowns, one soluble in the phenol-butanol solvent and apparently organic and the other water-soluble and probably inorganic. Results in successive experiments were not consistent.

There was also an unknown in fish solubles.

I. Leitch.

3932

MORIMOTO, H., ARIYOSHI, S. and HOSHII, H. **Comparison of some sources of unidentified chick growth factors with fish meal.** *Poultry Sci.*, 1955, **34,** 1392–1395. [Nat. Inst. Agric. Sci., Chiba, Japan.]

The following products were tested for effects on growth of day-old chickens : water-soluble fraction of sardine meal and residue, autolysed sardine solubles and residue, solubles prepared in the usual manner, autolysed cuttlefish, wood yeast, brewer's yeast, fungi feed (mould culture from distiller's residue), and Koji feeds (mould culture from starch cake and ammonium sulphide) containing differing amounts of vitamin B_{12}.

Although most of the fish products had a growth-promoting effect, none equalled that from sardine meal. Of the microbiological products, wood yeast, brewer's yeast and some of the Koji feeds had an effect similar to the sardine meal ; fungi feed had less effect.—J. S. Thomson.

3933

OLOUFA, M. M. **Effect of thyroprotein on the growth of Egyptian baby chickens.** *Poultry Sci.*, 1955, **34,** 1292–1294. [Coll. Agric., Univ. Cairo.]

Addition of 10 g. thyroprotein per 100 lb. ration to the diet of 7-day-old Egyptian chickens greatly depressed growth to 12 weeks. Addition at the rate of 5 g. per 100 lb. also depressed growth, but here the difference was not significant. Mortality at the higher level of intake was 22 per cent. higher than that of controls ; at the lower level, 6·5 per cent. higher.—J. S. Thomson.

3934

BIELY, J., MARCH, B. E. and TARR, H. L. A. **The nutritive value of herring meals. 3. The effects of heat treatment and storage temperature as related to oil content.** *Poultry Sci.*, 1955, **34,** 1274–1279. [Poultry Nutrit. Lab., Univ. British Columbia, Vancouver.]

For previous parts see Abst. 5514, Vol. 24.

Herringmeal prepared in the laboratory by a low-temperature process was used in chick starter mashes. Some of the meal was used without extraction and contained about 7·5 per cent. fat. Another lot was extracted with hexane, giving a meal with about 0·2 per cent. fat. A third lot of meal was extracted, but fresh herring oil was added to restore the fat content to the level of that of the unextracted meal. From each of these 3 lots of meal a ration was prepared in which the meal was unheated or heated for 1, 2 or 3 hr. at 149° C. When included as 18 per cent. of a starter mash for day-old chicks growth was retarded at 10 days of age by the unextracted meal heated for 2 hr. and all meals heated for 3 hr. Growth rates were equal with the unheated meals, and the addition of fresh herring oil gave no improvement over the other rations. In this experiment the basal ration was low or marginal in folic acid.

In a second experiment, to test the hypothesis that the poor growth on heated meals might be due to the destruction of folic acid, a basal mixture deficient in vitamins was used. To it were added heated and unheated meals and oils, with or without a vitamin mixture. With added vitamins growth was equal on all rations, but on the deficient diet both heated and unheated oils depressed growth.

With commercial meals it was found that folic acid was less stable during storage in meals extracted with hexane than in unextracted meals.

T. D. Bell.

3935

KURNICK, A. L., REID, B. S., SVACHA, R. L. and COUCH, J. R. **Effect of dried whey on growth, egg production and hatchability.** *J. Nutrition*, 1955, **57,** 345–352. [Dept. Poultry Husb., Texas Agric. and Mech. Coll. System, College Station.]

At 67 days of age chicks reared on a practical diet of ground yellow maize, soya bean oilmeal and vitamins and minerals were divided into 2 groups, each of 163 birds, and given a purified diet with all known requirements met and containing penicillin, 33 mg. per kg. feed. The second group had 4 per cent. of sucrose replaced by dried whey. At 143 days of age all had been transferred to individual cages for the laying test. After 12 weeks, the group without whey was divided into 2 subgroups of which one was given 4 per cent. of whey. In a second similar experiment with 135 chicks the age of transfer to the purified diet was 86 days and to laying cages 132 days of age.

Whey gave significantly better growth, earlier sexual maturity (94·8 per cent. in egg production at 175 days as against 62·2 per cent. without whey), more eggs, and better hatchability than no whey, but hatchability was not normal in either group.

I. Leitch.

3936

SCHLAMB, K. F., CLAGETT, C. O. and BRYANT, R. L. **Comparison of the chick growth inhibition of unheated linseed hull and cotyledon fractions.** *Poultry Sci.*, 1955, **34,** 1404–1407. [Dept. Agric. Chem., N. Dakota Agric. Exp. Stat., Fargo.]

Three trials are reported to determine the nature of the growth-depressing substance in raw linseed meal, previously attributed to several causes, including the development of a deficiency of some component of the vitamin B complex or to the contained mucilage. Flax seed was separated by a method described into hull and cotyledon fractions, and these were incorporated into a basal

ration for chickens of soya bean oilmeal, maizemeal, vitamins and minerals. Other groups were given a commercial linseed meal, an unheated meal extracted with light petroleum or a heated meal.

In all experiments growth was best on the basal ration, followed by groups on the linseed hulls, indicating that the mucilage was not the cause of the growth-depressing effect of linseed meal. The cotyledon fraction and the unheated meals produced poor growth.—J. S. Thomson.

3937

HEYWANG, B. W. and BIRD, H. R. **Relationship between the weight of chicks and levels of dietary free gossypol supplied by different cottonseed products.** *Poultry Sci.*, 1955, **34,** 1239–1247. [Agric. Res. Serv., U.S. Dept. Agric., Animal and Poultry Husb. Res. Branch, Glendale, Ariz.]

Different cottonseed meals raw, screw-press, hydraulic, solvent-extracted or pre-press solvent-extracted, partly or completely replaced soya bean meal in a control diet so as to supply from 0·008 to 0·075 per cent. of free gossypol. In one experiment pure gossypol was given and in some DL-lysine was added to determine whether part of the gossypol was inactivated by lysine. Day-old New Hampshire and White Leghorn chicks were given the diets to 5 or 6 weeks.

Growth in all cases was best on the soya bean meal ration, and curves are presented to show the decrease in final weight as the amount of free gossypol rose, particularly when raw cottonseed meal was used. DL-Lysine did not inactivate free gossypol. It is concluded that the free gossypol of the ration should not exceed 0·016 per cent. for White Leghorns or 0·020 per cent. for New Hampshires.—J. S. Thomson.

3938

ALMQUIST, H. J. and MERRITT, J. B. **Whole barley compared to hulled barley for turkeys on range.** *Poultry Sci.*, 1955, **34,** 1449. [The Grange Co., Modesto, Calif.]

On a limited mash intake turkeys on range consumed less hulled than whole barley, the ratio being 0·86, a ratio equivalent to the inverse ratio of the productive energy value of these grains. On a free choice mash and grain system much more of the hulled than of the whole barley was eaten, the former to the extent of 37 per cent. of the ration as compared with a voluntary intake of 15 per cent. whole barley under similar conditions.

J. S. Thomson.

3939

FANGAUF, R., KLEIN, K. W. and BARLÖWEN, G. v. Weizenkleie und Weizenfuttermehl im Küken-Alleinfutter. [**Wheat bran and wheat feed in all-mash rations for chicks.**] *Arch. Geflügelk.*, 1956, **20,** 24–34. [Lehr- u. Versuchsanst. Kleintierzucht, Kiel, Steenbek.] English summary.

Each of the 8 rations compared contained, per cent., fishmeal 6, soya extraction meal 6, lucerne leaf meal 2, dried yeast 3 and minerals 3. The other 80 per cent. was made up of different proportions of maizemeal and whole wheat meal, wheat bran and wheat middlings. Each ration was given to 30 day-old chickens for 8 weeks. Feed intake and weight gain were studied weekly.

The greatest feed intakes and weight gains were on 2 diets containing 60 per cent. of a mixture of maizemeal and whole wheat meal, one with 20 per cent. bran and the other with 20 per cent. middlings. With 80 per cent. of the maizemeal and wheatmeal mixture the intake was less, but growth was as good; use was more efficient. Growth was impaired when the proportion of maizemeal and wheatmeal mixture fell below 40 per cent.

It is concluded that 50 per cent. of ground grain is sufficient for chick mashes and that they should contain not more than 15 per cent. of bran or 30 per cent. of wheat by-products.

D. Duncan.

3940

CASTLE, M. E. and KING, J. O. L. **Fodder-beet for fattening ducks.** *Empire J. Exp. Agric.*, 1955, **23,** 251–256. [Dept. Animal Husb., Fac. Vet. Sci., Univ. Liverpool.]

In each of 6 trials with ducks 3 weeks old, one group was fed on meal only, as much as the birds would clean up in 3 feeds a day. This meal contained 18·7 per cent. crude protein. Another group was given 126 g. of a meal with 25·6 per cent. crude protein, and minced fodder beet to appetite. The birds were weighed weekly and killed at 9 weeks of age. The birds receiving meal only were on the average 12 per cent. heavier at the end of the experiment, a result which was statistically significant. Dressing percentages were not significantly different. The birds getting fodder beet ate 44 per cent. less meal than those getting meal only, but their meal was more costly. It was calculated that 2·98 g. beet replaced 1 g. meal. Accurate costings of the trials were not made, but the possible economies of replacing some of the meal for fattening ducks by fodder beet are discussed.—T. D. Bell.

3941

KRÜGER, L., LÖTHE, E. and SEEFELDT, G. Aufzucht-Versuch mit gepresstem Küken- und Junghennen-Alleinfutter. [**Rearing experiments with pressed all-mash for chicks and pullets.**] *Arch. Geflügelzucht Kleintierkunde*, 1955, **4,** 190–192. [Inst. Tierzucht, Justus Liebig Hochsch., Giessen.]

Of 4 groups of 40 day-old chickens, 2 groups were Leghorn × Rhode Island and 2 groups the reciprocal cross. One group of each cross had a standard ration with green feed, carrots and cod liver oil, the other had the pressed mash ration and carrots.

There was little difference in growth at first, but after 20 weeks the Leghorn × Rhode Island group given the pressed mash were 11 per cent. heavier than those on standard feed ; in the other 2 groups the difference was only 1 per cent. In both crosses utilisation of the pressed mash was poorer in the first 8 weeks, but later it was better than that of the standard ration. Over the whole 20 weeks the pressed mash was 5 per cent. better in this respect.

The composition of all the rations is tabulated in full.—D. Duncan.

3942

GUTTERIDGE, H. S. and NOWOSAD, F. S. **Pasture for poultry.** *Canada Dept. Agric. Publ.* No. 771 (revised) August 1955, pp. 16.

The value and importance for poultry of pasture as a source of vitamins, protein and minerals is discussed. Expensive feedingstuffs are saved. The management of annual and perennial pastures, with suitable crops for each, is described. The former have the advantage of being freed from parasites by constant attention and cultivation, but they are more expensive to maintain. In Canada oats is the most common crop. Perennial pastures, on the other hand, take their place in the farm rotation. With proper management the time elapsing between periods when poultry are folded on perennial pastures is long enough for the danger of parasites to be avoided. Grass and legume mixtures are recommended. Both types of pasture should be located well away from breeding houses, so that the young birds on pasture are not in contact with the older stock. Details of both types used successfully in the experimental farms in the different provinces of Canada, and their cultivation, are described.

Soilage crops, dried grass meal, silage and lawn clippings for poultry are discussed.—T. D. Bell.

3943

RUBIO PAREDES, J. Aprovechamiento del micelio de la fabricación de penicilina en la alimentación de aves. [**Use of penicillin mycelium in the feeding of birds.**] *An. Ins. Farm. Esp.*, 1954, **3,** 341–357.

From analysis of 50 samples of dried penicillin mycelium, the mean composition, per cent., was moisture 3·4, crude protein 31·3, crude fat 4·6, N-free extract 22·2, crude fibre 9·7 and ash 28·8. The mean riboflavin content was 40·25 μg. per g.

Four groups of 57 day-old chickens received a basal diet of, per cent., maizemeal 40, barleymeal 12, oatmeal 15, wheat bran 10, groundnut cake 8, fishmeal 10, alfalfa meal 3, chalk 1 and bonemeal 1. The supplements, each given to one group, were procaine-penicillin G, 5 g. per ton ; Aurofac, 2·5 kg. per ton ; and dried mycelium, 5 per cent. All groups had a vitamin supplement. The chickens were kept on wire floors and fed to appetite. Each of the supplements gave better growth in 7 weeks than the basal ration alone ; the improvements were 17·9, 18·9 and 8·5 per cent., respectively. The number of deaths was least with mycelium.

It is suggested that a combination of penicillin and mycelium would be valuable in rations for chickens.—D. Duncan.

3944

AMSCHLER, J. W. and PAMMER, H. Entenmastversuch mit Bi-Con TM_{3+3} (Terramycin). [**Duck fattening experiment with terramycin.**] *Bodenkultur*, 1955, **8,** 327–330. [Inst. Tierzucht, Hochsch. Bodenkultur, Vienna.]

Three hundred Pekin ducklings were fattened for 8 weeks on a mixture of ground maize and barley 40, wheat bran and oat flakes 32, animal protein (dried skimmed milk and fishmeal) 13, vegetable protein (ground soya and pumpkin cake and dried yeast) 12, and minerals (chalk and wood charcoal) 3. The feed contained crude protein 18·7, digestible protein 15·2, crude fibre 6·4 and total nutrients 65·4 per cent. and the ratio of protein to total nutrients was 1 : 4·2. The feed was given twice daily in a moist crumbly state. The ducklings had access to drinking water. Half of them had, per metric ton feed, $3\frac{1}{3}$ lb. (1·51 kg.) Bi-Con Tm_{3+3} (Pfizer Co., New York), supplying 10 g. terramycin and 10 mg. vitamin B_{12} [the percentages given at the foot of p. 327 are wrong] with soya bean meal as carrier.

The ducklings given terramycin and vitamin B_{12} made better weight gains, especially in the first 3 weeks ; over the whole period 7·1 per cent. better, with less feed. The overall improvement in feed efficiency assessed by Lehmann's method was 7·7 per cent. Losses were fewer. The flesh of the birds was pure white and of excellent quality.—W. M. Deans.

3945

NOWAK, H. Entenmast mit Terramycin und Vigofac. [**Fattening ducks with terramycin and Vigofac.**] *Arch. Geflügelk.*, 1956, **20,** 35–40. [Inst. Tierzucht, Hochsch. Bodenkultur, Vienna.] English summary.

There were 4 groups, each of 240 Pekin ducks, fattened from one-day-old for 8 weeks. They received standard rations throughout, with a change to the finishing ration after 4 weeks.

Group 1 had no addition ; group 2 had terramycin, 22 g. per metric ton in the first ration and 11 g. in the second ; group 3 had Vigofac, 9 lb. and then 4·5 lb. per ton ; group 4 had both terramycin and Vigofac at the same rates.

Feed intake was almost the same in all 4 groups. Relative weight increases in order from group 1 to 4 were 100, 105·7, 106·0 and 110·9. Relative feed requirements per unit weight increase, in the same order, were 100, 92·5, 91·7 and 89·8. Losses in all 4 groups were small, 2, 1, 1 and 3 ducks, respectively.—D. Duncan.

3946

AMSCHLER, J. W. Terramycin in der Fütterung des Geflügels. [**Terramycin in the feeding of poultry.**] *Bodenkultur*, 1955, **8,** 307 – 312. [Inst. Tierzucht, Hochsch. Bodenkultur, Vienna.]

3947

GERRIETS, E. Aureomycin ad us. vet. als Futtersupplement in der Kükenaufzucht. [**Aureomycin for veterinary use as a feed supplement in chick rearing.**] *Berl. Münch. tierärztl. Wochenschr.*, 1956, **69,** 9–13. [Abt. Geflügelkr., Humboldt Univ., Berlin.] English summary.

Three trials were made in 1955 with veterinary aureomycin, each with 2 groups of 100 chickens reared intensively indoors to 8 weeks on a mixture of ground wheat 50, ground oats 10, ground maize 13, soya grits 15, dried skimmed milk 5, dried yeast 3, vitamin mixture (bran coated with cod liver oil fortified with vitamins A, D_2 and E) 0·5, minerals 2·5, wood charcoal 1 per cent. Trials 1 and 2 were with Italian chicks on sawdust regularly changed under conditions resembling those of a well-run poultry farm ; trial 3 with Rhode Island chicks on old horse litter which was not changed, and under severe conditions in open-fronted pens. In each trial one group had 10 mg. aureomycin per kg. feed, mixed in by machine.

In trial 1, the group given aureomycin made significantly better weight gains ; in the other 2 trials there was no significant difference. Losses were few but aureomycin did not reduce them. From these results and those of other experiments by the author, it is concluded, contrary to the findings of others, that aureomycin at the rate of 10 mg. per kg. feed is useless ; and undesirable because of the risk of impairing its therapeutic effect. Evidence in favour of aureomycin comes mostly from the United States where conditions are different, *i.e.*, broilers are reared in such large groups that hygiene suffers and antibiotics therefore show an effect. Use of aureomycin in Germany should be legally restricted to fattening mixtures and its presence should be declared, as is done in Switzerland and the Netherlands.—W. M. Deans.

3948

SLINGER, S. J. and PEPPER, W. F. **Effect of water intake on the growth response of poults and chicks to penicillin.** *J. Nutrition*, 1955, **57,** 319–328. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

There were 8 groups each of 10 male and 10 female Broad Breasted Bronze poults and 4 groups each of 20 crossbred male chicks. Parallel reserves provided replacements for those that died. The diets, detailed, were of grain, soya bean oilmeal, tallow (poults), soya bean oil (chicks), dried grass, meatmeal, fishmeal, dried buttermilk, minerals and vitamins, including vitamin B_{12}, 3 mg. per lb. feed. Weight and consumption of feed and water were recorded daily for 14 days (poults) or 28 days (chicks). Groups of poults were in pairs, with and without penicillin, 25 mg. per kg. feed, 4 allowed to eat to appetite and 4 with their allowances equated to one or other of these latter groups ; of each of these series of 4 groups, 2 had water to appetite and 2 equated. There was no difference referable to water in response to penicillin. With the chicks, which were fed to appetite, there was no significant response to penicillin and no effect of amount of water taken.—I. Leitch.

3949

LINDBLAD, G. S., HUNSAKER, W. G. and AITKEN, J. R. **The influence of penicillin, aureomycin and 3-nitro-4-hydroxyphenylarsonic acid on the growth of goslings.** *Poultry Sci.*, 1955, **34,** 1259–1261. [Poultry Div., Central Exp. Farm, Ottawa.]

Two experiments are reported. In the first neither penicillin, 25 p.p.m., nor 3-nitro-4-hydroxyphenylarsonic acid, 50 p.p.m., added to a basal ration improved growth rates or efficiency of feed utilisation of goslings up to 4 weeks old. In the second the same supplement of arsonic acid and supplements of 25 or 100 p.p.m. penicillin or aureomycin were compared with the basal ration. In this experiment growth was improved up to 2 weeks old by 25 and 100 p.p.m. penicillin and 100 p.p.m. aureomycin, but by 5 weeks of age the advantage had disappeared.—T. D. Bell.

3950

KEELING, A. D., HILL, C. H., GARREN, H. W. and KELLY, J. W. **The effect of chlortetracycline and fish meal on the growth and thyroids of chickens.** *Poultry Sci.*, 1955, **34,** 1453–1454. [Dept. Poultry Sci., N. Carolina State Coll., Raleigh.]

Groups of day-old chickens were fed for 34 days on an all-vegetable diet or one containing 5 per cent. fishmeal, other groups on the same diets plus 100 mg. chlortetracycline per lb. Thyroid glands were removed, weighed and examined histologically.

Chlortetracycline had a significant effect on weight gains in the all-vegetable diet group, but with fishmeal there was none. The antibiotic had no significant effect on size or histological appearance of the thyroid. The glands of the all-vegetable group were slightly larger and more active than those of the fishmeal group, owing possibly to the iodine in the fishmeal.—J. S. Thomson.

3951

ADAMS, J. L. **The effect of ration, caponizing, and hormone treatment on broiler strain New Hampshire cockerels.** *Poultry Sci.*, 1955, **34,** 1295–1297. [Poultry Dept., Univ. Wisconsin, Madison.]

Cockerels of a modern broiler strain, New Hampshires, were divided into 3 groups: (1) surgically caponised at 6 weeks, (2) implanted with a 15-mg. pellet of diethylstilboestrol at 12 weeks and (3) untreated. One-half of each group was fed to 16 weeks on a ration in use in 1935 and the other on a modern broiler ration in use in 1951 to determine the improvement in feeding, and the results were compared with those reported in 1936 for heavy breeds.

The modern strain on the modern broiler ration weighed, on the average, 5·48 lb. at 16 weeks; the corresponding weight for the same strain given the old ration was 4·56 lb.; the heavy breeds reared in 1936 weighed only 3·68 lb. at the same age.

In comparison with untreated cockerels, surgical caponising did not affect the rate of growth of the modern breed on the modern ration, but on the old ration this treatment produced a 13 per cent. increase in growth. Implantation produced increases of 10 and 12·5 per cent. on the new and old diets, respectively, and improved conformation and finish. The economics of the problem are discussed.—J. S. Thomson.

3952

BRESSLER, G. O. **Confinement rearing of pullets in Penn State experimental poultry house.** *Pennsylvania Agric. Exp. Stat. Progr. Rep.* No. 140, September 1955, pp. 4.

An experimental poultry house 30 × 100 ft. is described which has been used for rearing and laying pullets. Details of the method of changing over are given. The cost of labour and electricity for the brooders, and the mortality, were low, and efficiency of feed conversion was high.—T. D. Bell.

See also Absts. 2841, 2842, 2944, 2945, 3078, 3080, 3081, 3800.

EGG PRODUCTION

3953

WEBER, F. and LE ROY, H. L. Wechselwirkungen zwischen Erbgut und Umwelt beim Haushuhn und ihre Bedeutung für die Umweltgestaltung bei Leistungsprüfungen. [**Interactions of heredity and environment in the domestic fowl and their bearing on the control of environment in tests of production.**] *Arch. Geflügelk.*, 1956, **20,** 1–14. [Versuchsgut Chamau, Eidg. Tech. Hochsch., Zürich.] English summary.

Although the possibility of interactions of heredity and environment is generally admitted, their existence has been demonstrated in only very few studies on domestic animals.

In the present paper hens in an egg-laying test made at the experimental farm of Chamau in 1954–55 and reported elsewhere (Weber, *Der Geflügelhof*, 14 October 1955) were compared with their full sisters in the flocks from which they came, for number of eggs from onset of laying to 9 January, egg weight in December, and body-weight at 10 weeks of age. From each of 4 flocks 70 unsexed chicks selected at random were sent for test. Owing to deaths, failure to lay, missing heredity data and exclusion of hens which had not at least 3 full sisters for comparison, correlations were worked out only for 22, 25 and 25 hens from 3 flocks. These were compared with theoretical correlations calculated from the heritabilities of the 3 characteristics as found from all the available data for each flock separately. From the differences found it was concluded that interaction of heredity and environment probably exists for weight at 10 weeks considered as a measure of early maturity, in agreement with the results of Skaller and Sheldon (*Austral. J. Agric. Res.*, 1955, **6,** 171), is not probable for number of eggs, and requires further investigation for egg weight. The results show the importance of conducting tests in an environment similar to that in which the birds or their descendants are likely to be kept.

W. M. Deans.

3954

MANTEL, K. Einfluss von verschieden hohem Getreideanteil im Alleinfutter auf Legeleistung, Zuchterfolg und Wirtschaftlichkeit der Fütterung. [**Effect of different levels of grains in an all-mash ration on egg yield, breeding and economics of feeding.**] *Arch. Geflügelk.*, 1956, **20,** 15–23. [Geflügelzuchtlehranst., Erding, Obb.] English summary.

Results of a previous experiment (Abst. 4438, Vol. 25) with different levels of grains in a mixed ration are briefly recapitulated, and a similar 350-day experiment made in 1954–55 with an all-mash ration and 3 groups each of 30 Leghorn and 30 Italian pullets is reported. Coarsely ground grains, equal parts of wheat, maize, barley and oats, formed 45, 60 or 75 per cent. of the ration; equal parts of wheat bran and pollards made up 30, 15 or 0 per cent., and the other items were Maizena 8, malt sprouts 3, herring meal 4, meatmeal 3,

dried skimmed milk 1, yeast 1, lucerne meal 3 and DLG mineral mixture Ia 2. Of this 15 g. per bird daily was given in a moist crumbly condition, the rest dry to appetite. In December and January 1 g. cod liver oil or 8 g. carrot silage per bird daily was given, week about. In winter the birds had a 12-hr. day, and they were let out every second day, weather permitting.

As before, total number of eggs, number of eggs produced in winter, egg weight, number of birds qualifying for recording and efficiency of feed utilisation all increased with the percentage of grains in the ration. With 45 and 60 per cent. grain the Leghorns laid more eggs than the Italians, but with 75 per cent. there was little difference between the breeds. Birds given 75 per cent. grain gained, the others lost weight; another group given only 30 per cent. grain did so badly that that part of the experiment had to be stopped after only a month. Least feed was consumed when 75 per cent. grain was given. In spite of the higher cost of the rations higher in grain, feed costs per 100 g. eggs plus meat fell as the percentage of grain rose; they were, respectively, 21·6, 19·7 and 17·5 Pf. Hence in an all-mash ration, the inclusion of 75 per cent. of grain is recommended.—W. M. Deans.

3955

MEHRING, A. L. (Jr.), TITUS, H. W. and BRUMBAUGH, J. H. **Effects of two sulfonamides on the formation of egg shells.** *Poultry Sci.*, 1955, **34,** 1385–1389. [Lime Crest Res. Lab., Limestone Products Corporation of America, Newton, N.J.]

Two unsubstituted sulphonamides, 2-acetylamino-1 : 3 : 4-thiadiazole-5-sulphonamide and benzenesulphonamide, given in capsule form to laying pullets, in amounts of 50 to 100 and 35 mg. daily, respectively, resulted in the production of thin-shelled eggs or eggs with no shell. Some of the pullets ceased laying. Normal eggs were laid soon after treatment ceased.—J. S. Thomson.

3956

CARTER, R. D., RISNER, R. N. and YACOWITZ, H. **Some effects of growth hormone preparations in pullets and mature hens.** *Poultry Sci.*, 1955, **34,** 1407–1414. [Ohio Agric. Exp. Stat., Wooster.]

Daily injection into pullets and hens of 1 or 2 mg. growth hormone from cattle for 25 days had little effect on growth or feed consumption but reduced egg production, the decrease continuing for 10 days after the injections ceased. Pullets injected with growth hormone from pigs showed a small growth response, but the effect on egg production was similar. Most of the pullets receiving the injections became broody, and the reasons for this are discussed.—J. S. Thomson.

3957

POPIEL, K. and SIKOROWICZ, Z. Wpływ zróżnicowanego odczynu pokarmu na kształtowanie się iolściowego stosunku obu płci u kury domowej. [**The effect of differential feeding of hens on the sex ratio.**] *Pamiętnik Inst. Zootech. Poland*, 1955 (1956), 61–73. Russian and English summaries.

The ratio of cockerels to pullets in the progeny of hens fed on an acid-producing diet and mated with cocks on an alkali-producing diet was 2·8 to 1. In the progeny of hens on alkaline diet and cocks on acid diet the ratio was 1 to 2·3. (From summary.)—J. S. Thomson.

See also Absts. 3080, 3935.

OTHER BIRDS

3958

COULTER, M. W. **Spring food habits of surface-feeding ducks in Maine.** *J. Wildlife Management*, 1955, **19,** 263–267. [Maine Cooperative Wildlife Res. Unit, Orono.]

The stomach contents of 72 wild ducks caught in muskrat traps were examined. There were 39 wood ducks, 20 black ducks, 12 green-winged teal and one blue-winged teal. The vegetation of the area from which they were obtained is described. Most of the feed was obtained from the seeds of sedges (*Carex* spp.), rushes (*Scirpus* spp.) and bur-reed (*Sparganium* spp.). Where available some fruits of bushes were also eaten, more by the black ducks than the others, and the proportion of animal feed, insects, eaten was from 6 to 10 per cent. of the total feed intake. Pondweed was not encountered as much as expected, probably because seeds were unavailable because of covering by flooding and silting.—T. D. Bell.

3959

BAILEY, W. J. (Jr.), SHARP, W. M., HAZEL, R. B. and DAVIS, G. **Food habit trends of ruffed grouse in the Centre county "Barrens" (based on droppings analysis.)** *Pennsylvana Agric. Exp. Stat. Bull.* No. 604, October 1955, pp. 18.

The advantages of the method are discussed. The seasonal trends of food habits are indicated. Fruit of oak, wild grape and teaberry, and aspen buds and some green leaves were the most used

foods. The importance of these items varied from year to year, depending on the relative yields of the fruits. The seasonal trend showed fruits to be most important in the autumn, diminishing in volume eaten as winter came on. Consumption of buds increased as the fruits became unavailable. Droppings collected at different sites showed difference in the choices of the birds, thought to be due to the availability of specific feeds at particular places. One cause of the variation in availability was the use of the succulent fruits by deer and migratory song-birds. Frost-resistant leaves, including 2 families of ferns, were important sources of food during the winter, but aspen buds were dominant.—T. D. Bell.

3960

DALE, F. H. **The role of calcium in reproduction of the ring-necked pheasant.** *J. Wildlife Management*, 1955, **19,** 325–331. [U.S. Fish and Wildlife Serv., Laurel, Md.]

Field observations indicated that in 2 areas similar agriculturally, but one on calcareous and one on non-calcareous soil, the pheasant population in the former was normal, and in the latter very low.

Experiments with pens of 20 pheasants were made. Diets were similar, except that in half the pens the feeds came from the calcareous, and in the other half from the non-calcareous area. Both these diets were adequate for maintenance, but not for reproduction. It was thought that grit was of importance for reproduction, and limestone or granite grit was added to each of the rations.

Rations from both areas with limestone grit gave satisfactory reproduction. Granite grit and the ration from the chalk area were marginal, and granite grit and the ration from the other area were still unsatisfactory. A supply of Ca carbonate rapidly rectified the fault. It was concluded that lack of limestone in the non-calcareous area was the cause of the low pheasant population. Bone ash of the birds on the different rations did not differ significantly. In birds which did not lay properly, development of the ovaries was normal. The role of Ca in ovulation is discussed.

T. D. Bell.

3961

MICHAEL, V. C. and BECKWITH, S. L. **Quail preference for seed of farm crops.** *J. Wildlife Management*, 1955, **19,** 281–296. [Sch. Forestry, Univ. Florida, Gainesville.]

In 600 trials the preference of quail for 53 types of seeds was investigated. Grass seeds were preferred to legumes, and the consumption of the legume seeds increased only when the supply of grass seeds declined. Even when no other feed was offered for 7 days quail would not eat seeds which were known to be toxic. It was demonstrated that the quail had a highly developed sense of smell which enabled them to find the preferred seeds even when buried under seeds rating low on the preference list. The placing of the feeds in different positions did not affect the choice of the birds and they did not require any length of time to become accustomed to new seeds which they found palatable. Harvester ants showed the same feed preferences as quails, and would be a serious source of competition, but cotton rats preferred seeds not chosen by quail. A diet of only one to 3 different seeds, even of the most highly preferred, caused loss of weight, and signs of deficiency of vitamin A, which could be cured by giving a wide variety in the diet. On inadequate diets hens were twice as likely to die as cocks.

T. D. Bell.

3962

BECK, J. R. and BECK, D. O. **A method for nutritional evaluation of wildlife foods.** *J. Wildlife Management*, 1955, **19,** 198–205. [Dept. Biol., Univ. Tennessee, Martin.]

A method for studying food habits of birds, which takes into account the amount eaten and the percentage of requirement of energy, protein and minerals it meets, is presented. It requires refinement to allow for vitamin requirements and trace minerals, but would be a useful guide to gamekeepers concerned with maintaining wild game.—T. D. Bell.

FOOD ECONOMICS AND STATISTICS

3963

FOX, K. A. and TAEUBER, R. C. **Spatial equilibrium models of the livestock-feed economy.** *Amer. Econ. Rev.*, 1955, **45,** 584–608. [Div. Agric. Econ., U.S. Dept. Agric.]

The spatial equilibrium model considered in this paper attempts to determine the level of production and consumption of both livestock and cattle feed in each of 10 regions in the United States and the aggregate amount and direction of inter-regional trade in these 2 commodities. The main difference between this model of jointly dependent commodities and those, quoted by the authors, which deal with single commodities is similar to the difference between the simultaneous equations and the single equation approach in econometrics. Spatial equilibrium is held to exist when (a) demand and supply are equal in the U.S. as a whole (gross equilibrium)

and (b) trade between regions of excess and deficit is determined in such a way that no trader could obtain more profit by further shipments.

The model consists of 42 equations, 40 determining the production and consumption of feed and livestock in each region and 2 specifying the gross equilibrium requirements for livestock and cattle feed separately. The production and consumption equations are jointly dependent, *i.e.*, some of the determining variables in one equation will be the dependent variables in others. A gross equilibrium position, in which prices, production and consumption within each region are consistent with the equations of the model, is obtained by a repeated trial and error process. The regional production and consumption levels at this gross equilibrium position determine the aggregate amount of inter-regional trade. The direction of trade is apparently determined by a linear-programming method similar to that used in the transportation problem by Koopmans.

The authors claim that the model could be used in a system of competitive markets with continuously varying prices to determine, *e.g.*, an equilibrium price structure, an allocation of trade or a transportation charges structure which will maximise or minimise a particular linear function, *e.g.*, profits or transportation costs. It could also be used to discover the effect of a change external to the model. Examples are given of the effects of a drought in part of the U.S. and of an increase in freight rates for feed. The main difficulty encountered in applying the model, the authors declare, is the inability to obtain satisfactory demand and supply functions.—P. Fisk.

3964

CHEVELEY, S. and PRICE, O. **Capital in United Kingdom agriculture present and future.** The Netherhall Press, London, 1955, pp. 54. [Imperial Chemical Industries, Ltd., Noel House, London, S.W.1.]

Capital in U.K. agriculture is surveyed and a budget is presented to show how efficiency might be raised and imports reduced by expansion of grassland output and production of beef and mutton.—F. C. Aitken.

3965

WITT, M. Bericht über die auf dem Gebiete der Niederungsviehzucht in der Zeit von 1945 bis 1954 veröffentlichten Arbeiten. [**Report on papers published between 1945 and 1954 on the breeding of Holstein cattle.**] *Züchtungskunde*, 1956, **28,** 3–28. [Max Planck Inst. Tierzucht, Mariensee, Trenthorst.]

A review, with 233 references, emphasises the important role of Holstein and Friesian cattle in the world's milk production.—D. Duncan.

3966

MUMFORD, D. C. **Quality milk: does it cost more to produce?** *Oregon Agric. Exp. Stat. Bull.* No. 551, July 1955, pp. 20.

Quality of milk was determined by the bacterial count. Costs of milk production on 23 farms producing high-quality "grade A" milk were not significantly different from costs on 31 farms producing milk of lower quality destined for factory processing. The costs were based on items such as labour, buildings and equipment. Feed costs were omitted.—J. N. Aitken.

3967

BEATTIE, W. A. **A survey of the beef-cattle industry of Australia.** *Commonwealth Sci. Indust. Res. Organiz., Melbourne, Austral.*, Bull. No. 278, 1956, pp. 135.

The main purpose of this survey of the history and development of the beef cattle industry in Australia is to provide a background for the future planning of research. The evolution and structure of the industry in a wide variety of climatic environments is described with particular emphasis on density and distribution of the main breeds, methods of management, costs, disease control, marketing, transport, and statistics.

J. N. Aitken.

3968

HART, J. **The agricultural potential of the Central Queensland Highlands.** *Queensland Agric. J.*, 1955, **81,** 187–201.

3969

DUTHIE, W. B. **Economics of hill farming. Blackface or Cheviot? An economic comparison between Blackface and South Country Cheviot breeds of sheep in the Border Counties, 1946 to 1953.** *Edinburgh and East of Scotland Coll. Agric. Tech. Bull.* No. 14, June 1955, pp. 20.

In an 8-year economic study of 50 Border hill farms, 25 carrying South Country Cheviots and 25 carrying Blackfaces, Cheviots required 0·4 acre rough grazing less per ewe and as draft ewes made higher prices than Blackfaces. The average lambing percentage of Blackfaces was 82·0 and that of Cheviots 80·4. Fleeces of Blackfaces were superior in weight, 4·4 lb. as against 3·9 lb., but inferior in value, 13s. each as against 14s. 4d. Blackface store lambs were slightly dearer than Cheviot store lambs, but hypothetical income from flocks of 1000 ewes slightly favoured the Cheviot. Mortality of Blackfaces was 4·6 per cent. of total stock at marking time and of Cheviots 4·8 per cent. The change-over of some hill farmers from South Country Cheviot sheep to Blackface sheep is discussed.—J. C. Gill.

3970

BERKOWITSCH, J. Kraftfutterindustrie in Venezuela. [**Concentrate industry in Venezuela.**] *Schweiz. Landwirtsch. Monatsh.*, 1956, No. 1, Sonderheft 60. Geburtstag. Prof. Crasemann, 57–66. [Protinal C.A., Valencia, Venezuela.]

This article gives an idea of the rapid growth of the feedingstuffs industry in Venezuela. Large-scale manufacture began only in 1942 and the amount of compound feedingstuffs produced has risen from under 350,000 kg. in 1943 to over 59 million kg. in 1954, of which 57 million kg. were accounted for about equally by poultry and dairy cows. Horse feed amounted to 817,000 kg. and pig feed to 571,000 kg. The main local raw materials are maize and maize offals, rice offals, molasses, cocoanut, sesame, cottonseed, and sardine meal; dried skimmed milk, phosphates, vitamins and antibiotics are imported. Owing to the absence of some common ingredients and the abundance of others, some of the mixtures produced are quite unorthodox. Before sale they must be registered with the Ministry of Agriculture with particulars of ingredients and minimum content of crude protein, crude fat and N-free extractives and maximum content of crude fibre; and sacks must be labelled with particulars of ingredients and nutrient content.—W. M. Deans.

See also Abst. 2815.

DIET IN ETIOLOGY OF DISEASE

GENERAL

3971

WILLEMSEN, W. Het voorkomen van ziekten en moeilijkheden met het drachtig worden van het rundvee op de vorbeeldbedrijven. [**Incidence of disease and slow breeding in cattle on demonstration farms.**] *Tijdschr. Diergeneesk.*, 1955, **80,** 1243–1248. [Rijkslandbouwvoorlichtingsdienst.] English, French and German summaries.

3972

PEROLD, I. S. **Prevention of physiological disorders in farm animals by means of copper and cobalt salts soluble in alkaline waters.** *Farming in S. Africa*, 1956, **31,** 6–8. [Stellenbosch-Elsenburg Coll. Agric.]

3973

NICHOLS, R. E. **Excessive frothing in rumen produced by fresh legume tops.** *J. Amer. Vet. Med. Assoc.*, 1956, **128,** 215. [Dept. Vet. Sci., Univ. Wisconsin, Madison.]

A sudden change from alfalfa hay to fresh young ladino clover tops produced an explosive escape of frothy reticulo-rumen contents in a cow with a rumen fistula. It is suggested that under natural conditions fresh legumes produce an increase in surface tension and viscosity of the rumen contents and a great increase in viscosity during periods of excessive frothing.—J. S. Thomson.

3974

NICHOLS, R. E. **Physical properties of paunch juice which may contribute to bloating.** *Vet. Med.*, 1956, **51,** 47–52. [Madison, Wis.]

3975

AGRICULTURAL RESEARCH COUNCIL. **Bloat.** *Agriculture, J. Minist. Agric. Engl.*, 1956, **62,** 507–511.

3976

REBER, E. F. and YUSKEN, J. W. **The effect of a high level of dietary sodium on the nutrition of baby pigs infected with transmissible gastro-enteritis.** *N. Amer. Vet.*, 1956, **37,** 198–201. [Dept. Vet. Physiol. Pharmacol., Univ. Illinois, Urbana.]

Seven littermate pigs were selected and divided at 7 days of age on an equal weight basis into groups of 3 and 4. At 20 days of age the group of 3 was infected with transmissible gastro-enteritis. The 2 groups were given the same semi-synthetic ration, which contained 920 mg. Na and 1020 mg. K per 100 g. ration, and each group was tended by different people. Faeces, urine and vomitus were collected for estimation of N, Na and K. Faecal excretion of N, Na and K was greater in the infected pigs, but no negative balance was found; in previous experiments when dietary Na was low K balance became negative (Reber and Whitehair, *Amer. J. Vet. Res.*, 1955, **16,** 116). The high dietary level of Na seemed to counteract to some extent the disturbance of K metabolism due to the infection.—T. D. Bell.

3977

LUDVIGSEN, J. Undersøgelser over den såkaldte "muskeldegeneration" hos svin. 4. Studier over pathogenesen. [**Studies of so-called "muscle degeneration" in pigs. 4. Pathogenesis.**] *Forsøgslab. København Beretn.*, 1955, No. 284, pp. 84. English summary.

For earlier reports see Absts. 1497 and 5983, Vol. 25.

4. The *p*H of degenerated muscle at slaughter is always below that of normal muscle, 5·3 to 5·5, and normal 6·4 to 6·7. It is suggested that disturbance of intermediary metabolism of carbohydrate is responsible: glycogen and pyruvic acid are low and lactic acid is high in abnormal

muscle, but pH is not closely related to the level of lactic acid. This implies a defect in buffering action which is attributed to lack of the normal amount of myoglobin. A comparison is made with Carlström's findings in myoglobinuria of horses (see Abst. 2898, Vol. 1). The amount of deposit carbohydrate at slaughter appears to determine the appearance of the abnormality in genetically predisposed pigs and restriction of feed for 24 hr. prevents it. There are differences between muscles by function and colour. Genetically predisposed pigs with muscular degeneration stored relatively more N and put on more flesh than normal pigs. Hormones are discussed again. The last section discusses rigor mortis in relation to quality of pork. It is important that pigs be rested before slaughter.—I. Leitch.

3978

GRASHUIS, J. Straling bij de opfok van het jonge vee en het voorkomen van stressverschijnselen. [**Irradiation in the rearing of young animals and the occurrence of signs of stress.**] *Tijdschr. Diergeneesk.*, 1956, **81,** 15–23. [Inst. Moderne Veevoeding "De Schothorst", Hoogland.] English, French and German summaries.

The chilling of newborn pigs, chilling as a stress in the Selye sense, and some Scandinavian data on the effect of exposure to ultraviolet light on mortality of young pigs are discussed.—I. Leitch.

3979

PARRY, H. B. **Prevention of toxaemia of late pregnancy in sheep.** *Nature*, 1956, **177,** 288–289. [Nuffield Inst. Med. Res., Woodstock Rd., Oxford.]

Data on the occurrence of pregnancy toxaemia in some 50 lowland flocks in England and Scotland are shown for 3 consecutive years. A striking reduction in the number of cases and in the number of deaths resulted from restricting gain of weight during early pregnancy and giving hay and concentrates to ensure good gains during the last 6 to 8 weeks. Over this period a concentrate feed of 10 per cent. good quality protein, at first at the rate of $\frac{1}{4}$ lb. per head daily and increased to 2 lb. during the last fortnight before lambing, is recommended. Severe weather might necessitate higher feeding levels. Exercise is also advisable.

J. C. Gill.

3980

SELIVANOV, A. V. Vliyanie uslovii soderzhaniya i kormleniya na vozniknovenie i techenie kopytnoi gnili ovets. [**Effect of management and feeding of sheep on incidence of footrot.**] *Veterinariya*, 1955, **32,** No. 2, 61–65.

The main causes of footrot in sheep are insanitary conditions and damp, dark and dirty buildings. Deficiency of minerals or vitamin A in the rations also help to reduce the resistance of sheep to footrot.

H. Scherbatoff.

See also Abst. 2984.

DEFICIENCY DISEASES

3981

GUILIANI, R. Le carenze alimentari del bestiame. 2. [**Nutritional deficiencies of livestock. 2.**] *Riv. Zootec.*, 1955, **28,** 341–346.

A review.

3982

LEBEDEV, P. T. Usilnit raboty po diagnostike mineralnoi i vitaminnoi nedostatochnosti. [**Reasons why efforts to diagnose mineral and vitamin deficiency should be increased.**] *Veterinariya*, 1955, **32,** No. 10, 81–83. [Sibirsk. Nauch.-Issled. Vet. Inst.]

The need to control intakes of Ca, P and carotene, especially in pregnant cows, is illustrated with examples from collective farms. An association between gastric disorders, lung illnesses and vitamin and mineral deficiency has been proved by many experiments. If in the last third of pregnancy the mother's diet is supplemented with 15 to 25 g. Ca, 10 to 18 g. P and 90 to 120 mg. carotene per 100 kg. bodyweight better offspring with a higher resistance to disease will result. Examples of how improvement of diet increased the survival rate of calves, diminished the incidence of gastric and other disorders and improved the milking capacity of cows are quoted. Blood analysis is advocated as a method of determining whether action should be taken, though pregnant animals should receive supplements in any case.

F. Billewicz.

3983

BARNES, J. E. and JEPHCOTT, B. R. **Phosphorus deficiency in cattle in the Northern Territory and its control.** *Austral. Vet. J.*, 1955, **31,** 302–312 (with discussion 312–316). [Animal Indust. Branch, Northern Territory Admin., Alice Springs.]

The condition known as "peg-leg" was widespread in the Northern Territory in 1952 and in 1954, during droughts. Affected cattle were poorly developed, with fine bones liable to fracture, poor in condition, with dull, rough coats and sometimes depigmentation, patchy alopecia and kyphosis. Lameness, sometimes acute, was common, especially in lactating cows. There was no correlation in 137 cattle between the incidence of the disorder and Hb value. Post-mortem examination showed erosion of articular cartilages, especially at the elbow and hock; osteomalacia was common. Tendon sheaths of the flexor tendons of the metacarpal and metatarsal regions were often inflamed.

Peg-leg was significantly correlated with low serum inorganic P; the values obtained might have been lower still if the animals had not been driven and thrown before samples were taken. Serum Ca was high whether or not the cattle had peg-leg. It is concluded that the condition is due to deficiency of P.

Soils from affected areas in the Barkly Tableland region had low or very low total P, nearly always below 0·05 per cent. P_2O_5. A limited number of pasture samples had a mean P content of 0·07 per cent. Water samples contained no P. The provision of bonemeal in troughs is not considered to be a satisfactory solution to the problem under the conditions of cattle production; addition of sodium orthophosphate to the drinking water is suggested, and a cheap and effective method is described.—D. Duncan.

3984

STEWART, J. and REITH, J. W. S. **The effects of magnesium liming on the magnesium content of pasture and the blood level of magnesium in cows.** *J. Comp. Pathol.*, 1956, **66**, 1–9. [Moredun Inst., Gilmerton, Edinburgh.]

Trials were made on a farm where tetany with low blood Mg was prevalent. The Mg content of herbage from pasture plots given a single dressing of 40 cwt. ground limestone (48 per cent. CaO, 2 per cent. MgO) per acre was similar to that from plots where no lime was applied. The annual mean Mg content was from 0·20 to 0·25 per cent. in the dry matter during 3 years. A single application of 40 cwt. ground magnesium limestone (31 per cent. CaO, 20 per cent. MgO) per acre raised the Mg content to 0·31 to 0·38 per cent. in the dry matter over the same period. Seasonal variations were apparent in all herbages, lowest values occurring in April and May. Blood serum Mg values of grazing cows were lowest in these months. Pastures treated with magnesian limestone were grazed continuously by a total of 12 cows during 4 consecutive years. In April of the year of application the mean Mg content of the serum was 1·78 mg. per 100 ml.; corresponding values in the subsequent 3 years were from 2·09 to 2·22, and for 6 cows grazing pastures of similar type not treated with magnesian limestone they were from 1·74 to 1·85 mg. during the 4 years. It is concluded that magnesian limestone dressings considerably improved the level of blood Mg in cows on this farm.—J. L. Corbett.

3985

WYNNE, K. N. and MCCLYMONT, G. L. **Copper-molybdenum-sulphate interaction in induction of ovine hypercupraemia and hypocuprosis.** *Austral. J. Agric. Res.*, 1956, **7**, 45–56. [Nutrit. Res. Lab., Vet. Res. Stat., Glenfield, N.S.W.]

Merino sheep in 5 groups of 6 or 7, with some black sheep in each group, received a basal diet of chaffed wheaten or oat hay, oats, wheat and meat-meal, containing Cu 5·2 p.p.m., Mo 0·83 p.p.m. and inorganic sulphate 0·04 per cent. One group received a supplement of ammonium molybdate to raise the Mo content to 5·14 p.p.m., one group sodium sulphate to raise the sulphate to 0·40 per cent., one group had both these supplements and another group had the ration with both supplements but with feed intake restricted to 2·7 kg. weekly given in only 2 feeds. The controls had no supplement. Liver biopsy samples were taken at intervals and blood was analysed for Cu on 3 occasions.

Sheep on the basal diet maintained liver Cu concentrations with relatively little change for 30 weeks and had normal blood Cu and wool. Sheep given both supplements showed a progressive fall in liver Cu, from 222 p.p.m. initially to 12·8 after 50 weeks; blood Cu fell to 0·042 mg. per 100 ml. after 43 weeks and the wool of the black sheep showed light bands. In the group on restricted feeding the fall in liver Cu was similar and so were the wool changes, but the fall in blood Cu was later in appearing. With no Mo supplement alone, liver Cu fell less, from 306 to 170 p.p.m. in 30 weeks, blood Cu remained within low normal limits and the wool showed no change. With sulphate alone, liver Cu fell in 50 weeks to 49·8 p.p.m., blood Cu fell slightly and the wool was unaffected.

It is concluded that the signs of Cu deficiency in sheep in New South Wales can be explained as an effect of the interaction of Cu, Mo and sulphate.

D. Duncan.

3986

ANDERSON, J. P. and ANDREWS, E. D. **The effect of phenothiazine on cobalt-deficient and cobalt-dosed lambs.** *N.Z. Vet. J.*, 1955, **3**, 150–151. [Dept. Agric., Invercargill.]

Of 4 groups of 10 lambs on a cobalt-deficient paddock one group was given 20 g. phenothiazine per lamb per fortnight, another 7 mg. cobalt per lamb per week, a third 20 g. phenothiazine per lamb per fortnight and 7 mg. cobalt per lamb per week and a fourth group acted as control. Compared with the controls, mean weight gains were higher and death rate lower in lambs given phenothiazine, but neither difference was significant. No significant difference was found between mean weight gains of lambs given cobalt and of those given cobalt and phenothiazine, but in both, weight gains were over twice those of controls.

J. C. Gill.

3987

CUMMING, R. B. and TRIBE, D. E. **The effect of floor type and the choline content of the diet upon the incidence of perosis in chickens.** *J.*

Agric. Sci., 1956, **47**, 103–106. [Sch. Vet. Sci., Univ. Bristol.]

The occurrence of perosis is reported in chickens on the vitamin-E-deficient diet No. 124 of Dam *et al.* (Abst. 3372, Vol. 21). Dam had reported the occurrence of encephalomalacia, but not perosis.

Four experiments are reported with the diets of Dam *et al.* containing 55 p.p.m. Mn and 500 mg. choline per kg., with 340 Rhode Island Red × Light Sussex day-old cockerels. In chickens brooded on a wooden floor the incidence of perosis was 42 per cent.; in those brooded on wire floors, 78 per cent. The addition of Mn up to a level of 1100 p.p.m. had no effect on the incidence, nor had doubling the floor space. When the choline content was raised to over 800 mg. per kg. the incidence was reduced to 15 per cent., but still higher additions, up to 1400 mg. per kg., did not further reduce it. Bodyweight at 21 days increased with increasing choline content of the diet up to a level of 1400 mg. per kg., and it is concluded that this is the least requirement for maximum growth.—J. S. Thomson.

3988

JOYCE, J. M. **Posterior paralysis in pigs. Summary of a Northland survey, 1954.** *N.Z. Vet. J.*, 1955, **3**, 157–158. [Te Hana.]

A survey of the incidence, signs and treatment of posterior paralysis in pigs indicated that the disease might be due to a deficiency of either copper or vitamin A. In areas of Cu deficiency with livers showing a Cu content of from 6 to 12 p.p.m., copper sulphate improved the condition. In other areas without deficiency of Cu, fish liver oil either alone or with copper sulphate or yeast had a beneficial effect.—J. S. Thomson.

See also Absts. 2939–41, 3337, 3382, 3383, 3385.

DISEASES OF METABOLISM

3989

BEIJERS, J. A. **Vetverharding of vetnecrose. [Fatty induration or fatty necrosis.]** *Tijdschr. Diergeneesk.*, 1956, **81**, 199–207. [Klin. Inw. Ziekten, Diergeneesk. Fac.] English, French and German summaries.

This disorder is more common in young than in mature animals, especially in calves. Fatty tumours are palpable superficially and occur in the omentum, and mesentery along the stomach, colon and rectum. Clinical signs are of digestive disorders, colic and loss of weight and are not diagnostic; of laboratory analyses only a low blood cholesterol has been found consistently, and histologically defects in the islets of Langerhans. Etiology is obscure.—I. Leitch.

3990

'T HART, M. L. and KEMP, A. De invloed van de weersomstandigheden op het optreden van kopziekte bij rundvee. **[Effect of weather on the occurrence of grass tetany in cattle.]** *Tijdschr. Diergeneesk.*, 1956, **81**, 84–95. [Centraal Inst. Landbouwk. Onderzoek, Wageningen.] English, French and German summaries.

The incidence of grass tetany was recorded for about 750 farms in the Netherlands for 11 years, during which time there were 1146 cases. A study of variations in environmental temperature in relation to the incidence of grass tetany was made. There was a peak in spring, and 940 of the cases occurred in the first half of the year. Nearly all of them occurred between the time when the cows went out to grass and the time when the mean temperature for 10 days rose above 14° C., and in autumn the incidence increased when the mean temperature fell below that level, especially in wet years. When there was a sharp rise in temperature in spring it was commonly followed, on the average 5·1 days later, by a rise in the incidence of grass tetany, and a sharp drop in temperature was followed by a fall in the number of cases, also 5·1 days later. In spring the number of cases was directly proportional to the rate at which the grass grew.—D. Duncan.

3991

SJOLLEMA, B., VAN KOETSVELD, E. E., GRASHUIS, J. and LEHR, J. J. Onderzoekingen over kopziekte 2. **[Grass tetany 2.]** *Tijdschr. Diergeneesk.*, 1955, **80**, 1111–1134. [Inst. Moderne Veevoeding " De Schothorst ", Hoogland.] English, French and German summaries.

For part 1 see Abst. 1343, Vol. 26.

2. The same 8 cows as were used in the spring experiment were studied in autumn. The 3 which had no attack of tetany in spring were given K salts, 3 which had had tetany now received Na salts, and the other 2 received Mg. Serum composition was studied for 3 months.

Serum Mg fell in all the cows except those given Mg. One of the cows given Na salts had an attack of grass tetany early in October, and another in this group had oedema of the lung followed by emphysema. The cows of this group had a high intake of K as well as of Na. Serum inorganic P was high, 6·8 to 11·2 mg. per 100 ml., in the cows given K salts, but not in those given Na. The results agree with those of the spring experiment.—D. Duncan.

3992

ADLER, J. H. and DYE, J. A. **On the mechanism of ketogenesis in ruminants.** *Cornell Vet.*, 1956, **46**, 58–63. [Dept. Physiol., New York State Vet. Coll., Ithaca.]

The demands of pregnancy, especially in high producing cows and multiparous ewes, and the peculiarities of energy metabolism in the ruminant, in which most of the carbohydrate is absorbed as ketogenic fatty acids, are considered to be concerned in the etiology of ketosis.

T. R. Preston.

3993

HOPKINS, D. W. **Ketosis from the feed manufacturer's standpoint.** *N. Amer. Vet.*, 1956, **37**, 22–28. [Greenfield, N.H.]

In a discussion of ketosis in dairy cattle in relation to feeding practices, data from 5 herds are quoted which indicate that the incidence of the disease is higher where feeding programmes are such that cows calve in over-fat condition and are then often fed on production rations low in protein. It is suggested that feeding in-calf cows on rations with a narrow nutritive ratio, so that they would lay down flesh instead of fat, might reduce the incidence of ketosis.—T. R. Preston.

3994

KROOK, L. and ARWEDSSON, G. **On urolithiasis in the dog.** *Nord. Vet.-Med.*, 1956, **8**, 65–72. [Dept. Pathol., Royal Vet. Coll., Stockholm.] German and Swedish summaries.

Analysis of 245 records of urinary calculi in dogs showed that there was in the affected dogs a highly significant excess of Dachshunds and a significant excess of Pekinese and Poodles with a significant deficit of Airedale terriers, Alsatians and Boxers. That is to say, dogs of breeds characterised by chondrodystrophy showed an excess. The disease becomes more frequent with age ; sex has no effect ; surgical treatment is palliative only. Urolithiasis in dogs appears, therefore, to be a disease of metabolism, specifically of Ca and P metabolism, associated with breed.—I. Leitch.

POISONS OCCURRING IN FOOD

3995

BODDIE, G. F. **" Fluorine alleviators " : a review.** *Vet. Rec.*, 1955, **67**, 827–830. [Dept. Vet. Med., Univ. Edinburgh.]

3996

MULLINS, J. **Acorn poisoning in sheep.** *N.Z. Vet. J.*, 1955, **3**, 159. [P.O. Box 11, Masterton.]

3997

BEIJERS, J. A. Vergiftigingen bij ons vee door plantenziektebestrijdingsmiddelen, middelen tegen schadelijke insecten en andere dieren en onkruidverdelgers. [**Poisoning of cattle by chemicals used to combat plant diseases, harmful insects and other animals and weeds.**] *Tijdschr. Diergeneesk.*, 1956, **81**, 1–14. English, French and German summaries.

See also Abst. 3369.

IMMUNITY

3998

TUGWELL, R. L. **Helminth infections in relation to restricted feeding on range.** *Poultry Sci.*, 1955, **34**, 1372–1375. [Poultry Dept., Univ. Tennessee, Agric. Exp. Stat., Knoxville.]

A survey was made of the helminth burden of poultry over 4 years. Four groups of birds were given different amounts of mash. All the birds were put on pasture when they were 12 weeks old and housed in mid-September when they were 24 weeks old. There was a gradual build up of helminths throughout the period of observation. Birds on restricted amounts of mash tended to have more helminths than those fed to appetite. The number of helminths collected continued to increase after the birds had been housed.

G. C. Hunter.

See also Absts. 2916, 3482.

7. BOOK REVIEWS

3999

PAECH, K. and TRACEY, M. V. (Eds.) Moderne Methoden der Pflanzenanalyse. Erster Band. Vierter Band. [**Modern methods of plant analysis. Volumes 1 and 4.**] Springer-Verlag, Berlin, 1956, pp. xvii + 542. Price 151s. 6d. ; 1955, pp. xiv + 766. Price 203s.

Volumes 2 and 3 of this work have been reviewed earlier (Abst. 6005, Vol. 25).

Volume 1 deals with general considerations relating to plant material, general methods for separation, making and handling extracts, electrical transport, counter-current distribution, chromatography on columns and paper, colorimetric, absorptiometric and fluorimetric methods, refractometry and interferometry, polarimetry, nephelometry, principles of biological assay, methods involving labelled atoms, estimation of *p*H values in living tissues and saps, oxidation-reduction potentials, gasometric analysis in plant investigations (Warburg, Van Slyke, microdiffusion methods and the estimation of ethylene), cytochemical methods, mineral components and ash analysis. A few of the sections deal specifically with plant materials, but most are general and the volume as a whole will serve most biochemists, not only those interested in plant biochemistry. Several similar publications have appeared in recent years ;

nevertheless, these articles are of considerable interest and are noteworthy for the detail with which both theory and practice are considered. Any student or research worker using the techniques discussed here for the first time would profit by reading the appropriate section of this book in order to appreciate fully the theoretical bases and the possibilities and limitations of the methods. As in the later volumes of this work, each section includes an extensive bibliography.

Volume 4 deals with analytical methods applicable to peptides and free amino acids, proteins (including their nutritive value), urea and ureides, chlorophylls, haematin compounds, adenosine di- and triphosphate, coenzymes I and II, nucleic acids and related compounds, vitamin B_1 and its derivatives, alkaloids, amines and betaines, pantothenic acid and coenzyme A, riboflavin, folic acid and biotin, melanins, compounds of hydrocyanic acid, mustard and leek oils and other sulphur-containing plant constituents. As before the treatment is detailed, authoritative and critical. The editors and contributors are to be congratulated on producing a work which will be of great value to biochemists both as a practical manual and as a work of reference.—H. G. Bray.

4000

McDONALD, H. J. (with LAPPE, R. J., MARBACH, E. P., SPITZER, R. H. and URBIN, M. C.) **Ionography. Electrophoresis in stabilized media.** The Year Book Publishers, Inc., Chicago, Ill., 1955, pp. x + 268. Price 48s.

This book is a welcome addition to the literature on modern experimental techniques. Ionography is treated as an independent technique rather than as a modification of paper chromatography or traditional electrophoresis. The authors are clearly enthusiastic and expert technicians and have written a most readable account of their subject. About one-half of the book deals with fundamental considerations, *e.g.*, historical background, types of apparatus, nomenclature, general methods and procedures, mobility, and the relation between mobilities in stabilised and non-stabilised media. The remainder is concerned with the application of the technique to proteins, peptides, amino acids, carbohydrates and related compounds, lipoproteins and related substances, enzymes, hormones, vitamins and inorganic substances. A final chapter deals with miscellaneous applications of ionography, *e.g.*, ion transfer, electro-osmosis. The bibliography contains 760 references.

H. G. Bray.

4001

WOLFROM, M. L. and TIPSON, R. S. (Eds.) **Advances in carbohydrate chemistry. Volume 10.** Academic Press, Inc., New York, 1955, pp. xx + 437. Price 84s.

4002

PINCUS, G. and THIMANN, K. V. (Eds.) **The hormones: physiology, chemistry and applications. Volume 3.** Academic Press, Inc., New York, 1955, pp. xiii + 1012. Price 157s.

4003

ANSON, M. L., BAILEY, K. and EDSALL, J. T. (Eds.) **Advances in protein chemistry. Volume 10.** Academic Press, Inc., New York, 1955, pp. viii + 425. Price 72s.

4004

TULLIS, J. L. (Ed.) **Blood cells and plasma proteins: their state in nature.** Academic Press, Inc., New York, 1953, pp. xxi + 436. Price 68s.

4005

MRAK, E. M. and STEWART, G. F. (Eds.) **Advances in food research. Volume 6.** Academic Press, Inc., New York, 1955, pp. xii + 398. Price 72s.

4006

HALDEN, W., WENGER, R. and HARTL, H. Milch und Milchprodukte in der Ernährung und Diätetik. [**Milk and milk products in nutrition and dietetics.**] Gesundheitskommission der Österreichischen Liga für die Vereinten Nationen, Vienna, 1955, pp. iii + 60. Price 12 Sch.

An attractive brochure on milk and milk products, intended for doctors, nurses, dietitians and the intelligent layman. It is clearly printed and illustrated with 8 half-tone plates. There is no index but marginal headings make reference easy.

A brief preface by Professor Lauda (1. Med. Klin., Univ. Vienna) is followed by 3 independent chapters. In 12 pages Professor Halden (Graz) gives a concise account, with tables and select references, of the composition of whole milk and the role of the different constituents, including minerals and vitamins, in human nutrition. The next 10 pages briefly describe the composition and properties of skimmed milk, sour milk (including acidophilus milk, yoghourt and kephir), cream, butter, curds, cheeses, whey, condensed milk and dried milk.

Dr. Wenger (Vienna) follows with about 20 pages on the uses of milk, ordinary or modified, and milk products for pregnant and lactating women and old people and in hospital and other special diets for digestive disorders, liver diseases, diabetes, obesity and a variety of other diseases, with a caveat that for some patients the salt content may be too high.

The concluding chapter by Hartl deals with the collection and heat treatment of milk and the

manufacture of butter, curds, cheese, condensed milk and dried milk, and includes some statistics for Austria. In 1955 there were over a million dairy cows, and over a million and a half people (22 per cent. of the population) were engaged in agriculture. In 1954, 2539 thousand metric tons of milk were produced, valued at 4000 million Schilling, more than 20 times the value of Austria's coal production. Of this, 1361 thousand tons were used on the farms or sold direct to the consumer; of the 1178 thousand tons sent to the dairies, 571 thousand tons were sold as liquid milk, and the rest yielded butter 23,000, curds 6300 and cheese 14,600 tons. According to O.E.E.C., Austria comes seventh in Europe for milk consumption with 176 kg. per head per year, being surpassed only by Norway, Switzerland, Sweden, Holland, Canada and Éire.—W. M. Deans.

4007

SCHWIMMER, M. and SCHWIMMER, D. **The role of algae and plankton in medicine.** Grune and Stratton, New York ; London, 1955, pp. x + 85. Price $3.75.

This monograph on medical, including nutritional, uses of algae and plankton has a 15-page bibliography with over 300 references to newspapers, magazines, books, and scientific papers in a wide variety of journals, mostly non-medical. Of the text, rather less than half is devoted to seaweeds, a few pages to zooplankton and the remainder to phytoplankton, which consists mainly of microscopic algae.

The first part of the chapter on seaweeds deals with their composition and uses as food for man and beast. The second touches on past uses of seaweeds in the treatment of diseases, including deficiency diseases ; but nowadays emphasis has shifted to derivatives such as agar and alginates and a fuller account is given of the uses of these in medical treatment and medical research.

The brief section on zooplankton refers only to its use as food, and owing to the scarcity of supplies this is of interest chiefly to the victims of shipwreck. Phytoplankton has greater potentialities for human food, since cultivation is possible, though not yet on a practical scale, and an account is given of the nutrients supplied by and required by *Chlorella* and some other microscopic algae. The section on medical aspects, in addition to the unpleasant effects which algae may produce in reservoirs and sewage disposal plants, devotes a good deal of space to the poisoning of animals, and of man through the eating of certain fish. In the concluding discussion there are some interesting speculations about the possible role of algae in hitherto obscure diseases of the nervous system.

W. M. Deans.

4008

WISHART, J. and SANDERS, H. G. **Principles and practice of field experimentation.** Commonwealth Bur. Plant Breeding and Genetics, Tech. Commun. No. 18, 2nd ed., 1955, pp. vii + 133. Price 21s. (Obtainable from Commonwealth Agric. Bur., Farnham Royal, Slough, Bucks.]

This book, as its title implies, is directed principally at the experimenter in the field, who measures yields of crops. For the biological worker measuring growth and associated responses a certain amount of adaptation is necessary. This is particularly true of the second part of the book, dealing with practical considerations.

The opening chapters illustrate a uniformity trial, the methods of calculation adopted, and the principles underlying tests of comparison between 2 or more samples.

The subsequent chapters of the first part deal with different problems and the designs of increasing complexity, along with the appropriate methods of analysis, for handling these problems. The points raised are well illustrated. This part of the book closes with a chapter on the subject of sampling, and one on the analysis of covariance, which is clearly illustrated for the case with one concomitant observation.

The second part of the book is written for the agricultural worker, who, armed with the statistical principles laid out in the first part, is preparing to make his experiments. Perhaps the most valuable chapter is that dealing with policy and general procedure (Chapter 12), which offers much practical wisdom. Of this, the advice to decide on the questions which are to be answered, and to " spend time in reconnaissance ", can never be repeated too often. Another chapter deals with the importance to agriculture of differences which are shown to be statistically significant. The remainder of the book deals with the shape and size of plots and their lay-out, and with the methods of sampling from them. The final chapter is another which cannot be read too often. It discusses the day-to-day management of an experiment and the need for keeping an accurate record of all the methods of treatment and sampling used, in fact, a diary containing all the information likely to have any bearing on the results.

In summary, this book presents much useful advice on the conduct and interpretation of experiments, with emphasis on crops and field trials. The only quarrel which the reviewer has with it is on account of the advice to apply t-tests to individual comparisons in an experiment where several treatments are being tested, as this tends to exaggerate the significance of differences.

A. W. Boyne.

4009

ROWETT RESEARCH INSTITUTE, BUCKSBURN, ABERDEENSHIRE, SCOTLAND. **Collected papers, Volume 12, 1956.**

This volume contains 72 papers, some by title only, published during the year 1955, with an introductory summary by the Director of the year's work and two reviews, one covering the past 6 years' work at the Institute on "Micro-organisms concerned in the fermentation of non-cellulosic carbohydrates in the rumen" by A. E. Oxford and the other on "Pig research at the Institute, 1948–1955" by I. A. M. Lucas.

The bound volumes of papers are available only to a small and selected number of those interested but copies of the summary and progress reports are available on application to the Librarian.

8. SYMPOSIA, PROCEEDINGS AND CONGRESS REPORTS

Proceedings of the Second Radioisotope Conference, Oxford, July 1954, Johnston, J. E. (Ed.). Butterworths Scientific Publications, London.

Medical and Physiological Applications, Vol. 1, pp. 418; Vol. 2, pp. 223.

The conference, attended by 800 delegates from over 30 countries, was sponsored by the Atomic Energy Research Establishment, Harwell. There were 70 papers in all, in sessions on therapy, diagnosis, animal physiology and pathology (2), biochemistry (3) and plant nutrition, reported in Vol. 1, and on chemistry, chemistry and metallurgy, physics and industrial applications, and industrial applications, reported in Vol. 2 all fully, with the discussions.

Diagnosis, LEDLIE, E. and BAXTER, C. F. (97–106), clinical applications of tracer doses of ^{59}Fe.

Animal Physiology and Pathology, LACROIX, P. (134–137), study of bone metabolism with radio-active Ca and S (dog); MILLER, H., MUNRO, D. S., RENSCHLER, H. E. and WILSON, G. M. (138–146), measurement and distribution of exchangeable sodium (man); REED, G. W. and CARE, A. D. (147–160), migration of ^{24}Na, ^{38}Cl and ^{42}K across bladder and intestinal mucosa (man); HAMILTON, J. G., WALLACE-DURBIN, P. and PARROTT, M. W. (219–231), acute and chronic changes produced by iodine-131 and astatine-211 at lethal levels (rat), and uptake of astatine-211 in patients with thyroid disease; FORSSBERG, A. and KLEIN, G. (232–242), effects of X-rays on incorporation of glycine-2-^{14}C into Ehrlich ascites tumour (mouse).

Biochemistry, PICHAT, L., BARET, C., AUDINOT, M., HERBERT, M. and LAMBIN, J. (245–257), synthesis of ^{14}C-labelled compounds, including glutamic acid and proline; CATCH, J. R. (258–261), carbon-14 amino acids from *Chlorella*; GLASCOCK, R. F. and REINIUS, L. R. (262–270), synthesis of tritium compounds with high specific activity and their use in biochemical research, *e.g.*, on stearic acid metabolism during lactation (goat); CRITCHLOW, A. and GOLDFINCH, M. K. (271–280), preparation of thyroxine labelled with ^{131}I and its use as an analytical tool; WOLF, G., JOHNSON, B. C. and KAHN, S. G. (283–286), synthesis of vitamin A-2-^{14}C; ROSENBLUM, C., WOODBURY, D. T. and REISNER, E. H. (Jr.) (287–297), evaluation of intrinsic factor activity with cobalt-60 labelled vitamin B_{12} (man, rat); FRAZER, A. C., POVER, W. F. R. and SAMMONS, H. G. (298–305), rate of elimination of ^{14}C labelled organic compounds, *e.g.*, distearyl tartrate, effect of fat intake (rat); SCHAMBYE, P. and WOOD, H. G. (346–350), conversion of ^{14}C-glycerol into liver glycogen *in vivo* (rat).

Industrial Applications, BROWNELL, L. E. and NEHEMIAS, J. V. (213–221), studies with a gamma radiation source of high intensity, on exposure of canned foods, fresh or raw frozen, pork and other meat, cereals and potatoes.

Symposium on nutritive aspects of preserved food. Proceedings. Göteborg, Sweden, October 1954.

SIK-Publication 115. Swedish Inst. Food Preservation Research (SIK). Göteborg, 1956. 30 Swedish crowns (incl. postage). 173 pp. mimeographed.

The symposium was organised under the auspices of the Comité International Permanent de la Conserve (CIPC).

The introductory analysis by BORGSTRÖM, G. (11–23) discusses general trends in food processing with some less familiar points: the craze for low-calorie diets with the associated danger that carboxymethyl-cellulose compounds may act as ion exchangers in the gastro-intestinal tract; the dangers to human health of the use of antibiotics in veterinary medicine and to the health of animals fed on the offal of other animals treated with hormones during fattening; the danger of rancid fat and, still greater, of highly dispersed, oxidised fat; GORTNER, R. A. (Jr.) (24–34) reviews recent progress in the field of nutrition, with the sole novelty that lipoic acid may be a component of the vitamin B complex; LANG, K. (35–40) discusses the necessity for the use of conserved foods; ADAM, W. B. (41–60) reports that the minimum loss of vitamins attainable in canning fruits and vegetables is now very small; MELLANDER, O. (61–65) shows that the amino acid composition of a protein is not necessarily a reliable guide to its biological value; the peptides which result from hydrolysis are decisive; human and cow's milk are compared; ÅGREN, G. (66–78) describes an automatic apparatus for sampling and titrating hydrolysates of protein in microbiological work, reports amino acids in a number of plant foods and discusses limiting amino acids; methionine is most frequently limiting in Swedish foods. Unpublished estimates of amino acids in human foetal and adult liver and muscle are presented to show that the greatest demand is possibly for *iso*leucine, leucine, threonine, tryptophan and valine, none of which appears as a limiting amino acid in rat experiments. CREMER, H. D. (79–84) deals with the effect of heat on protein with special reference to milk protein and DÜRRENMATT, K. (95–107) with dehydrated milks and the digestibility of different types. In the discussion on these papers, VAHLQUIST

announced an experiment running in north Sweden to study the immunological reactions and biochemistry of infants fed on breast milk, fresh cow's milk and dried milk. Other papers were by ALM, F. (108–111) on the decomposition of protein in semi-preserved herring (pickled, spiced and sometimes preserved with benzoic acid); GEIGER, E. (112–114), on histamine in poisoning by fish; CHARLEY, V. L. S. (115–125), on fruit juices; NIELSEN, N. (126–132), on vitamin B_{12} in processed foods and its effect on undernourished subjects; DAHL, O. (133–137), on loss of weight in canning beef as affected by pretreatment; SÖDERHJELM, L. (138–143), on essential fatty acids in human nutrition. There was a discussion on the nutritional effects of rancid fat and polymerised oils followed by papers by ECKERSTRÖM, S. (151–158), on problems of old age; CLIFCORN, L. C., on dietetic canned food; ABDON, N., on canned food for babies; FRAZER, C. A. (159–170), on control of chemical aids in processing and finally, DELPHIN, K. A. (171–173), on preserved food in military establishments.

Commission d'Études du Centre National de Coordination des Études et Recherches sur la Nutrition et l'Alimentation. **[Committee on Studies of the National Centre for the Coordination of Study and Research on Nutrition and Diet.]** *Ann. Nutrit. Alimentation*, 1955, **9**, 271–309.

A discussion on digestion in ruminants with an introduction by E. F. TERROINE. The first section deals with the composition of foods, with contributions from JARRIGE (280–283) on carbohydrate; FAUCONNEAU (283–286) on nitrogen; FRANÇOIS (286–288) on lipids and pigments and also on mineral matter.

The second section deals with the physiology of digestion, with contributions from DUSSARDIER (289–291) on the origin of extrinsic gastric contractions; BRUNAUD (291–294) on cannula for permanent fistula of the digestive tract, physiology of the rumen, composition of the stomach muscle, pharmacodynamic studies, physiopathological role of histamine; LE BARS (294–297) on humoral intervention in motility, effect of different foods on motility and origin of typanites.

Section three dealt with the microbiology of digestion with a contribution by POCHON (298) on bacterial flora under different dietary regimes.

The fourth section was on the biochemistry of digestion with contributions from FRANÇOIS and ZELTER (299–300) on digestion of carbohydrates; RERAT (300–304) on utilisation of urea, RAYNAUD (304–306) on variations in the total nitrogen content of various parts of the digestive tract; RERAT (306–309) on synthesis of vitamins in the digestive tract.

Verhandlungen der Vierten Konferenz der Internationalen Gesellschaft für Biologische Rhythmus-Forschung, Basle, September 1953. **[Proceedings of the Fourth Conference of the International Society for Research on Biological Rhythm, Basle. September 1953.]** *Acta med. scand.*, 1955, **152**, Suppl. 307, pp. 199.

PETRÉN, T. (42–47), development of the diurnal rhythm of liver glycogen (chick embryo, chicken) and the effect of inverting the rhythm of light and feeding (chicken); SOLLBERGER, A. (69–75), diurnal variations in scatter of biological values; MILLS, J. N. and STANSBURY, S. W. (95–96), diurnal variations in behaviour of renal tubule towards Na, K and chloride (man); BALZER, E. and WERNER, K. (124–131), rhythm of exocrine pancreas enzyme secretion; PIERACH, A. (159–166), night work and shift work by healthy and diseased persons; BERINGER, A. (172–174), diurnal variations in liver fat and liver glycogen (man, animals).

Proceedings of the XXIV Scandinavian Congress for Internal Medicine, Stockholm, September 1954. *Acta med. scand.*, 1955, **152**, Suppl. 308, pp. 55.

CHRISTENSEN, B. (23), thyroid function and iodine metabolism (man); DAM, D., GEILL, T., LUND, E. and SØNDERGAARD, E. (38–39), clinical experience with newer anticoagulants, including effects of vitamin K preparations; COLLDAHL, H. (46–47), disturbances of nicotinic acid metabolism in patients with liver parenchymal injury or disorders with insufficient gaseous exchange; SIURALA, M. (51), gastric mucosal changes in pernicious anaemia, Addisonian and tapeworm; HOFF JØRGENSEN, E. and LANDBOE-CHRISTENSEN, E. (52–53), histotopographic localisation of the vitamin B_{12} binding factor in the fundus, pylorus and duodenum; in the pig the highest activity was in the glandular layers of the pyloric mucosa, followed by the Brunner's glands layer of the duodenum and the glandular layers of the mucosa of the fundus; material obtained from man at operation was much less active than corresponding material from the pig; HALLBERG, L. (54–55), effect of treatment of pernicious anaemia on total Hb and carboxyhaemoglobin; with remarks on the life span of red cells.

Proceedings of the Nutrition Society, 1956, **15**, 1–99.

Conference held in July 1955 on the nutritional work of FAO, WHO and UNICEF, contributions being made by DOROLLE, P. (1–4), international co-operative activities in the field of nutrition; AYKROYD, W. R. (4–13), FAO and nutrition; BURGESS, R. C. (13–21), WHO and nutrition; The Secretariat of the U.N. Children's Fund, UNICEF (22–29), assistance for child nutrition; ROSS, M. A. (30–35), nutrition and home economics programme in Egyptian villages; POSTMUS, S. (35–40), nutrition work in Burma past and present.

Conference held in September, 1955 on cholesterol and fat metabolism in relation to nutrition and disease. COOK, R. P. (41–45), chemistry and biochemistry of the sterols; LOVERN, J. A. (46–51), methods for investigating cholesterol and associated lipids; BOYD, G. S. and OLIVER, M. F. (52–61), cholesterol metabolism; RANNIE, I. (61–66), experimental cholesterol atherosclerosis; FULLERTON, H. W. (67–71), relation of lipaemia to thrombosis and atheroma.

Conference held in October 1955 on energy expenditure in man. DOUGLAS, C. G. (72–77), experimental methods for determining energy expenditure; WOLFF, H. S. (77–80), techniques for measuring energy expenditure; EDHOLM, O. G. (80–83), energy expenditure in relation to nutrition; PASSMORE, R. (83–89), daily energy expenditure; DURNIN, J. V. G. A. (89–93), energy expenditure in the elderly; NOLTIE, H. R. (93–99), energy expenditure in athletics.

Bericht über die 67. Jahresversammlung der Schweizerischen Gesellschaft für Analytische und Angewandte

Chemie. September 1955. **[Report of the 67th Meeting of the Swiss Society for Analytical and Applied Chemistry. September 1955.]** *Mitt. Geb. Lebensmittel. Hyg.*, 1955, **46**, 453–568.

The first session dealt with legislation about food with papers by HÖGL, O. (453–463) on development and fundamentals of federal food legislation; DESHUSSES, J. (464–474), chemical impurities in food; ACHERMANN, F. (475–482), prevention of falsification in trade in foods, and others. At the second session the papers included, MATTHEY, E. and RAMUZ, A. (503–508), estimation of malic acid; SCHÜRCH, A. (509–515), respiration apparatus for use with rats; TEMPUS, P. and HÖGL, O. (527–536), quantitative estimation of carnosine by paper chromatography; BOVAY, E. (540–568), estimation of K, Ca, Mg and Na in plant ash by flame spectrophotometer and of N by semi-micro distillation.

Proceedings of the Biochemical Society. November 1955. *Biochem J.*, 1956, **62**, 1P–9P.

DRÈZE, A. (3P), tryptophan stability during alkaline hydrolysis of protein; OLLEY, J. and DAWSON, R. M. C. (5P–6P), paper chromatography of hydrolysis products of phospholipins; JONES, N. R. (7P–8P), estimation of free sugar in codling muscle; LEWIS, C. A. (9P), low-sodium milk for clinical use.

Proceedings of the Biochemical Society. December 1955. *Biochem. J.*, 1956, **62**, 11P–19P.

RATTRAY, J. B. M. and COOK, R. P. (11P), lipid of livers of cholesterol-fed rats; SMITH, E. L., PARKER, L. F. J. and GANT, D. E. (14P), antimetabolites from vitamin B_{12}; CUTHBERTSON, W. F. J., GREGORY, J., O'SULLIVAN, P. and PEGLER, H. F. (15P), anti-vitamin B_{12} activity of compounds related to cobalamin.

Proceedings of the Biochemical Society. January 1956. *Biochem. J.*, 1956, **62**, 21P–38P.

HUNTER, G. and STOTT, F. D. (29P), micro estimation of magnesium; ACKLAND, J. D. (30P), estimation of serum protein-bound iodine; CLARK, C. M., NAISMITH, D. J. and MUNRO, H. N. (32P), effect of diet on [^{14}C] glycine incorporation into liver ribonucleic acid; BRADLEY, J. E. S., DAVIDSSON, D., MACINTYRE, I. and RAPOPORT, A. (33P–34P), estimation of extracellular fluid using ^{82}Br; DAVIDSSON, D., MACINTYRE, I., RAPOPORT, A. and BRADLEY, J. E. S. (34P), estimation of total fat *in vivo* using ^{85}Kr; BRADLEY, J. E. S., DAVIDSSON, D. MACINTYRE, I. and RAPOPORT, A. (34P), estimation of total body water using tritium; LAURENCE, D. J. R. (36P), separation of protein by electrodialysis through filter-paper "membranes"; DAVIDSSON, D. (37P–38P), estimation of calcium in biological fluids with ethylenediamine tetra-acetic acid; MACINTYRE, I. and BRADLEY, J. E. S. (38P), ultraviolet flame photometer; PAUL, R. M. (38P), estimation of aluminium with ethylenediamine tetra-acetic acid.

Proceedings of the Physiological Society. December 1955. *J. Physiol.*, 1956, **131**, 1P–23P.

BUXTON, J., MAYER, A. and SINCLAIR, H. M. (17P–18P), histamine level in vitamin B_6 deficiency in the rat; DURNIN, J. V. G. A. and MIKULICIC, V. (22P–23P), effect of graded exercise on energy expenditure in man.

Proceedings of the Physiological Society. January 1956. *J. Physiol.*, 1956, **131**, 25P–37P.

MACDONALD, I. and THOMAS, G. A., hepatic fibrosis on fat-free diet (25P).

Gesellschaft für Ernährungsphysiologie der Haustiere. 5. Tagung, Bad Homburg, October 1955. **[Society for the nutritional physiology of domestic animals. 5th Session in Bad Homburg, October 1955.]** *Ztschr. Tierernährung Futtermittelk.*, 1955, **10**, 378–383.

The theme for the meeting was the technique of practical feeding experiments on animals: KIRSCH (378–379), methods with dairy cows and pigs, with suggestions for the breeding of "standard animals", especially pigs: the use of special centres for the statistical analysis of results and of centres for analysis of feedingstuffs; WITT (379–380), methods with calves; FEWSON (380–381), statistical analysis; FANGAUF (381–382), techniques with poultry; BRONSCH (382–383), use of radio-active tracers; WITT (383), fat content of milk of pastured cows.

Symposia of the Society for Experimental Biology No. 8, 1954, pp. vi + 516. Cambridge Univ. Press.

The theme of the meeting was "Active transport and secretion". Most of the articles are reviews and deal with physiological concepts and laws relating chiefly to the movement of Na and K and sugar into and out of cells, particularly erythrocytes, and isolated tissues. DAVIES, R. E. (453–475), in his review of "Relations between active transport and metabolism in some isolated tissues and mitochondria" makes an appeal for data on "number of ions moved actively in relation to the number of molecules of oxygen used or substrate metabolized, and also, if this can be estimated, the amount of energy needed to drive the active transport relative to the amount of energy made available from metabolism".

BRAMBELL, F. W. R. and HEMMINGS, W. A. (476–489) deal with "Active transport through embryonic membranes" but the transport measured is of antibodies. FRAZER, A. C. (490–499) discusses the "transport of lipid through cell membranes".

Proceedings of the Royal Society of Medicine, Section of Pathology, April 1955. *Proc. Roy. Soc. Med.*, 1955, **48**, 911–918.

DUBOS, R. J., SMITH, J. M. and SCHAEDLER, R. W., metabolic disturbances and infection (mouse).

Section of Odontology, March 1955. *Proc. Roy. Soc. Med.*, 1955, **48**, 983–992.

FORREST, J. R., mottled enamel and caries experience in fluoride and non-fluoride areas.

Schweizerische Gesellschaft für Pädiatrie. Jahresversammlung Aarau, Juni, 1955. **[Swiss Paediatric Society. Annual meeting Aarau, June 1955.]** *Ann. paediat.*, 1956, **186**, 90–125.

Among the 21 papers read at this meeting the following were of interest in the field of nutrition. STALDER, G. (90–91) dealt with the renal action of vitamin D. Familial rickets resistant to vitamin D was discussed by TOBLER, R., PRADER, TAILLARD and DEBRUNNER (91–92), anthropometry of growth by LELONG, M. (100) and the basal metabolism of obese infants by JUILLARD, E. and DUBOIS,

R. (108). ZIEGLER, E. (110–111) discussed fluoridation of milk ; he calculates that when water is fluoridated at 1·5 p.p.m. the infant fed on dried milk may receive up to 7 times the physiological optimum dose.

American Heart Association, 28th Scientific Sessions, New Orleans, La., October 1955. *Circulation*, 1955, **12**, 675–794.

BOUCEK, R. J., NOBLE, N. L. and KAO, K.Y.T. (683), protein and lipids in normal and atherotic areas of the intima of the aorta (man) ; FARBER, S. J. and SOBERMAN (703), body sodium and water in heart disease (man) ; FRIEDMAN, M., HOMER, R. and BYERS, S. O. (709), no significant effect of β-sitosterol on intestinal absorption of dietary cholesterol (man, rat) or on plasma cholesterol in coronary artery disease (man) ; FRIEDMAN, S. M. and FRIEDMAN, C. L. (709–710), salt and water balance in hypertension (rat) ; GRIFFITH, G. C. and BUTT, E. M. (715–716), tissue metal concentrations (man) ; JONES, R. J., REISS, O. K. and BALTER, E. L. (727–728), reduction of blood cholesterol with brain extract (chicken, dog, man) ; KEYS, A., STEWART, B. B., BROCK, J. F., MOODIE, A., KEYS, M. H. and ANTONIS, A. (730–731), fat in diet and prevalence of coronary disease in 9 population samples (Bantu, Cape Town Negro and white, 3 income groups of each) in South Africa ; KUO, P. T. and JOYNER, C. R. (735), relief by heparin of angina produced by fatty meals ; LYON, T. P., YANKLEY, A., GOFMAN, J. W. and STRISOWER, B. (743), lipoproteins and diet in coronary heart disease ; a 5-year follow-up provided evidence in favour of low-fat, low-cholesterol diet ; MONIE, I. W., NELSON, M. M., BAIRD, C. D. C. and EVANS, H. M. (750), cardiovascular abnormalities in foetus after maternal deprivation of pteroylglutamic acid from 9th to 11th day of pregnancy (rat) ; STEINER, A. (780), production of high blood fat and early atherosclerosis by diet containing 30 to 40 per cent. vegetable fat from ground peanuts (rabbit) ; SUTTON, D. C., SUTTON, G. C. and FELL, E. H. (781), creatine content of biopsied human and rabbit heart muscle, values for man believed to be the first for nearly normal heart muscle ; WENNESLAND, R., HOPPER, J. (Jr.), BROWN, E., HODGES, J. L. (Jr.), GUTTENTAG, O., TUCKER, I. N. and BRADLEY, B. (787–788), variation of blood volume in health studied with radio-active chromium ; regression equations given for red cell volume on weight, height or weight and height, and for total blood volume on weight and height (man).

Actes de la Société belge de Gastro-Entérologie, September 1954. **[Proceedings of the Belgian Society of Gastroenterology, September 1954.]** *Acta gastro-enterol. belg.*, 1956, **19**, 97–166.

DE GROOTE, J. and VANDENBROUCKE, J. (97–104), blood glutathione in liver disease ; SCHETTLER, G. (134–141), blood lipids and lipoproteins in gastro-enterology ; NYS, A. and VANDENBROUCKE, J. (142–152), electrophoresis of proteins in liver disease.

Verhandlungen der deutschen pharmakologischen Gesellschaft. Zweiundzwanzigste Tagung. September 1955. **[Proceedings of the German Pharmacological Society. Twenty-second meeting. September 1955.]** *Arch. exp. Pathol. Pharmakol.*, 1956, **228**, 1–250.

An entire issue, Numbers 1 and 2 of this volume, is devoted to this meeting. WOOLLEY, D. W. (68–81), drugs and antimetabolites ; KÜHNAU, J. (81–93), antimetabolites and antibiotics ; SIESS, M. (139–140), energy consumption and work in the contraction of surviving mammalian diaphragm ; RUMMEL, W., JACOBI, H. and PFLEGER, K. (204–206) absorption of minute amounts of iron from the intestine ; SCHMID, W. (241–243), significance of intermediary carboxylic acids for cell multiplication in yeast.

Proceedings of the British Society of Animal Production, 1955.

DONEY, J. M. (3–12), hill sheep improvement ; MACLEOD, A. C. (13–17), heather in the diet of sheep ; AVERILL, R. L. W. (18–29), oestrogens and fat lamb production ; SPEDDING, C. R. W. (30–37), parasite control by grazing management ; THOMSON, W. and MCDONALD, I. (38–44), relation of weaning weight to birthweight of lambs ; MACLUSKY, D. S. (45–51), quantity of herbage eaten by grazing cows ; PARRY, H. B. (52–54), pregnancy toxaemia in sheep ; GORDON, I. (55–63), hormones and fertility in sheep ; BATH, D. R. (64–76), bloat in intact cow grazing New Zealand pasture ; EYLES, D. E. and ALDER, F. E. (77–93), fattening pigs on pasture ; JOHANSSON, I. (102–108), first lactation yield as basis for selection ; MCDONALD, P. and JACKSON, T. H. (109–114), application of magnesium sulphate to grass to prevent hypomagnesaemic tetany.

Nederlands Genootschap voor Landbouwwetenschap. Twintigste Nederlandse Landbouwweek. Juni-Juli 1955. **[Netherlands Society of Agricultural Science. Twentieth Netherlands Agricultural Week, June-July 1955.]** *Landbouwk. Tijdschr.*, 1956, **68**, 1–236.

SCHIPPERS, P. A. (77–81), storage of potatoes ; HENKENS, C. H. (109–112), deficiency of Mo and Mn in crops ; GALEMA, A. (117–123), quality of wool, fleece weight and mutton quality of the improved Texel sheep ; KETELAARS, E. H. (129–140), solids-not-fat of milk from the standpoint of the breeder ; SCHIERE, C. (144–151) and ADAMSE, G. (152–156), the problem of payment for milk so as to take composition into account.

Deutschen Gesellschaft für Züchtungskunde, October 1955, Munich. **[German Society of Animal Breeding, October 1955, Munich.]** *Zuchtungskunde*, 1955, **27**, 197–294.

There are 4 papers of some nutritional interest : TRAUTWEIN, K. (200–206), milk production on peasant farms, with a plea for study of composition of milk as affected by amino acid composition of feedingstuffs and by vitamin supply ; KOCH, W. (252–256), hormones in relation to milk formation ; HARING, F. (270–289), inheritance of capacity to produce the major components of milk ; SCHÄPER, W. (289–294), milk yield and " constitution " in cows.

Proceedings 31st Annual Convention of the Philippine Veterinary Medical Association, May 1954. *Philippine J. Animal Indust.*, 1954, **15**, 101–275.

OLIVARES, E. O. and MASANKAY-ARENAS, L. (237–245), cow manure extract for pigs ; PARIÑA, S. L. (255–260), maize in laying mash under Philippine conditions ; LOOSLI, J. K., VILLEGAS, V. and YNALVEZ, L. A. (265–270), composition and digestibility of Philippine forages.

9. FOOD AND AGRICULTURE ORGANIZATION (AND OTHER ORGANIZATIONS) OF THE UNITED NATIONS

Monthly Bulletin of Agricultural Economics and Statistics.
Vol. 5, No. 3, March 1956, pp. 48. Price $0.50.
p. 13. Potential uses of rice in Germany. The country should be of special interest to rice exporters because of its breweries, its linen industry which requires starch and its intensive animal production.
Vol. 5, No. 4, April 1956, pp. 48. Price $0.50.
Vol. 5, No. 5, May 1956, pp. 52. Price $0.50.
p. 1. Input-output work as a basis for development planning. The problems in applying input-output work to agriculture are discussed.
Vol. 5, No. 6, June 1956, pp. 48. Price $0.50.
p. 1. The agricultural policy of the U.S.S.R. and the sixth five-year plan.
p. 9. The new international wheat agreement.

Yearbook of Food and Agricultural Statistics. 1955, Vol. 9, Part 1. Production. Rome, Italy, 1956. Price $3.50.

Nutritional Studies No. 14. Protein malnutrition in Brazil. Rome, Italy, March 1956, pp. vi + 40. Price $0.50.

This third study of protein malnutrition (for the others in Africa and Central America see Vol. 22, p. 278 ; Vol. 25, p. 306) is based on questionnaires sent to pediatricians and on the authors' observations made during brief visits to 5 state capitals, Recife, Rio de Janeiro, Belo Horizonte, Belem de Para and Porto Alegre. The condition, known locally as *distrofia pluricarencial* and thought to be the same as kwashiorkor in Africa, was common in the first 3 cities. Most frequent signs were oedema and failure of growth. Level of albumin in blood was low and the tendency, seen elsewhere, for that of globulin to rise did not appear. Changes in skin and hair were variable ; those in hair could not be regarded as diagnostic. Increase in size of liver also varied and, as in other areas, the degree of fatty change was not a measure of the severity of the disease. Cirrhosis was not common and primary carcinoma of the liver seldom occurs.

In treatment the best results have been with a diet rich in protein on the basis of dried skimmed milk supported, if need be, by blood transfusions, an antibiotic and vitamins A and C. These are the essential forms ; the results for others which have been tried are summarised.

From the food balance sheets for 1947 and 1952 there are indications that the amount of protein available per head of population may be falling in Brazil. Differences in supplies between districts may be considerable. Government's action has been to set up plants for drying surplus milk, to prepare plans for a fish flour factory and to experiment with protein-rich plant foods. Education of mothers in nutrition and schemes for supplementary feeding of children should be extended beyond their present ranges. Suggestions are made for further biochemical and pathological studies of protein deficiency in man, facilities for which already exist in Brazil.

Report of the Eighth Session of the Conference, 4-25 November 1955. Rome, Italy, March 1956, pp. lv + 270.

The Conference adopted 55 resolutions. By the first, Member Nations on the occasion of the tenth anniversary of the founding of FAO " ratified their accession to the purposes and principles laid down in the Constitution of the Organization ". Many of the others were concerned with administration. Particular resolutions requested the Director-General to strengthen the Organization's work on education, nutrition and home economics with special reference to proper food selection and preservation and expressed the Conference's interest in the proposal for the establishment of a Special United Nations Fund for Economic Development. The use of surpluses for raising the nutritional levels of vulnerable and underprivileged groups and for aiding economic development was approved with a further resolution on the need for adequate intergovernmental machinery for consultation on these matters. The Conference agreed to continue to support, with the money available, the work on the broad field of milk and its part in child nutrition but, at the same time, considered that 2 subjects, the nutrition of aged people and the enrichment of foods with concentrates were deserving of more attention in the future.

10. DEPARTMENTAL AND OTHER REPORTS

UNITED KINGDOM

The Hannah Dairy Research Institute, Kirkhill, Ayr. Report for the Three Years ending 31st March, 1956. Pp. 44. (Twenty-fifth to Twenty-seventh Annual Reports combined.)

Effect of hormone preparations (containing thyrotropin and the luteinising and follicle stimulating hormones) on the composition of milk and carotene and vitamin A metabolism of cows and goats.
Formation of lactose in the mammary gland.
Muscular dystrophy and vitamin E (calf).
Magnesium metabolism with reference to hypomagnesaemic tetany in calves.
Energy metabolism of feedingstuffs fed at different levels and effect of frequency of feeding, exercise and previous diet.
Energy metabolism of lower steam-volatile fatty acids in sheep.
Physiological response of cattle to climate, especially temperature and humidity,
Protein stability in milk.

Milk Marketing Board, Thames Ditton Surrey. 6th Report of the Production Division, 1955/56. Pp. 118.

INDIA

Annual Report of the Indian Veterinary Research Institute, Mukteswar and Izatnagar for the Year 1952-53 (1955). Pp. 114.

Tobacco seed cake as feed for cattle.
Juar (*Andropogon sorghum*) husk as feed for cattle.
Nutritive value of untreated, lime-treated and alkali-treated straws.
Utilisation of nitrogen, calcium and phosphorus from paddy straw.
Optimum level of fat in the ration of ruminants.
Nutritive value of tree leaves ; Gaujina (*Saurauja napaulensis*), Rohini (*Mallotus philippinensis*), Jaman (*Eugenia jambolana*), Kumbhi (*Careya arborea*), Tendu (*Diospyros tomentosa*), Kanju (*Holoptelea integrifolia*).
Ensiling tree leaves.
Histopathological studies of lambs under conditions of vitamin A and calcium deficiency.
Studies with sheep of chemical and morphological constituents of blood at different iron intake levels.
Processed cow manure as ingredient of poultry rations.
Feeding bajra to poultry as sole cereal.
Semen production in buffaloes at different levels of protein intake.

SOUTH AFRICA

The South African Institute for Medical Research, Johannesburg, Annual Report for the Year ended 31st December, 1955. Pp. 109.

Calcium and iron metabolism in the South African Bantu.
Incidence of clinical rickets in urban and rural Bantu children.
Studies on atherosclerosis in Bantu and white subjects.
Parasitism and nutritional state.
Serum electrolyte pattern in kwashiorkor.

TANGANYIKA

Annual Report of the Veterinary Department for the Year 1954. Vol. 2, Research and Statistics. Pp. 52.

Mineral imbalance in stock ; phosphorus, trace elements and fluorine. Occurrence of fluorosis.
Physiology of the hump in Zebu stock.

UNITED STATES OF AMERICA

68th Annual Report of the Pennsylvania Agricultural Experiment Station for the Fiscal Year ended June 30, 1955. Pp. 20.

Soft phosphate with colloidal clay as a source of phosphorus in swine feeds.
Factors affecting the vitamin content of canned foods.
Evaluation of grasses and legumes for use as poultry pasture.
Interrelations between nutrition, microbial flora of the rumen and " X " disease (hyperkeratosis) in cattle.
Physical and chemical properties of fats and fatty acid derivatives in relation to their composition, structure and utilisation.
Relationship of vitamin intake to growth, to longevity and to well-being (freedom from abnormal external and internal conditions) of the rat.
The nutritive value of grass silage as affected by species and stage of maturity.
The losses of nutritive value of grass silage in tower silos as affected by method of preservation.
The nutritive value of hay as affected by the method of curing.
Influence of soils and fertilisation on the composition and nutritive values of foods and feeds.
The efficiency of utilisation of normal diets of equal metabolisable energy but differing in protein, carbohydrate, or fat content.
The effects of specific food nutrients on energy metabolism.
The role of antibiotics in protein metabolism and growth.
The relation between age and nutritional requirements of dairy calves.
Study of riboflavin deficiency in eggs affecting hatchability.
The influence of energy-fibre concentrations and protein source of the diet on certain egg quality characteristics.
The etiology of calf scours and evaluation of control measures.
Ascorbic acid metabolism of the human.

Sixty-eighth Annual Report of the New York State College of Agriculture at Cornell University and the Cornell University Agricultural Experiment Station for the Year 1954-55. Pp. 126.

Relation of feeding and management to cause of " stiff lamb " disease.
Comparison of various protein supplemental mixtures, and effects of vitamin and antibiotic supplements for growing and fattening pigs.
Protein requirements of growing, fattening lambs.
Nutritional requirements of herbivora as studied by purified-diet methods.
Physiology and metabolism of fats and related constituents in animals.
Effect of curing methods upon feeding value of hay.
Investigations with young dairy calves on effects of composition of dry starters, levels of starter and hay consumption, rumen inoculation, levels of milk consumption, and antibiotics.
Requirements and functions of cobalt in rations of livestock.
Causes and prevention of ketosis in ruminants.
Development and use of indirect methods for measurement of digestibility and rate of consumption of feeding-stuffs, particularly forages, by ruminants.
Value of molasses and urea in rations for dairy cattle.
Influence of feeding and management practices of the young upon early rumen development and subsequent mature performance.
Nutritional requirements of baby pigs.

Whole body composition and carcase studies of cattle at different ages and at three nutritional levels.
Chemical and biological evaluation of nitrogenous requirements of animals.
Digestibility and dry matter consumption of various feeds for beef cattle.
Influence of antibiotics in rumen digestion and synthesis.
Relative value of roughage and concentrates for ruminants fed for production.
Development of dry diets for minks.
Value of fat (beef tallow) in ration for fattening lambs.
Investigations in body composition of swine.
Relationship of time of cutting to digestibility of different forages.

THE COMMONWEALTH BUREAU OF ANIMAL NUTRITION

NUTRITION ABSTRACTS AND REVIEWS

Volume 26. No. 4. October 1956

IRON-DEFICIENCY ANAEMIA IN THE PREGNANT WOMAN AND ITS RELATION TO NORMAL PHYSIOLOGICAL CHANGES

BY

F. E. HYTTEN

OBSTETRIC MEDICINE RESEARCH UNIT (MEDICAL RESEARCH COUNCIL), MIDWIFERY DEPARTMENT, UNIVERSITY OF ABERDEEN

AND

D. L. DUNCAN

COMMONWEALTH BUREAU OF ANIMAL NUTRITION, ROWETT RESEARCH INSTITUTE, BUCKSBURN, ABERDEENSHIRE

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INTRODUCTION

To define a pathological state in pregnancy is sometimes difficult because knowledge of changes which might be accepted as normal and physiological is not precise. It becomes increasingly clear that metabolism generally and the whole *milieu intérieur* are grossly altered by pregnancy and that the "normality" of any biochemical finding in pregnancy cannot be decided by reference to the non-pregnant state. Some consideration of changes in haemopoiesis which occur in normal, healthy women during pregnancy is therefore an essential preliminary to the discussion of anaemia in pregnancy.

THE BLOOD IN NORMAL PREGNANCY

There is general agreement that, in terms of a given volume of blood, the haemoglobin, the red cells and the packed cell volume decrease during pregnancy in healthy women who are not taking iron medicinally: the "physiological anaemia of pregnancy". Some figures from the literature.

TABLE I.—HAEMOGLOBIN IN NON-PREGNANT AND PREGNANT WOMEN (NUMBER OF WOMEN IN BRACKETS)

Authority and Place	Haemoglobin, g. per 100 ml.									
	Non-pregnant	*Pregnant*								
Medical Research Council (1945) (United Kingdom)	13·9 ± 1·4 (770)	*Month 1* 13·4 (13)	*2* 13·2 (92)	*3* 13·2 (90)	*4* 12·6 (58)	*5* 12·8 (71)	*6* 12·0 (103)	*7* 12·1 (88)	*8* 12·1 (140)	*9* 12·2 (75)	
Roscoe and Donaldson (1946) (Edinburgh)	13·8 ± 1·3 (20)			*Weeks 8–16* 12·0 ± 1·3 (20)			*20–27* 11·5 ± 1·2 (20)			*33–38* 11·3 ± 0·8 (20)	
Wills, *et al.* (1947) (London)				*Weeks 5–16* 13·2 (350)			*17–28* 12·4 (210)			*29–40* 11·9 (219)	
Hamilton (1950) (Edinburgh)	13·3 (23)		*Weeks 6–9* 12·3 (32)	*10–13* 12·0 (45)	*14–17* 12·9 (43)	*18–21* 12·3 (47)	*22–25* 12·1 (41)	*26–29* 11·5 (39)	*30–33* 12·9 (43)	*34–37* 12·1 (41)	*38–40* 12·1 (31)
Rath, *et al.* (1950) (Boston, U.S.A.)			*Month 2* 13·5 (12)	*3* 13·4 (13)	*4* 12·7 (9)	*5* 12·7 (16)	*6* 12·7 (15)	*7* 12·9 (18)	*8* 12·7 (17)	*9* 12·8 (9)	
Lund, (1951) (New Orleans, U.S.A.)				*Week 12* 13 (3)	*16* 13 (8)	*20* 12 (9)	*24* 12 (6)	*28* 12 (6)	*32* 11 (7)	*36* 11 (7)	*40* 11·5 (8)
Magee and Milligan (1951) (Manchester)	13·1 (38)		*Weeks 0–13* 13·6 (92)			*14–26* 12·8 (267)			*27–40* 12·0 (174)		
Ventura and Klopper (1951*a*) (London)	14·34 ± 1·48 (25)		*Weeks 0–10* 13·93 ± 1·49 (15)		*11–20* 13·50 ± 1·29 (25)			*21–30* 12·67 ± 1·07 (25)		*31–40* 11·62 ± 1·12 (40)	
Benstead and Theobald (1952) (Bradford)					*Week 16* 13·2 (36)	*20* 13·0 (36)	*24* 12·4 (36)	*28* 11·6 (36)	*32* 11·4 (36)	*36* 11·3 (36)	*40* 12·0 (36)
Walsh, *et al.* (1953) (New South Wales)	13·93 ± 1·11 (595)			*Weeks 8–12* 13·26 ± 1·00 (144)	*13–16* 12·71 ± 0·88 (116)	*17–20* 12·62 ± 1·01 (108)	*21–24* 12·34 ± 0·94 (118)	*25–28* 12·26 ± 0·81 (124)	*29–32* 12·10 ± 1·05 (155)	*33–36* 12·19 ± 1·02 (171)	*37–40* 12·23 ± 1·13 (107)
Edgar and Rice (1956) (Nottingham)					*Week 16* 12·5 (25)	*20* 12·2 (25)	*24* 11·6 (25)	*28* 11·2 (25)	*32* 10·8 (25)	*36* 10·8 (25)	*40* 11·1 (25)

which illustrate these changes, are given in Tables 1 to 3. The fall begins during the first trimester and the lowest point is usually reached early in the third trimester.

Haemoglobin Concentration (*Table 1*)

In studies in which pregnant and non-pregnant women were compared, haemoglobin towards the end of the first trimester of pregnancy averaged about 5 per cent. (0·78 g. per 100 ml.) and at the lowest point about 15 per cent. (2 g. per 100 ml.) below the mean for non-pregnant women, after which there was a slight rise, of the order of 2 per cent. (0·25 g.), to term. There is less information about changes which occur after delivery. Tysoe and Lowenstein (1950) reported haemoconcentration immediately after delivery, and Wills *et al.* (1947) and Lundström (1950) found a rise in haemoglobin concentration on the first day *post partum.* Thereafter haemoglobin falls by the middle of the first week of the puerperium to a little below the lowest level found in pregnancy (Wills *et al.*, 1947 ; Tysoe and Lowenstein, 1950 ; Turnbull, 1956). Normal non-pregnant level is regained by the third month of the puerperium, but there is no evidence to show the earliest time at which it is reached.

In healthy non-pregnant women the haemoglobin concentration, measured by standard techniques (for a note on technique see p. 867), is on the average about 13·9 g. per 100 ml. The lowest average levels recorded during pregnancy are between 11 and 12 g. per 100 ml. (74 to 81 per cent. Haldane) in most series, and where the data have been treated statistically the standard deviation of the mean is about 1 g. An exception is Lundström's (1950) reported mean, in over 100 Swedish women at term, of only 9·8 g. per 100 ml. In 98 healthy, non-parous women an average of 12 g. per 100 ml. is claimed. The admitted discrepancy between these and other data for Swedish women is attributed by Lundström himself to "bias" on the part of his technical assistant. Clearly the data for his pregnant women have no value in absolute terms. At the other extreme 21 pregnant women in Boston, whose blood was examined by Rath *et al.* (1950), had an average haemoglobin value which did not fall below 12·7 g. per 100 ml.

Packed Cell Volume (*Table 2*)

The packed cell volume falls in parallel with the haemoglobin concentration to reach an average of about 34 per cent. at its lowest point ; the value generally accepted as normal for non-pregnant women is 40 to 42 per cent. The average lowest values found by Rath *et al.* (1950), 36·7 per cent., and by Hamilton (1950), 38·3 per cent., were exceptional. Like the haemoglobin concentration, the packed cell volume rises slightly towards term and reaches the range for non-pregnant women by about the third month of the puerperium.

Red Cell Count (*Table 3*)

There is relatively little information about the red cell count; what evidence there is suggests that it, too, runs parallel to the haemoglobin concentration.

Mean Cell Volume

There is general agreement that the mean cell volume does not change (Roscoe and Donaldson, 1946; Wills *et al.*, 1947 ; Rath *et al.*, 1950 ; Merivale and Richardson, 1950); but Tysoe and Lowenstein (1950) found that the size of cells "increased throughout pregnancy, although the values remained within normal limits", Edgar and Rice (1956) found a similar small rise and Lundström (1950) records a decrease during the last two months. The mean cell diameter as measured by Merivale and Richardson (1950) was slightly below the mean for non-pregnant women, which means that the cells were more spherical; Elliott (1944) found no deviation from the non-pregnant.

Mean Cell Haemoglobin Concentration

The mean cell haemoglobin concentration appears to vary little from an average of about 32 to 33 per cent. during pregnancy. Lundström (1950), Rath *et al.* (1950), Tysoe and Lowenstein (1950), Lund (1951) and Turnbull (1956) found no appreciable change ; Benstead and Theobald (1952) and Davis and Jennison (1954) showed a fall of about 0·5 per cent. during the last trimester in two small series of women, and Edgar and Rice (1956) showed in 25 women a mean fall from 32·6 per cent. at 16 weeks to 30·2 per cent. at term ; Roscoe and Donaldson (1946) found a small rise during pregnancy in a series of 20 women. The mean cell haemoglobin similarly remains almost constant throughout pregnancy, although Rath *et al.* (1950) and Lundström (1950) reported a small decrease during the last month.

Individual Variation

All reports emphasise that the individual variation is much greater in pregnant than in normal non-pregnant women, so that, although the trends indicated above represent those in the *average* healthy, pregnant woman, they may not hold for a particular individual, and averages from small series must be accepted with reserve. For example, some women show no fall in haemoglobin concentration during pregnancy, or even a slight rise, and others may show a considerable fall. It appears

TABLE 2.—PACKED CELL VOLUME IN NON-PREGNANT AND PREGNANT WOMEN (NUMBER OF WOMEN IN BRACKETS)

Authority and Place	Packed cell volume, per cent.									
	Non-pregnant	*Pregnant*								
Roscoe and Donaldson (1946) (Edinburgh)	42·3 ± 3·9 (20)	*Weeks 8–16* 39·2 ± 3·2 (20)				*20–27* 37·0 ± 2·0 (20)			*33–38* 36·4 ± 2·2 (20)	
Hamilton (1950) (Edinburgh)	41·5 (23)	*Weeks 6–9* 42·8 (32)	*10–13* 42·0 (45)	*14–17* 40·9 (43)	*18–21* 39·8 (47)	*22–25* 39·8 (41)	*26–29* 38·3 (39)	*30–33* 39·3 (43)	*34–37* 38·8 (41)	*38–40* 40·0 (31)
Lundström (1950) (Upsala, Sweden)	39·0 ± 0·22 (98)	*Weeks up to 8* 38·3 ± 0·59 (17)		*16* 37·2 ± 0·23 (98)		*24* 35·2 ± 0·26 (115)		*32* 33·7 ± 0·26 (119)		*40* 33·7 ± 0·28 (123)
Rath *et al.* (1950) (Boston, U.S.)		*Month 2* 39·5 (12)	*3* 38·8 (13)	*4* 37·2 (9)	*5* 37·0 (16)	*6* 36·7 (15)	*7* 37·2 (18)	*8* 37 (17)	*9* 37·9 (9)	
Lund (1951) (New Orleans, U.S.)			*Week 12* 40 (3)	*16* 39 (8)	*20* 37 (9)	*24* 35·5 (6)	*28* 35·2 (6)	*32* 34·2 (7)	*36* 34·4 (7)	*40* 35·7 (8)
Benstead and Theobald (1952) (Bradford)				*Week 16* 39·8 (36)	*20* 38·3 (36)	*24* 37·1 (36)	*28* 35·5 (36)	*32* 34·6 (36)	*36* 35·5 (36)	*40* 36·8 (36)
Edgar and Rice (1956) (Nottingham)				*Week 16* 37·8 (25)	*20* 36·2 (25)	*24* 34·4 (25)	*28* 34·2 (25)	*32* 33·0 (25)	*36* 33·0 (25)	*40* 36·3 (25)

that age has little or no effect, and parity a doubtful effect, on these changes. Roscoe and Donaldson (1946) found in one of their series, but not in another, a greater fall in haemoglobin concentration during pregnancy in older mothers, whatever the parity, but Lundström (1950), Magee and Milligan (1951) and Walsh *et al.* (1953) found no association with age. Multiparae showed a greater fall in haemoglobin concentration than primiparae in the studies of Wills *et al.* (1947), Magee and Milligan (1951) and in one series of Roscoe and Donaldson (1946), but no difference with parity was found by Lundström (1950), Walsh *et al.* (1953), or Roscoe and Donaldson in their second series.

To summarise, the haemoglobin concentration, the red cell count and the packed cell volume all decrease during the first 7 or 8 months of normal pregnancy and rise again slightly towards term; the size of the red cell and its haemoglobin content do not alter.

Dilution

The plasma volume rises, on the average, by about 35 to 40 per cent. during pregnancy, but there is an almost incredibly wide range in clinically well women. For example, Lund (1951) found the extremes of the rise during pregnancy in 66 women to be 14 and 121 per cent. There is no explanation of this variation. The maximum plasma volume is reached at about the 32nd to 36th week of pregnancy, after which there is a slight decline to term. It is estimated that total red cell mass increases by about 17 per cent. and with less variation than plasma volume; it rises continuously to the end of pregnancy. Plasma volume decreases rapidly to normal after parturition, with little, if any, rise in haemoglobin concentration, and there is a suggestion (Verel *et al.*, 1956) that a large quantity of red cells may be removed from the circulation at this time. They may be stored in the spleen.

The dilution of red cells which occurs in pregnancy is due to the disparity between the increases in plasma and red cells, and the wide variations in the degree of dilution are due to the variation in the increase of plasma. The concept of "dilution" is perhaps unfortunate if it gives the impression that the red cell concentration is less than it should be. The blood is dilute only in comparison with the blood of non-pregnant women. The two blood components are controlled independently by different mechanisms and for different purposes. The red cell mass increases in response to a requirement for increased oxygen-carrying capacity. The plasma volume increases for quite different purposes, the most important of which is to fill the increased vascular bed.

TABLE 3.—Red Cell Count in Non-pregnant and Pregnant Women (Number of women in brackets)

Authority and Place	Red cell count, millions per c.mm.											
	Non-pregnant	*Pregnant*										
Roscoe and Donaldson (1946) (Edinburgh)		*Weeks 8–16* 4·47 ± 0·42 (20)			*20–27* 4·15 ± 0·25 (20)			*33–38* 4·15 ± 0·39 (20)				
Lundström (1950) (Upsala, Sweden)	4·20 ± 0·03 (98)	*Weeks up to 8* 4·16 ± 0·10 (17)		*16* 4·05 ± 0·03 (98)		*24* 3·79 ± 0·03 (115)			*32* 3·69 ± 0·02 (119)			*40* 3·82 ± 0·03 (123)
Rath *et al.* (1950) (Boston, U.S.)		*Month 2* 4·46 (12)	*3* 4·43 (13)	*4* 4·24 (9)	*5* 4·17 (16)	*6* 4·17 (15)	*7* 4·20 (18)		*8* 4·17 (17)	*9* 4·30 (9)		
Edgar and Rice (1956) (Nottingham)				*Week 16* 4·39 (25)	*20* 4·15 (25)	*24* 4·02 (25)	*28* 3·85 (25)		*32* 3·70 (25)	*36* 3·80 (25)		*40* 3·80 (25)

The Effect of Iron

There can be little doubt that the changes in the blood are considerably modified when extra iron is given to the pregnant woman.

Haemoglobin Concentration

Lundström (1950), Benstead and Theobald (1952), Davis and Jennison (1954), Fisher and Biggs (1955) and Edgar and Rice (1956) have all reported that the mean haemoglobin concentration in women given extra iron by mouth rose during pregnancy, sometimes to non-pregnant levels, and Wills *et al.* (1947), Lund (1951) and Magee and Milligan (1951) were able to arrest the usual fall. Gerritsen and Walker (1954) say that Bantu women, with an exceptionally high intake of iron, have no fall in mean haemoglobin concentration during pregnancy. The very small fall in haemoglobin concentration found for a group of Boston women by Rath *et al.* (1950) is remarkably close to that in other series in which medicinal iron was given, and suggests that those women may have been taking iron supplements of their own accord.

Other Values

The usual falls in packed cell volume and red cell count can be similarly modified by iron (Lundström, 1950; Lund, 1951; Benstead and Theobald, 1952; Wills *et al.*, 1947; Davis and Jennison, 1954; Edgar and Rice, 1956). The mean cell haemoglobin concentration and mean cell volume are not appreciably altered by iron, although Lundström and Edgar and Rice found higher values in their patients given iron, and Benstead and Theobald were able to raise the average mean cell haemoglobin concentration to the high value of 34 to 36 per cent. by the end of pregnancy.

The Evidence for Iron Deficiency

The finding that the haemoglobin concentration of the blood can be increased by giving iron raises the question whether the usual fall in pregnancy is truly normal or should be regarded as a sign of iron deficiency. It suggests cure by replacement, the classical test of deficiency, and other evidence is believed to support that suggestion.

Free Protoporphyrin

For example, the mean concentration of free protoporphyrin in the red cell was found to be raised during pregnancy (Fay *et al.*, 1949; Lund, 1951; Ventura and Klopper, 1951*a*) and is known to be increased in hypochromic anaemia (Cartwright *et al.*, 1948), but the rise in pregnancy, which varies widely in magnitude, is not necessarily analogous. Ventura and Klopper stated that free protoporphyrin values "are increased whenever the linkage between iron and protoporphyrin is disturbed. Anaemia is not the only condition which may disturb this linkage; it is just as reasonable to assume that pregnancy may itself be the disturbing factor."

Serum Iron

The average serum iron concentration is reduced at term to about 35 per cent. below the mean in non-pregnant women (Fay *et al.*, 1949; Lundström, 1950; Ventura and Klopper, 1951*a*; Mukherjee and Mukherjee, 1953), and the iron-binding capacity is raised, so that the percentage saturation of iron-binding protein is low. Similar changes are found in iron-deficiency anaemias (Laurell, 1947; Smith, 1952). Taken together with the fact that the serum iron can be raised by iron in pregnancy, as in iron-deficiency anaemia (Lundström, 1950; Davis and Jennison, 1954; Mukherjee and Mukherjee, 1953), and does not fall at all in women on diets rich in iron (Gerritsen and Walker, 1954), these findings are assumed by many to be strong evidence that the usual changes in the blood in pregnancy are due to deficiency of iron, but the analogy must be drawn with great caution. In health the serum iron shows immense individual variability, even from hour to hour (Jacot, 1951; Fowler and Barer, 1952; Howard, 1953; Rechenberger and Hevelke, 1955), and the processes which determine the changes are not understood. Serum iron is low during the first week of the menstrual cycle (Powell, 1944; Dahl, 1948; Smith, 1952) and during acute infections. It falls whenever production of red cells rises (Wasserman *et al.*, 1952; Finch and Finch, 1955), and may be low even when large stores of iron can be demonstrated histologically in the marrow (Davidson and Jennison, 1952). Goldeck *et al.* (1954) have shown that the concentrations of haemoglobin and serum iron are not correlated in pregnancy. In any event, the total amount of iron circulating in the plasma is probably raised, because of the increased plasma volume of pregnancy.

Iron-binding Capacity

The iron-binding capacity of the blood is even less well understood. It is now known to depend on the β_1-globulin transferrin, which is thought to act specifically as an iron transporter. Ventura and Klopper (1951*a*) attribute the raised iron-binding capacity to "the vastly increased turnover of iron in late pregnancy", but it may simply be associated with the rise in the concentration of plasma globulin. Gerritsen and Walker (1954) found an increased iron-binding capacity in the

blood of Bantu women who showed no reduction of either haemoglobin or serum iron.

The concept of *saturation* of iron-binding capacity is not helpful, since saturation occurs only when large quantities of iron are released into the bloodstream, either by haemolysis or after intravenous injection of iron. Laurell (1947) believed that the low saturation during deficiency of iron and in pregnancy presents a condition favourable for absorption of iron from the gut, but the saturation of 30 or 40 per cent. in non-pregnant women should provide an adequate margin for any further transport of iron which is required. A more logical explanation might be that the additional facilities for carriage of iron and the "enhanced power and speed in coping with an influx of iron" (Ventura and Klopper, 1951*b*) are needed to deal with the relatively large amount of iron returned to stores at the end of pregnancy, when the blood volume returns to normal. The amount is estimated to be equivalent to from 54 g. haemoglobin (Lund, 1951) to about 100 g. (Lowenstein *et al.*, 1950).

Serum Copper

The copper content of serum in pregnancy is above that of non-pregnant women (Fay *et al.*, 1949; Röttger, 1950; Ventura and Klopper, 1951*a*; Lahey *et al.*, 1953), as it is in iron-deficiency anaemia (Cartwright *et al.*, 1948). But the copper content of plasma is raised in many conditions (Lahey *et al.*, 1953) and is not related to serum iron. Its role is not well understood.

What, then, are the grounds for regarding the fall in haemoglobin concentration during pregnancy, which occurs in healthy normal women, as an indication of deficiency of iron? The low serum iron, the increased iron-binding capacity, the high serum copper and the high free protoporphyrin in red cells have been discussed. None of these specifically indicates deficiency of iron, nor does the peripheral blood picture. The cells are of normal size and the mean cell haemoglobin concentration, regarded by Whitby and Britton (1953) as "the true indicator of the presence or absence of iron deficiency", is normal. There remains the belief that because the haemoglobin concentration in the blood can be raised by giving iron, there must be deficiency of iron. Widdowson and McCance (1936), Fowler and Barer (1941) and Garry *et al.* (1954) have shown that iron will raise haemoglobin concentration even in normal persons, and in one of Fowler and Barer's series the haemoglobin fell again to its initial level even while iron was still being given. Iron appears to provide a specific, though temporary, stimulus to erythropoiesis. Wills *et al.* (1947), commenting on the rise in haemoglobin level which followed administration of iron in their series of pregnant women, say that ". . . judging from the nature of the changes in the haematological picture, [the iron] cannot have acted by correcting a latent hypochromic anaemia". Lund (1951) too saw that the total mass of haemoglobin could be increased in pregnancy by giving iron when there was no evidence of deficiency.

The fact that the fall in haemoglobin concentration in normal multigravidae has been found to be greater than in primigravidae (Goodall and Gottlieb, 1936; Wills *et al.*, 1947; Magee and Milligan, 1951) has been interpreted as indirect evidence of depletion of iron, accentuated by repeated pregnancy. But the blood pictures of primigravidae and multigravidae are not directly comparable; there is evidence of a relatively greater rise in plasma volume in multigravidae (Thomson *et al.*, 1938; McLennan and Thouin, 1948; Kjellberg *et al.*, 1950; Lowenstein *et al.*, 1950) and a lower haemoglobin concentration is to be expected.

The Significance of Haemodilution

The problem might be viewed in another way. Is there any clinical disadvantage in the "physiological anaemia of pregnancy"? The rise in cardiac output in pregnancy is closely parallel to the rise in total blood volume. It seems that, on the average, a volume equivalent to the total blood volume is pumped through the heart each minute at all stages of pregnancy. If the pregnant woman's blood has a relatively low oxygen-carrying capacity, blood will return to the heart from her peripheral circulation with less than the normal quantity of oxygen. But it has been shown by cardiac catheterisation (Palmer and Walker, 1949; Bader *et al.*, 1955) that the arteriovenous difference in oxygen content in normal pregnancy, at the time when dilution is greatest, is only 3·5 volumes per cent., so that blood is returned to the heart at a higher oxygen tension than usual, which is explicable in terms of function. Of the extra 1100 ml. of blood pumped into the systemic circulation each minute in late pregnancy, only about 600 ml. are required for carriage of extra oxygen, mostly to the uterus and its contents (Romney *et al.*, 1955). The remaining 500 ml. circulate in the skin, mainly of the arms and hands (Abramson *et al.*, 1943; Burt, 1950), where they help to eliminate the heat generated by the foetus. It can be calculated that the usual fall in haemoglobin concentration occurring in pregnancy would be produced by adding 600 ml. of whole blood and 500 ml. of plasma to the blood of a non-pregnant woman. The mass of red cells increases on the average by about 17 per cent. during pregnancy and the velocity of blood flow by 20 per cent. or

more. The increase in weight of tissue requiring oxygen, calculated as the mean gain of weight during pregnancy minus the weight of additional blood, extravascular fluid and liquor amnii, is less.

The average increase of basal metabolic rate as measured by Bader *et al.* (1955) in terms of oxygen consumption per square metre of body surface was 9 per cent. above the DuBois standard for non-pregnant women. Since the rise to be expected from gain of tissue alone is of the same order, the absolute increase would be about 19 per cent., which is in good agreement with other estimates.

As might be expected from such a favourable physiological balance, the woman with "physiological anaemia of pregnancy" does not feel any benefit from having her haemoglobin raised by administration of iron, which is freely admitted, even where medication with iron in pregnancy is recommended as a routine. Fisher and Biggs (1955) say that the women in their series, who did not respond to iron and whose haemoglobin fell throughout pregnancy, were nevertheless "clinically well at all stages", and Magee and Milligan (1951) commented that in their large series "the great bulk of women, whether taking iron or not, were perfectly healthy and had no complaints, which raises the question whether a haemoglobin level raised by iron therapy is in itself an advantage".

A possible advantage which had been claimed for a high level of haemoglobin in pregnancy is that the woman is in a stronger position to withstand haemorrhage and even that she has less tendency to haemorrhage *post partum*. Wills *et al.* (1947) reported a greater incidence of haemorrhage in women who took no additional iron, but Lund (1951) found no significant difference in the incidence of haemorrhage between treated and untreated women, and Benstead and Theobald (1952) say that "the only disadvantage of maintaining the haemoglobin level at its normal value throughout pregnancy would appear to be a slightly increased risk of post-partum haemorrhage".

In general, there is no convincing published evidence that the normal pregnant woman is at an advantage if she takes extra iron. Perhaps the real benefit is not to the woman at all, but lies in that ". . . the confidence of both doctor and midwife, particularly in domiciliary practice, is greatly increased by the knowledge that the haemoglobin level is high at term" (Fisher and Biggs, 1955).

The Iron Balance in Pregnancy

The total amount of iron required for the products of conception and for the extra needs of the mother during pregnancy is about 650 mg.; 250 mg. for the foetus (Iob and Swanson, 1938; Widdowson and Spray, 1951; Rechenberger, 1955), 50 to 100 mg. for the placenta (Rechenberger, 1955) and 300 mg. for the mother's additional haemoglobin mass of about 90 g. (Berlin *et al.*, 1953; Lund, 1951). Almost all of the 650 mg. is required in the second half of pregnancy. At 20 weeks the foetus weighs about 300 g. and the placenta 180 g., accounting for perhaps 60 mg. iron, and the increase in total haemoglobin in the mother has not begun (Berlin *et al.*, 1953; White, 1951; Lund, 1951), so that the mean daily requirement for the last 20 weeks is about 4·2 mg. Not all of it need be supplied by the diet. The stores in a healthy woman at the beginning of pregnancy are probably about 1500 mg. (Haskins *et al.*, 1952), so that in fact the whole of the requirement of mother and foetus should theoretically be present from the start. In the absence of excessive loss at parturition, much of the additional haemoglobin will be retained and the iron will eventually be returned to stores. Thus only the iron used for the foetus and placenta and for blood lost at delivery will require replacement, and an uptake of between 3 and 4 mg. daily for the second half of pregnancy will suffice. Absorption of iron is regulated so that more is absorbed when stores are low (Balfour *et al.*, 1942), which may account for what occurs in pregnancy, when relatively large quantities may be absorbed even from a normal diet. Hahn *et al.* (1951) showed that as pregnancy progressed women absorbed increasing proportions, for example, about 3·7 mg. from 9 mg. of labelled iron in the last trimester. There is no direct information about the normal state of the body's iron reserves at the end of pregnancy, but there seems no reason to suppose that they are grossly depleted. The average diet in the United Kingdom in 1954 (Ministry of Agriculture, Fisheries and Food, 1956) supplied about 13 mg. iron daily, which should be more than adequate for a pregnant woman.

Possible Ill Effects of Medicinal Iron

If additional iron does no good to a normal pregnant woman, it should not be assumed that it does no harm. Hamilton (1950) has shown that the relative viscosity of the blood, but not that of the plasma, falls in parallel with the fall of haemoglobin concentration, to reach an average of 3·84 at 22 to 28 weeks, compared with a mean non-pregnant value of 4·61. This fall considerably diminishes the work of the heart and must help substantially to keep arterial blood pressure normal as the cardiac output rises.

There may be a danger of excessive storage of iron. The proportion absorbed falls as the dose rises, but the total amount absorbed increases. Hahn *et al.* (1951) found an average absorption of 9·5 mg. from 120 mg. in the second half of pregnancy. A common prescription is 200 mg. daily, or more.

Such extra iron will raise the haemoglobin, and will probably also fill the stores. Lund (1951) found the total mass of haemoglobin added in pregnancy to be 86 g. in normal, untreated women and 152 g. in those given 240 mg. iron daily. Normally only about 30 g. haemoglobin is lost at parturition and the remainder is broken down and the iron is returned to stores, but if the stores are already filled it must be laid down as haemosiderin. Large deposits of haemosiderin are rare in women (Finch and Finch, 1955), but more than half the Bantu described by Gerritsen and Walker (1954), whose intake of iron was very high and who showed no fall of haemoglobin in pregnancy, had haemochromatosis at autopsy (Walker, 1956).

Anaemia due to Deficiency of Iron

All that has been said so far refers to the normal healthy woman in pregnancy, but of course, true deficiency of iron can occur in pregnancy and has often been described.

Diagnosis

It has been shown that the haemoglobin concentration in pregnancy is not a reliable guide to the presence or absence of true iron-deficiency anaemia. Tysoe and Lowenstein (1950) found it impossible, without knowing the blood volume, to predict haemoglobin concentration, red cell count or packed cell volume in a given patient, and Lund (1951) also found that the plasma volume increased independently of the mass of haemoglobin by amounts varying from 14 to 121 per cent. of the volume before pregnancy. He described one woman whose haemoglobin concentration fell to about 9·5 g. per 100 ml. while she was taking iron by mouth; the increase of 49 per cent. in her total haemoglobin was masked by an increase of 94 per cent. in plasma volume. Roscoe and Donaldson (1946) showed that by the third trimester there was little or no correlation between the total amount of haemoglobin and its concentration in the blood. The correlation coefficient was 0·145 (S.E. $\pm$ 0·233) and that in non-pregnant women was 0·843 (S.E. $\pm$ 0·127). Yet anaemia in pregnancy is defined by all textbooks in terms of haemoglobin concentration. Eastman (1950), for example, says " . . . the diagnosis of anaemia in pregnant women is not made unless the haemoglobin is less than 10·0 grams (about 70 per cent.), the red cell count less than 3·5 million or the haematocrit reading less than 30 per cent. ", and Brews (1953) states that " Haemoglobin levels of 70 to 80 per cent. are regarded as doubtful anaemia and levels below 70 per cent. as definite anaemia ".

The assessment of iron stores has been suggested as a method for detecting deficiency of iron. Davidson and Jennison (1952) say that " it is probable that ordinary hypochromic anaemia only develops after exhaustion of the iron stores . . . " and Hutchison (1953) goes so far as to say that " if stainable iron were present in the marrow the anaemia would not be improved by the administration of iron ", but Pratt and Johnson (1954) found some iron in marrow even when haemoglobin was low in both pregnant and non-pregnant subjects. Marrow biopsies for estimation of iron, which would be difficult and on a large scale probably undesirable, are not likely to provide a simple indication of deficiency of iron.

In anaemia due only to iron deficiency the bone marrow is normoblastic, but deficiency can occur in association with megaloblastic anaemia. Scott and Govan (1952) suggest that the two conditions do not form distinct entities, but shade into one another; megaloblastic changes occur as the anaemia increases in severity and the capacity to respond to iron is then lost.

The mean cell haemoglobin concentration, and possibly the mean cell volume, appear to be the only reasonably accessible laboratory criteria of iron deficiency in pregnancy. The diagnosis offers an opportunity for the exercise of clinical judgement.

Incidence

The incidence of iron deficiency causing anaemia in pregnancy is not anywhere known, because no survey has been attempted which differentiated the low haemoglobin concentration of anaemia from that of simple haemodilution. The many published series which give the distribution of haemoglobin concentration among pregnant women can be interpreted only on the broadest epidemiological basis. Because of differences in technique of blood sampling and of estimating and recording haemoglobin, and because the stage of pregnancy at which the samples were taken and the method by which women were selected are seldom stated, published surveys are rarely comparable and there would be little profit in listing them. In this country, the Medical Research Council's survey in 1943 (Medical Research Council, 1945) found about 5 per cent. of women with haemoglobin below 10·4 g. per 100 ml. (70 per cent. Haldane) in the first half of pregnancy, and Benstead and Theobald (1952) found that 6·5 per cent. of 2000 Bradford women had less than 10 g. per 100 ml. before 16 weeks. In Glasgow in 1946–47, Scott and Govan (1949) found that 17·6 per cent. of 4595 women had haemoglobin concentrations below 10·4 g. per cent. at their first visit to the antenatal clinic. But in Aberdeen in 1954–55 only 2·4 per cent. of 3841 women, of whom 55 per cent. attended before the 16th week, had a haemoglobin concentration below 10·4 g. per 100 ml. in venous blood taken at the first antenatal examination (Turnbull, 1956).

Elsewhere low concentrations of haemoglobin in pregnant women are reported to occur much more frequently. In Dublin, Doyle and McGrath (1954) found 31·4 per cent. of 1000 " unselected " women attending the Coombe Hospital to have 10 g. haemoglobin per cent. or less, and Lillie *et al.* (1954) found 23·8 per cent. with less than 10 g. at their first visit to the antenatal clinic at the Rotunda Hospital. Wesselhöft (1950) said that 46·9 per cent. of 2970 pregnant women in Hamburg in 1947–48 had less than 10·4 g. haemoglobin. By contrast, Walsh *et al.* (1953) reported that only 4 per cent. of Sydney women had 10 g. haemoglobin per cent. or less at any stage of pregnancy. Although these figures allow rough comparison, no conclusion can be drawn about the incidence of iron deficiency. There is considerable scope for research into iron deficiency in pregnancy on a population basis, with a more meaningful criterion such as mean cell haemoglobin concentration.

Etiology

It is usual for the low haemoglobin in the surveys quoted to be attributed in large part to deficiency of iron in the diet, or to a generally poor diet, but any supporting evidence is at best indirect. Many of the low haemoglobin values in these series form the lower end of the range normal in pregnancy and are not due to deficiency of any sort. In Magee and Milligan's (1951) series of Manchester women, the 5·2 per cent. who were graded as nutritionally " poor " or " fair " by the criteria of the Ministry of Health had a slightly, but not significantly, lower average concentration of haemoglobin than those of better nutritional status. In Doyle and McGrath's (1954) Dublin series the general social and economic circumstances, including the diets, of 504 women were assessed by an almoner ; where conditions were good, 30 per cent. were " anaemic ", and of the 27 women whose circumstances were poor, 22 were anaemic. From similar investigations, also in Dublin, Lillie *et al.* (1954) attributed low haemoglobin levels to defective diet and related seasonal variations in incidence to seasonal changes in diet. In the 6 months from December to May, the percentage of patients with less than 9 g. haemoglobin per 100 ml. ranged from 10 to 14, average 11·6 ; from June to November the range was from 4 to 9 per cent., the mean 6·6. The high incidence of anaemia in pregnancy in post-war Hamburg was attributed by Wesselhöft (1950) to poor diet.

A rough comparison can be made between recent data (Turnbull, 1956) and those of Fullerton (1936), both for Aberdeen ; exact comparison is not possible. From the recent data, all booked hospital patients from Social Classes IV and V were taken as the group most nearly comparable with Fullerton's " representative cross-section of the poor classes in Aberdeen ", but the later investigation used venous blood and the earlier capillary blood from finger pricks. The average haemoglobin concentration of the women in 1955 was about 1 g. per 100 ml. higher at all stages of pregnancy than that from the group investigated 20 years earlier. A proportion of this difference almost certainly results from the difference in methods of blood sampling (see p. 867), but the real difference, possibly of the order of 0·5 g., may be attributable to general improvement in nutrition between the two investigations.

The relationship between parity and anaemia has been discussed already, and it was suggested that the slightly lower haemoglobin concentration found by some in pregnancies after the first might be explained by greater dilution of blood. The only published study of a sufficient number of pregnancies of high parity is from Dublin (Doyle and McGrath, 1954). The proportion of women with haemoglobin concentrations of 10 g. per 100 ml. or less was about 30 per cent. for the first 5 pregnancies and then rose to about 40 per cent. for further pregnancies, which might suggest depletion of stores of iron.

Apart from deficiency of iron, several other contributory causes have been suggested. Strauss and Castle (1932) thought that reduced gastric secretion in pregnancy was likely to prejudice the absorption of iron, and Hamilton *et al.* (1953) were able to improve the clinical response to iron by giving dilute hydrochloric acid with it. On the other hand, Grace *et al.* (1954) have confirmed that absorption of iron is not necessarily related to gastric acidity, and most recent experiments with labelled iron show that absorption is always improved in pregnancy (Hahn *et al.*, 1951 ; Balfour *et al.*, 1942). Other evidence suggests that, in a few women, there may be a temporary breakdown in iron metabolism. Klopper and Ventura (1951), for example, described 5 women, out of 1804 studied, who had severe normocytic anaemia with reasonably high serum iron, in whom they believed there was a block in the utilisation of iron, and Scott and Govan (1951) have described a small proportion of anaemic pregnant women who responded slowly or poorly to intravenous iron, though women with puerperal anaemia always responded quickly. Scott (1956), on the basis of two subjects, attributes delayed response to intramuscular iron to haemodilution which temporarily masks haemopoiesis.

Clinical Features

The clinical features of hypochromic anaemia in pregnancy are similar to those of any hypochromic anaemia and need not be described here ; as in

other anaemias, pallor of the skin and mucous membranes is without significance. It is significant that, in pregnancy, apparently severe anaemia may be symptomless. For example, a third of the women found by Lillie *et al.* (1954) to have less than 10 g. haemoglobin per 100 ml. had no symptom, and symptoms were not always found until the haemoglobin concentrations were as low as 6 g. per 100 ml., a level which is unlikely to be physiological.

Treatment

Treatment with iron in pregnancy is probably seldom necessary. It will be clear from what has been said earlier in this review that a "low" haemoglobin without morphological evidence of deficiency requires no treatment. If a woman has had a low intake of iron for a long time, or has lost iron by bleeding, so that her stores are insufficient to supply the demands of the foetus and her own need for extra haemoglobin, her requirements are not likely to be met by ordinary diet.

To give salts of iron by mouth is the usual treatment. There is a large literature reporting the effects of many preparations of iron alone or in combination with other haematinics, but there are seldom comparable data from which relative efficiencies may be estimated. All seem to be effective in a high proportion of patients, and in a recent experimental comparison, not during pregnancy, O'Sullivan *et al.* (1955) found no difference in efficiency between ferrous sulphate, ferrous gluconate and ferrous succinate. It is generally agreed that ferric salts are much less effective than ferrous. Cope *et al.* (1956) have shown that ferrous succinate in pregnancy is as effective by mouth as about one-third of the amount of iron in preparations given parenterally. Copper, manganese and molybdenum added to iron have not been shown to increase the efficiency with which it is used.

Hahn *et al.* (1951), in a large study with ^{59}Fe in ferrous sulphate, showed that the mean quantity of iron absorbed from a given amount in "normal healthy . . . non-anaemic" women increased as pregnancy advanced, but above a certain level extra intake had only a slight effect on the amount absorbed. For example, after the 25th week of pregnancy about 5 mg. was absorbed from 20 mg., but with larger amounts the absorption increased relatively little; only about 6 mg. was absorbed from 40 mg. and 9·5 mg. from 120 mg. From these figures and on the assumption that such rates of absorption are maintained, it can be calculated that, in the second half of pregnancy, 3 standard tablets daily, each containing 55 to 60 mg. iron, would supply about 15 mg. iron to the body each day, 105 mg. in a week, so the total requirement of pregnancy would be provided in six weeks. More would probably be absorbed in true iron deficiency. In comparison, the doses of iron used in most of the reported series, varying from about 165 to 330 mg. daily, are large and seem to have been derived quite arbitrarily.

The common complications of oral iron medication are nausea and vomiting, and they may be a handicap to its use, but no clear picture can be formed from the literature to show whether the incidence or severity of these side effects is related to the amount given. Lund (1951), who gave 1200 mg. of molybdenised ferrous sulphate (240 mg. iron) daily to 75 women, had to stop treatment because of digestive disturbance in only one. But Lillie *et al.* (1954), who gave ferrous sulphate in doses of 1200 mg. daily, found that half the women could not tolerate it, and, in the series of Fisher and Biggs (1955), about the same proportion of women taking half that quantity of ferrous sulphate "complained of digestive disturbances". Such reports raise doubt about the validity of studies of iron treatment where there were few reactions or none. It may be that the lack of haematological response in some women in most studies may be due to failure to take the iron because of its side effects, not to failure to absorb or use it. Benstead and Theobald (1952), who found that a high proportion of women in their series were intolerant of ferrous sulphate, said "It can be assumed that between 30 and 40 per cent. of all antenatal patients will not, in fact, take these tablets if they are routinely prescribed in the antenatal department". It is widely agreed that, of all the ferrous salts, the sulphate is least well tolerated. Lund (1951) claimed that its side effects were less when it was given with molybdenum, and this was confirmed by Benstead and Theobald, who found 86 per cent. of women able to tolerate the combination, compared with between 60 and 70 per cent. of those who took the ordinary ferrous sulphate tablet.

Fisher and Biggs (1955) claimed that a preparation of ferrous sulphate with ascorbic acid was tolerated better than the routine ferrous sulphate tablet, but in the combined tablet the dose of ferrous sulphate was reduced by a third, so that the beneficial effect may not have been due to the ascorbic acid. Other ferrous salts are much better tolerated. Ferrous gluconate, in particular, causes considerably fewer and less severe side effects (Jones, 1953; Lillie *et al.*, 1954).

The possible value of hydrochloric acid given with the iron has already been discussed (p. 864). Failure to show the usual haematological response to oral iron has been reported for from 8 to 22 per cent. of women in many of the published series (Govan and Scott, 1949; Lund, 1951; Hamilton *et al.*, 1953; Fisher and Biggs, 1955; Edgar and Rice, 1956). They usually, but not always,

respond well to intravenous or intramuscular iron. Scott and Govan (1951) reported that of 13 pregnant women with anaemia refractory to oral iron, 11 responded rapidly to intravenous iron, but the other 2 had a "delayed" response. The result is not worse than the response shown by 78 other pregnant women with anaemia, of whom 26 showed a delayed or poor response to intravenous iron. Intramuscular iron has been used successfully by Jennison and Ellis (1954), Scott (1956) and Cope *et al.* (1956).

It has been calculated (Heath *et al.*, 1932) that the haemoglobin should be raised by 0·64 g. per 100 ml. by 100 mg. iron. In pregnancy the mean rise is much less than that. Klopper and Ventura (1951) found the haemoglobin to rise by only 0·44 g. per 100 ml. for each 100 mg. of iron, and Scott and Govan (1951 ; 1954) found a mean rise of only 0·3 g. per 100 ml. for each 100 mg. of iron given by either intravenous or intramuscular injection. Scott (1956) reports that " utilisation " falls from 0·309 g. to 0·173 g. as bodyweight rises from 100 to over 160 lb. The word " utilisation " has no meaning, since difference in weight may be merely difference in retention of water. Differences in response are presumed by Ventura and Klopper to be due to passage of iron to the foetus, but one would in any case expect a smaller rise in *percentage* of haemoglobin when the plasma volume is raised as it is in pregnancy. In one pregnant woman with severe anaemia the whole of 18 mg. of ^{59}Fe given intravenously was used for maternal haemoglobin (Dubach *et al.*, 1955).

The side reactions associated with parenteral administration of iron are apparently not altered by pregnancy. They will not be discussed here. The dose given appears to be generally quite arbitrary, but large, varying from 900 mg. intravenously (Hamilton *et al.*, 1953) to 2000 mg. by intramuscular injection (Scott and Govan, 1954). Jennison and Ellis (1954) gave iron by intramuscular injection in anaemia of pregnancy only when there was no demonstrable iron in the marrow. On the assumption that " 250 mg. would increase the haemoglobin of non-pregnant patients by 10 per cent ", they calculated their dose as

$$\frac{100 - \text{observed Hb per cent.}}{10} \times 250 + 500 \text{ mg.}$$

to allow for " depletion of iron, increased blood volume, and the demands of the foetus ".

There seems to be little doubt that iron given parenterally is useful both where iron by mouth is ineffective or not tolerated and where iron deficiency must be corrected quickly, but it has a drawback ; there is considerable evidence that the body normally regulates its uptake of iron according to its requirements, as it must when it has no mechanism for excretion, and the same is true even in pregnancy, although the temporary diversion of stored iron to extra haemoglobin probably causes the real requirement to be overestimated. When iron is given parenterally this discriminating mechanism is by-passed and excess of iron must then be immobilised as haemosiderin. It is important, therefore, that the dose should be calculated with some regard to the changed circumstances of pregnancy. There is no need to fill the iron stores when they will be replenished after delivery ; and there is no evidence that an unphysiological procedure such as raising the haemoglobin during pregnancy to 14·8 g. per 100 ml. is beneficial in any way.

Summary

In normal pregnancy the plasma volume rises, on the average, by about 40 per cent. and the red cell mass by about 17 per cent. The result is reduction of the red cell count to about 80 or 85 per cent. of the non-pregnant ; the haemoglobin concentration and the packed cell volume show a parallel decrease. Minimum levels are usually reached during the third trimester. There is no qualitative alteration of the red cell ; the mean cell haemoglobin concentration remains within normal limits.

The fall in haemoglobin concentration during pregnancy is often interpreted as an index of iron deficiency because it can be reduced or prevented by giving additional iron, but iron in large doses appears to be a specific stimulus to blood formation even in healthy non-pregnant persons. There are other analogies between the blood in pregnancy and in iron-deficiency anaemia : the serum iron is lower and the iron-binding capacity is raised ; the serum copper is higher and there is an increase in free protoporphyrin. None of these is a specific sign of iron deficiency.

There are good theoretical reasons why the rise in plasma volume is proportionately greater than the increase in red cells. The red cell mass increases only in response to a demand for increased oxygen transport, and the mean increase of 17 per cent. with the 20 per cent. rise in velocity of blood flow more than covers the need for oxygen. This favourable balance is confirmed by a decrease in the mother's arterio-venous oxygen difference during pregnancy. Plasma volume is controlled by a different mechanism ; extra plasma is required both to carry the extra red cells and fill the increased vascular space and to dissipate foetal heat.

No advantage has been demonstrated from raising the haemoglobin level in normal pregnancy and there may be dangers. The fall in the concentration of red cells results in a fall in blood viscosity and this makes a substantial saving in

the work of the heart, contributing to the maintenance of normal blood pressure as the cardiac output rises.

Since iron absorption is proportionately much increased during pregnancy and large quantities are absorbed from medicinal doses, there is a danger of excessive storage of iron.

The very wide individual variation in the extent of haemodilution makes it impossible to give an arbitrary lower value for haemoglobin concentration in normal pregnancy. Nevertheless, all published surveys of the incidence of anaemia in pregnancy rely on haemoglobin concentration as their main criterion. There has been no survey of anaemia in pregnancy on a more meaningful basis such as mean cell haemoglobin concentration. The diagnosis offers an opportunity for the exercise of clinical judgement.

A high incidence of "low" haemoglobin levels has been taken as evidence of poor nutrition, but, in the United Kingdom at least, the average diet provides more than enough iron for the extra requirements of pregnancy.

The treatment of iron deficiency anaemia in pregnancy is discussed.

Note on Technique

It is uncommon, in published papers, for the technique of blood sampling and of haemoglobin estimation to be described in detail, and yet results from different investigations cannot be adequately compared without full knowledge of the procedures used. The technical pitfalls of haemoglobinometry have frequently been stressed; readings vary between instruments and observer errors can be large. Even if one assumes that the technique of examining the blood has always been accurate, the procedure used for obtaining the blood can introduce gross errors, many of which have been reviewed by Walsh *et al.* (1953). There are seasonal and diurnal variations in venous haemoglobin concentration. Walsh *et al.* found the mean haemoglobin level in Sydney women in summer to be about 0·5 g. per 100 ml. below the winter mean; in 34 women the mean haemoglobin concentration at 9 a.m. was 0·34 g. per 100 ml. higher than the mean at 3 p.m., and the difference in some women was as high as 1 g. per 100 ml. between morning and afternoon readings. Physical exercise can cause a transitory haemoconcentration and lying down can cause a fall in haemoglobin level in peripheral blood. A tourniquet round the arm causes a progressive rise in the haemoglobin concentration of blood distal to it which is obvious after half a minute of constriction. Capillary blood from the finger tip has a considerably lower haemoglobin concentration than venous blood in pregnant women; Lund (1951) found an average difference of about 0·5 g. per 100 ml.

It can be appreciated from this summary of the known influences on venous haemoglobin concentration that substantial differences in haemoglobin values between groups of women can be introduced by differences of technique. For example, blood samples obtained by finger prick at an afternoon antenatal clinic are bound to show much lower readings than venous samples taken in the morning from the same women.

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1. TECHNIQUE

CHEMICAL

APPARATUS

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WOOD, T. **A laboratory electrodialyser and desalter.** *Biochem. J.*, 1956, **62,** 611–613. [Res. Dept., Bovril, Ltd., 148–166 Old St., London, E.C.1.]

4011

STADHOUDERS, J., MULDER, H. and VAN CAPELLEVEEN, A. G. **An automatic fraction collector for chromatographic analysis.** *Nederlands Melk Zuiveltijdschr.*, 1956, **10,** 60–63. [Lab. Dairying, Agric. Univ., Wageningen.] Dutch summary.

The device operates on the constant volume principle and is photo-electrically controlled.

H. G. Bray.

4012

HOTTA, K. and MORISHITA, M. **A Rf scale for paper chromatography.** *Nagoya J. Med. Sci.*, 1955, **18,** 183–185. [Dept. Biochem., Sch. Med., Nagoya Univ.]

The R_F scale consists of a plastic triangle with a right angle at the base and the sides forming the apex graduated into 100 equal divisions and joined by lines. If the origin spot of the chromatogram is placed at the beginning of the scale at the apex and the solvent front on the base, the line passing through the unknown spot seen through the transparent plastic gives the R_F value.—A. Hepburn.

4013

BANGHAM, D. R. **A collimated windowless Geiger counter for scanning chromatograms.** *Biochem. J.*, 1956, **62,** 550–551. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

4014

BANGHAM, D. R. **A simple helium-ethanol flow counter for monitoring chromatograph-column effluents containing weak β-emitting isotopes.** *Biochem. J.*, 1956, **62,** 552–553. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

4015

MIDKIFF, V. C. **Three devices which aid the crude fiber determination.** *J. Assoc. Off. Agric. Chem.*, 1956, **39,** 529–531. [Kentucky Agric. Exp. Stat., Lexington.]

Helpful additions to the apparatus used in the method of Midkiff and Shrader (Abst. 4, Vol. 20) are described.—A. Hepburn.

4016

HEIN, R. E., CLEGG, R. E., CLARK, T. J. and MCFARLAND, R. H. **Electrophoresis cells modified for determination of labeled protein fractions.** *Anal. Chem.*, 1956, **28,** 544–545. [Kansas State Coll., Manhattan.]

The ascending arm of the centre cell of the Tiselius apparatus is modified to permit measurement of the radio-activity associated with the protein front. The modification does not affect other observations usually required, *e.g.*, mobilities, electrophoretic patterns.—H. G. Bray.

4017

RAPPAPORT, F., EICHHORN, F. and NUTMAN, M. **An apparatus for microdetermination of CO_2 in plasma.** *J. Clin. Pathol.*, 1956, **9,** 166–170. [Beilinson Hosp., Petach Tiqua, Israel.]

A modified Van Slyke apparatus is described, for samples of from 0·05 to 0·1 ml. plasma. The results obtained can be read directly from Van Slyke's nomogram.—H. G. Bray.

4018

BOESEN, E. and LOUD, P. A. **A preliminary communication on a conductrimetric screening test for electrolytes.** *J. Clin. Pathol.*, 1956, **9,** 173–175. [Central Lab., Portsmouth.]

An apparatus for measuring the conductivity of plasma is described. The average normal range of values for plasma electrolytes found from 118 samples was from 290 to 310 m. equiv. per litre. The use of the test in the study of electrolyte balance is suggested.—H. G. Bray.

See also Absts. 4047, 4073.

ANALYTICAL METHODS

General

4019

CLAYTON, R. A. **Chamber size and R_f values of amino acids.** *Anal. Chem.*, 1956, **28,** 904–906. [Dept. Biochem., Sch. Med., George Washington Univ., Washington 5, D.C.]

The term " critical volume " is suggested for the volume of solvent necessary to saturate a specific chamber under given conditions. Volumes of solvent above this value give constant and minimum R_F values: volumes below the critical volume give constant maximum values. It is suggested that greater standardisation of R_F values would result if volumes of chamber and solvent were reported in publications.—H. G. Bray.

4020

POTTERAT, M. Une nouvelle technique de chromatographie sur papier. [**New technique for chromatography on paper.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1956, **47**, 66–71. [Serv. Féd. Hyg. Pub., Berne.] German and English summaries.

A procedure is described by which 8 spots can be run on the same circular chromatogram (cf. Matthias, *Naturwissenschaften*, 1954, **41**, 17).

H. G. Bray.

4021

GORBACH, G. and DEMMEL, H. Beiträge zur quantitativen "Test-tube"-Papierchromatographie. [**Quantitative "test-tube" paper chromatography.**] *Mikrochim. Acta*, 1956, No. 7–8, 1264–1276. [Inst. Biochem. Technol., Tech. Hochsch., Graz.]

A procedure for small-scale quantitative paper chromatography is described.—H. G. Bray.

4022

AZERAD, E., LEWIN, J. and GHATA, J. L'électrophorèse sur papier. Étude critique. [**Electrophoresis on paper. Critical study.**] *Presse méd.*, 1956, **64**, 717–719. [Lab. Nutrit., Hôp. Beaujon, Clichy.]

4023

AFONSO, E. and AFONSO, S. Uma nova técnica de microelectroforese. [**New technique for microelectrophoresis.**] *An. Inst. Med. trop.*, 1955, **12**, 757–764. [Lab. Anál., Estado India.] French and English summaries.

4024

HIMES, M. and MORIBER, L. **A triple stain for deoxyribonucleic acid, polysaccharides and proteins.** *Stain Technol.*, 1956, **31**, 67–70. [Dept. Zool., Columbia Univ., New York.]

The sequence of stains is Feulgen with azure A-Schiff reagent, periodic acid Schiff with basic fuchsin-Schiff reagent, and 0·02 per cent. naphthol yellow S in 1 per cent. acetic acid. Nuclei stain blue to green, polysaccharides red and proteins yellow. The procedure was found to be specially useful for stomach, intestine, kidney, thyroid and plant root tips.—H. G. Bray.

Carbohydrate Constituents

4025

LORING, H. S., LEVY, L. W. and MOSS, L. K. **Detection and paper chromatography of sugars and sugar phosphates in picric acid system.** *Anal. Chem.*, 1956, **28**, 539–540. [Dept. Chem., Stanford Univ., Calif.]

The solvent mixture consists of picric acid, 4 g., dissolved in *tert.*-butanol, 80 ml., and water, 20 ml. The papers are dried in air, sprayed with ethanolic NaOH and heated at 85° C. for 7 to 10 min.: sugars and sugar phosphates give reddish brown spots. R_F values are given for 14 sugars and 6 sugar phosphates.—H. G. Bray.

4026

GORDON, H. T., THORNBURG, W. and WERUM, L. N. **Rapid paper chromatography of carbohydrates and related compounds.** *Anal. Chem.*, 1956, **28**, 849–855. [Dept. Entomol., Univ. California, Berkeley 4.]

An account is given of an ascending procedure for the rapid separation and identification of carbohydrates in biological fluids without previous desalting or purification. Interference by inorganic salts is eliminated by the use of pyridinium sulphate. The developing solvent is *iso*propanyl : pyridine : acetic acid : water (8 : 8 : 1 : 4). R_F values are given for about 70 carbohydrates and derivatives, as well as their reactions with 4 spray reagents.—H. G. Bray.

4027

WOLFROM, M. L. and MILLER, J. B. **Detection of carbohydrates on paper chromatograms.** *Anal. Chem.*, 1956, **28**, 1037. [Dept. Chem., Ohio State Univ., Columbus 10.]

The dry chromatogram is sprayed with 1 per cent. sodium metaperiodate and 3 to 4 min. later with 1 per cent. aqueous potassium permanganate. After 5 min. excess permanganate is washed away and the chromatogram is dried and sprayed with a benzidine reagent (benzidine 1 g., trichloroacetic acid 8 g., anhydrous acetic acid 20 ml. and absolute ethanol 160 ml.). Carbohydrates are revealed as dark blue spots against a light blue background.—H. G. Bray.

4028

MORENO CALVO, J. Cromatografía de glúcidos sobre papel. [**Chromatography of sugars on paper.**] 1. Resultados con el sistema acetato de etilo-piridina-agua. [**1. Results with ethyl acetate, pyridine and water.**] 2. Aplicación a productos alimenticios y a otras sustancias naturales. [**2. Application to food products and other natural substances.**] *An. Bromatol.*, 1955, **7**, 95–105; 107–115. [Inst. Español Fisiol. Bioquím.]

1. The sugars were in 1 per cent. solution. Chromatography was on strips of Whatman No. 1 paper, 4 by 41 cm. The solvent was a 2 : 1 : 2 mixture of ethyl acetate, pyridine and distilled water. The developer was prepared by dissolving 930 mg. aniline and 1·6 g. phthalic acid in 10 ml. distilled water saturated with butanol. An illustration is given of a chromatogram showing arabinose, glucose, mannose, fructose, sucrose,

lactose and raffinose. R_F values are tabulated. Maximum sensitivity was obtained with 1·6 μl. of 1 per cent. solutions.

2. Sugars were identified in cow's milk, coffee with milk, sherry and fruit juices. Pure coffee was free from sugar. Inorganic ions present did not interfere.—D. Duncan.

4029

TING, S. V. **Rapid colorimetric methods for simultaneous determination of total reducing sugars and fructose in citrus juices.** *J. Agric. Food Chem.*, 1956, **4**, 263–266. [Florida Citrus Exp. Stat., Lake Alfred.]

The sugars are oxidised with ferricyanide and the ferrocyanide formed is converted to a blue derivative by an arsenomolybdate reagent and estimated colorimetrically. At 100° C. glucose and fructose are oxidised to equal extents: at 55° C. fructose is completely oxidised, but only 1/8 to 1/9 of the glucose, so that differential analysis of the sugars is possible.—H. G. Bray.

4030

SZUMSKA, M. Porównanie środków odbiałczających stosowanych przy ilościowyn oznaczaniu cukrów. [**Comparison of protein precipitants used in the quantitative estimation of sugars.**] *Rocz. Państwowego Zakł. Hig.*, 1956, **7**, 185–190. Russian and English summaries.

The properties of basic lead acetate plus NaH_2PO_4 or Na_2SO_4 and of Carrez's reagents (see Hadorn and Jungkunz, Abst. 4571, Vol. 20) used for protein precipitation in the estimation of sugars in honey, marmalade and wine are discussed. It was concluded that Carrez's reagents gave the best results and basic lead acetate plus Na_2SO_4 produced the greatest adsorption of sugar on the precipitate. (From English summary.)—A. Hepburn.

4031

HADORN, H. and BIEFER, K. W. Über den Einfluss von Aminosäuren auf die Zuckerbestimmung speziell nach der Methode von Potterat und Eschmann sowie nach Hadorn und von Fellenberg. [**Effect of amino acids on estimation of sugar, especially by the methods of Potterat and Eschmann and of Hadorn and von Fellenberg.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1956, **47**, 4–15. [Lab. VSK, Basle.] French and English summaries.

Some amino acids increase the reducing power of sugars and favour the formation of colloidal cuprous oxide.—H. G. Bray.

4032

GRIMBLEBY, F. H. **The determination of lactose in milk.** *J. Dairy Res.*, 1956, **23**, 229–237. [Dept. Agric. Chem., Univ. Reading.]

Protein-free milk serum was made by adding 5 ml. of a zinc acetate and phosphotungstic acid reagent (25 g. and 12·5 g., respectively, 20 ml. glacial acetic acid and water to 100 ml.) to 40 ml. milk, diluting to 50 ml. and filtering. The lactose in this solution of p_H 4·6 was estimated by polarimetry, with corrections for the percentage and specific volumes of the precipitated protein and fat. After experiments with different protein-precipitating agents at different p_H values it is suggested that any errors introduced by conditions affecting the lactose content of the serum, namely, (1) incomplete precipitation of protein, (2) formation of lactose-protein complexes and (3) degree of hydration of the protein coagulum, were reduced to a minimum by this method.—A. Hepburn.

4033

KRAJČINOVIĆ, M. and DJUKIĆ-JOVANOVIĆ, J. Über den Einfluss der Salzsäure auf den hydrolytischen Abbau von Stärke und Stärkerohstoffen im Zusammenhang mit der quantitativen Bestimmung der Stärke. [**Effect of hydrochloric acid on the hydrolytic decomposition of starch and materials containing starch, with reference to the quantitative estimation of starch.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1956, **103**, 350–355. [Tehnički Fak., Zagreb.]

The effect of different concentrations of HCl on the hydrolysis of maize, maize starch and residues was studied by estimating reducing values and dextrin content. The results obtained did not agree with those obtained with standard polarimetric procedures.—H. G. Bray.

4034

DOUGALL, H. W. **Crude fibre: its determination and its place in the analysis of animal feeding-stuffs.** *E. African Agric. J.*, 1956, **21**, 225–229. [Grassland Res. Stat., Dept. Agric., Kenya.]

The work of Voelcker, and of Henneberg and Stohman, leading to establishment of the Weende method for the estimation of crude fibre is described. The present modifications of the method by other workers and its shortcomings are discussed.

T. D. Bell.

4035

ROADHOUSE, F. E. and MACDOUGALL, D. **A study of the nature of plant lignin by means of alkaline nitrobenzene oxidation.** *Biochem. J.*, 1956, **63**, 33–39. [Ontario Agric. Coll., Guelph.]

4036

GYERMEK, L. and FEKETE, GY. **Studies with a simple method of liver glycogen estimation.** *Acta physiol. hung.*, 1955, **8**, 259–267. [Pharmacol. Dept., Pharmaco-Indust. Res. Inst., Budapest.] Russian summary.

Liver homogenate is deproteinised with trichloroacetic acid, alcohol is added to the filtrate and the turbidity is measured photometrically. The accuracy of the method is claimed to be comparable with that of hydrolytic methods and greater than that of colorimetric methods.—H. G. Bray.

See also Abst. 4134.

Nitrogenous Constituents

4037

SHAH, G. D., PANSARE, V. S. and MULAY, V. N. **A modified micro-Dumas method for rapid determination of nitrogen.** *Mikrochim. Acta*, 1956, No. 7–8, 1140–1143. [Nat. Chem. Lab., Poona, India.]

A procedure for serial estimations is described in which the copper oxide in the tube need not be changed for each analysis, nor heating discontinued.

H. G. Bray.

4038

BELCHER, R. and BHATTY, M. K. **The elimination of the distillation procedure in the Kjeldahl method.** *Mikrochim. Acta*, 1956, No. 7–8, 1183–1186. [Chem. Dept., Univ. Birmingham.]

After digestion, with mercury as catalyst, the solution is diluted, neutralised and treated with KBr. Excess sodium hypochlorite is added to oxidise ammonia, then excess arsenious oxide. The excess of the latter is estimated by titration with hypochlorite, with tartrazine as indicator. This procedure is not applicable when preliminary reduction is necessary.—H. G. Bray.

4039

MONTY, K. J., MORRISON, M., ALLING, E. and STOTZ, E. **Electrophoresis of cationic proteins on filter paper.** *J. Biol. Chem.*, 1956, **220,** 295–302. [Dept. Biochem., Sch. Med. Dent., Univ. Rochester, N.Y.]

Adsorption of cationic proteins on filter paper results in tailing, so that mobility depends on the concentration of protein. This can be prevented by impregnating the paper with a cation detergent.

H. G. Bray.

4040

SCHOBER, R. and HETZEL, H. Zur Trennung von Milchproteinen durch Säulenchromatographie. **[Separation of milk proteins by chromatography on columns.]** *Milchwissenschaft*, 1956, **11,** 63–65. [Staatl. Milchwirtsch. Lehr.-Forschungsanst., Wangen, Allgäu.] English and French summaries.

The proteins are adsorbed on alumina columns at *p*H 4·2 and fractionally eluted with phosphate buffers of different *p*H and ionic strength. The proteins in the eluates are estimated by the biuret reaction and examined by paper electrophoresis.

H. G. Bray.

4041

SCHOBER, R. and HETZEL, H. F. Über eine einfache, kolorimetrische Bestimmung von Milchproteinen. **[Simple colorimetric estimation of milk proteins.]** *Milchwissenschaft*, 1956, **11,** 123–126. [Staatl. Milchwirtsch. Lehr.-Forschungsanst., Wangen, Allgäu.]

Milk is treated with a solution of Amidoschwarz 10B at *p*H 2·8 and centrifuged. The dye not adsorbed by the proteins and remaining in the supernatant fluid is measured spectrophotometrically at 578 mμ. The method is standardised against the Kjeldahl method and gives results comparable with those of formol titration.—H. G. Bray.

4042

ROLAND, F. Die quantitative Bestimmung der Hüllenieweiss-substanz der Milchfettkügelchen. **[Quantitative estimation of the protein substance of the membrane of milk fat globules.]** *Milchwissenschaft*, 1956, **11,** 85–87. [Lab. Milchverwertungs-Genossensch., Herford.] English, Spanish and French summaries.

A method based on ascertainment of the partition of nitrogen between the layers of centrifuged milk is described. It is calculated that there is about 1 g. protein per 100 g. milk fat.—H. G. Bray.

4043

PARSONS, T. R. and BAKER, B. E. **Studies on protein hydrolysis. 3. The preparation and analysis of sulphurous acid hydrolysates of casein.** *J. Sci. Food Agric.*, 1956, **7,** 261–265. [Dept. Chem., Fac. Agric., Macdonald Coll., McGill Univ., Que.]

For part 2 see Abst. 1607, Vol. 25.

3. Casein was hydrolysed by heating for 24 hr. at 100° C. with *N* HCl saturated with SO_2. SO_2 was removed by evaporation under reduced pressure and HCl by passage through a column of anion-exchange resin. The hydrolysate contained half the tryptophan of casein, less total N, and relatively less acid amino acids and more basic amino acids. Rat feeding trials showed that the hydrolysate was not inferior to casein or a commercial enzymic digest of casein.—A. Hepburn.

4044

UDY, D. C. **Estimation of protein in wheat and flour by ion-binding.** *Cereal Chem.*, 1956, **33,** 190–197. [Field Crops Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Pullman, Wash.]

The method depends on the binding of the dye Orange G by wheat proteins at *p*H 2·2 to form an insoluble complex. The samples are treated with an excess of a buffered solution of the dye and the excess is measured colorimetrically. Starch and bran bind significant amounts of dye.

H. G. Bray.

4045

BUGYI, B. Vereinfachung der refraktometrischen Bestimmung des Bluteiweissgehaltes. [**Simplification of the refractometric estimation of blood protein.**] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselkr.*, 1956, **16,** 120–121. [Komitatskrankenhaus, Szolnok, Hungary.]

A nomogram is given relating refractive index and temperature to protein content.—H. G. Bray.

4046

SMITHIES, O. and POULIK, M. D. **Two-dimensional electrophoresis of serum proteins.** *Nature*, 1956, **177,** 1033. [Connaught Med. Res. Labs.]

The proteins are separated first by electrophoresis on filter paper and then in a starch gel in a direction at right angles to the first. This technique gives information about the distribution of molecular sizes in electrophoretic fractions.

H. G. Bray.

4047

LAURELL, C. B., LAURELL, S. and SKOOG, N. **Buffer composition in paper electrophoresis : considerations on its influence, with special reference to the interaction between small ions and proteins.** *Clin. Chem.*, 1956, **2,** 99–111. [Lab. Clin. Chem., Malmö Hosp., Sweden.]

An apparatus built on the moist-chamber principle is described. The separated fractions were eluted with 0·1 *N* Na_2CO_3 and their absorption was measured at 595 mμ. When small amounts of Ca ions were added the β-lipoprotein fraction of serum was resolved into 2 fractions. The effect of Ca on the mobility of other fractions was studied.

H. G. Bray.

4048

HIRSCH, A. and CATTANEO, C. **The quantitative determination of plasma fibrinogen through the electrophoresis of blood plasma on filter paper.** *Arch. Biochem. Biophys.*, 1956, **61,** 27–37. [Dept. Biol. Chem., Clin. Tisiol., Univ. Rome.]

4049

WYCOFF, H. D. **A microassay for plasma fibrinogen.** *J. Lab. Clin. Med.*, 1956, **47,** 645–648. [Augusta, Ga.]

4050

GOTTSCHALK, A. and ADA, G. L. **The separation and quantitative determination of the component sugars of mucoproteins.** *Biochem. J.*, 1956, **62,** 681–686. [Walter and Eliza Hall Inst. Med. Res., Melbourne, Australia.]

The procedure consists in acid hydrolysis of the mucoprotein, neutralisation and concentration of the hydrolysate, removal of unhydrolysed protein and polypeptides by precipation with ethanol, removal of amino acids and peptides on an ion-exchange resin and identification of amino acids by paper chromatography. The accuracy of the method is $\pm$ 10 per cent.—H. G. Bray.

4051

BALIKOV, B. and CASTELLO, R. A. **Urinary peptides : method for assay.** *Clin. Chem.*, 1956, **2,** 83–90. [Surg. Res. Unit, Brooke Army Med. Centre, Fort Sam Houston, Tex.]

The method depends on application of the biuret reaction to a tungstic acid filtrate of urine treated with Permutit. The value, as glutathione, for normal subjects was found to be from 1·1 to 4·7 g. per 24 hr.—H. G. Bray.

4052

CHERKIN, A., WOLKOWITZ, H. and DUNN, M. S. **Modified ultraviolet spectrophotometric micromethod for determination of amino acids and peptides as copper complexes.** *Anal. Chem.*, 1956, **28,** 895–896. [Chem. Lab., Univ. California, Los Angeles.]

A simplification of the method of Spies (Abst. 1516, Vol. 22) is described.—H. G. Bray.

4053

BECK, M. T. and ÉBREY, P. **Interaction of substances during the process of paper chromatography.** *Biochim. biophys. Acta*, 1956, **20,** 393. [Inst. Inorg. Anal. Chem., Dept. Paediat., Univ. Szeged, Hungary.]

The interaction of amino acids is considered. The use of complexes of amino acids and metals, which do not interact, is suggested.—H. G. Bray.

4054

SAIFER, A. and ORESKES, I. **Color reaction of amino acids with alloxan, isatin and ninhydrin in circular paper chromatography.** *Anal. Chem.*, 1956, **28,** 501–504. [Isaac Albert Res. Inst., Brooklyn, N.Y.]

R_F values are given for 51 amino acids and related compounds in phenol : water and butanol : acetic acid : water systems, and the colours given on paper by these compounds with ninhydrin, alloxan and isatin. The use of these reagents for distinguishing compounds with similar R_F values is discussed.—H. G. Bray.

4055

BARROLLIER, J., HEILMAN, J. and WATZKE, E. Polychrome Sichtbarmachung von Aminosäuren auf Papierchromatogrammen und Elektropherogrammen. [**Polychromatic reagents for colouring amino acids on paper chromatograms and electropherograms.**]

Hoppe-Seyler's Ztschr., 1956, **304**, 21–25. [Hauptlab. Schering A.G., West Berlin.] English summary.

Two detecting reagents are described, containing isatin and 1 : 2-naphthoquinone - 4 - sulphonic acid, respectively. These give a range of colours with amino acids at different concentrations.

H. G. Bray.

4056

SCHOBER, R., PRINZ, I. and CHRIST, W. Quantitative Mikrobestimmung von Aminosäuren als Dinitrophenyl - Derivate; Anwendung auf Untersuchungen zur Verdaulichkeit von hocherhitzter Milch. [**Quantitative micro-estimation of amino acids as dinitrophenyl derivatives; application to studies of digestibility of milk heated to high temperatures.**] *Milchwissenschaft*, 1956, **11**, 209–210. [Staatl. Milchwirtsch. Lehranst., Wangen, Allgäu.]

The dinitrophenyl amino acids were separated by 2-dimensional paper chromatography, with toluene : ethylene chlorhydrin : pyridine : 0·8 *N* NH_4OH (5 : 3 : 1·5 : 3) followed by phosphate buffer as developing solvents. The separate compounds were cut out, eluted with water and estimated spectrophotometrically. Fifteen amino acids were estimated in the portal blood of dogs which had been given unheated milk and milk heated at 92° to 112° C.—H. G. Bray.

4057

ROSENBERG, H., ENNOR, A. H. and MORRISON, J. F. **The estimation of arginine.** *Biochem. J.*, 1956, **63**, 153–159. [Dept. Biochem., John Curtin Sch. Med. Res., Australian Nat. Univ., Canberra.]

The method depends on the reaction of arginine, diacetyl and α-naphthol in propanol solution to give a red colour and is applicable to protein hydrolysates. Other guanido compounds, *e.g.*, streptomycin, may also be estimated by the procedure described.—H. G. Bray.

4058

GILBOE, D. D. and WILLIAMS, J. N. (Jr.) **Evaluation of the Sakaguchi reaction for quantitative determination of arginine.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91**, 535–536. [Dept. Biochem., Univ. Wisconsin, Madison.]

A procedure is described suitable for the estimation of from 0 to 30 μg. arginine in 5-ml. samples of amino acid mixtures, *e.g.*, protein hydrolysates.

H. G. Bray.

4059

HOLASEK, A., LIEB, H. and MERZ, W. Zur mikroanalytischen Bestimmung von Cystin und Methionin. [**Micro-analytical estimation of cystine and methionine.**] *Mikrochim. Acta*, 1956, No. 7–8, 1216–1218. [Med. Chem. Inst., Univ. Graz.]

The apparatus described is a modification of that of Kuhn *et al.* (Abst. 26, Vol. 9) and can be used for the estimation of sulphydryl, thiomethyl and alkoxy groups.—H. G. Bray.

4060

HALPERN, Y. S. and GROSSOWICZ, N. **Determination of L-glutamic acid by use of L-glutamic acid decarboxylase from *Mycobacterium phlei*.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91**, 370–373. [Dept. Bacteriol., Hebrew Univ.-Hadassah Med. Sch., Jerusalem.]

The preparation used had no decarboxylase activity towards 18 other amino acids, and no glutaminase or glutamo-racemase activity.

H. G. Bray.

4061

MIYADA, D. S. and TAPPEL, A. L. **Colorimetric determination of hydroxyproline.** *Anal. Chem.*, 1956, **28**, 909–910. [Dept. Food Technol., Univ. California, Davis.]

A modification of the method of Neuman and Logan (Abst. 1335, Vol. 20) is described and the results of its application to samples of collagen and gelatine are given.—H. G. Bray.

4062

HUNTER, I. R., DIMICK, K. P. and CORSE, J. W. **Determination of amino-acids by ninhydrin oxidation and gas chromatography. Separation of leucine and *iso*leucine.** *Chem. and Indust.*, 1956, No. 16, 294–295. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 10, Calif.]

Aldehydes formed by the oxidation of amino acids with ninhydrin are subjected to gas chromatography in a 10-ft. column filled with a mixture of silicone and celite.—H. G. Bray.

4063

MILLER, G. D., JOHNSON, J. A. and MILLER, B. S. **Fluorometric micromethod for determination of tryptophan.** *Anal. Chem.*, 1956, **28**, 884–887. [Dept. Flour Feed Milling Indust., Kansas State Coll., Manhattan.]

To separate tryptophan from other amino acids the sodium form of Dowex-50 is used and the separated tryptophan is treated with glucose at *p*H 1·38 and 118° C. for 4 hr. The fluorescence of the products is measured at *p*H 1·8.—H. G. Bray.

4064

MILKS, J. E. and JANES, R. H. **Separation and detection of cyanamide and its derivatives and determination of urea by paper chromatography.** *Anal. Chem.*, 1956, **28**, 846–849.

[North American Cyanamid, Ltd., Welland Plant, Niagara Falls, Ont.]

The solvents used are 1-butanol : ethanol : water (4 : 1 : 1) and methyl ethyl ketone : light petroleum : water (9 : 4 : 3) and the paper is Whatman No. 3 or 3 MM. Detecting reagents are ferricyanide : nitroprusside, ammoniacal silver nitrate, *p*-dimethylaminobenzaldehyde, 2 : 6-dichloro-quinone - chloroimide and 1 : 2 - naphthoquinone - 4 - sodium sulphonate. R_F values and colour reactions are given for a number of cyanamide derivatives. Urea can be estimated with 95 per cent. recovery by elution, the intensity of the colour given with *p*-dimethylaminobenzaldehyde being measured at 420 mμ.—H. G. Bray.

See also Absts. 4016, 4223, 4247, 4564, 4686.

Lipoid Constituents

4065

MANGOLD, H. K., LAMP, B. G. and SCHLENK, H. **Indicators for the paper chromatography of lipids.** *J. Amer. Chem. Soc.*, 1955, **77**, 6070–6072. [Univ. Minnesota, Austin.]

Mixtures of microgram quantities of known lipids were subjected to reversed-phase chromatography on Whatman No. 1 paper impregnated with silicone, with acetic acid and water, tetrahydrofuran and water, and chloroform and methanol as solvents. The R_F values are given for a range of saturated and unsaturated fatty alcohols, acids, methyl esters of fatty acids and mono-, di-, and triglycerides. A spray of 1 per cent. α-dextrin in 30 per cent. ethanol followed by exposure to iodine vapour revealed unsaturated alcohols, acids, esters and monoglycerides; the corresponding saturated compounds remained colourless. Di- and triglycerides responded only after hydrolysis into free acids and monoglycerides; this was achieved by spraying the chromatograms with 1 per cent. pancreatin in water and incubating for 24 hr. at 37° C. in a damp atmosphere.

Direct exposure of the chromatograms to iodine vapour was found useful for the detection of certain unsaturated compounds, such as alcohols, esters, acids and some glycerides, which give yellow or brown spots on a white background. However, such compounds as symmetrical oleodipalmitin could not be located satisfactorily on chromatograms by this procedure. Lead tetra-acetate revealed monoglycerides as white spots on a black background and could be used to detect di- and triglycerides after they had been subjected to hydrolysis with the pancreatin spray.

G. A. Garton.

4066

LAGONI, H. and SAMHAMMER, E. Ein Beitrag zur Bestimmung der Jodzahl in Nahrungsfetten. [**Estimation of iodine number in edible fats.**] *Milchwissenschaft*, 1956, **11**, 132–133. [Physikal. Inst., Bundesforschungsanst. Milchwirtsch., Kiel.] English, Spanish and French summaries.

An estimate of the iodine value can be made from the refractive index of the fat, so that the approximate quantity of halogen reagent for the estimation can be calculated.—H. G. Bray.

4067

TEASDALE, B. F. and SVARDAL, R. **A modified dilatometer for fast evaluation of "solids content" in fats.** *J. Amer. Oil Chem. Soc.*, 1956, **33**, 78–80. [Canada Packers, Ltd., Toronto.]

4068

GODFRAIN, J. C. and TRACATÉLIS, D. Application d'une méthode sinacide de dosage de la matière grasse du lait aux produits laitiers. [**Application to dairy products of a method without acid for estimating milk fat.**] *Rev. Méd. vét., Toulouse*, 1956, **107**, 248–250.

The method described earlier (Abst. 55, Vol. 26) is applied to butter and cheese.—H. G. Bray.

4069

POHJA, M. S., KOMULAINEN, S. E. and NIINIVAARA, F. P. Die Fettbestimmung in Fleisch und Fleischprodukten nach dem Verfahren von Gerber. [**Estimation of fat in meat and meat products by the Gerber method.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1956, **103**, 333–341. [Osuusteurastamojen Tutkimuslaitos, Hämeenlinna, Finland.]

The results obtained by the procedure described are in general agreement with those by the Schmid-Bondzynski-Ratzlaff and Soxhlet procedures.

H. G. Bray.

4070

PERILÄ, O. **Separation of saturated straight chain fatty acids. 3. Quantitative paper chromatography.** *Acta chem. scand.*, 1956, **10**, 143–144. [Finland Inst. Technol., Helsinki.]

For previous parts see Absts. 62, 1433, Vol. 26.

3. The acids are converted to their hydroxamic derivatives via their methyl esters and separated by circular paper chromatography. The spray reagent is ferric chloride. The spots are cut out and the ferric complexes of the hydroxamic acids are eluted with an acid ferric chloride solution and estimated photometrically at 520 mμ. For acids from formic to valeric the developing solvent is *n*-butanol : benzene : water (1 : 1 : 1) and for acids from caproic to pelargonic, benzene : formic acid : water (1 : 1 : 1). For acids from capric to cerotic, paper saturated with hydrocarbon is used, the developing solvent being acetic acid : water (9 : 1) saturated with hydrocarbon. After development

the dried paper is treated with 1·5 per cent. silver nitrate, washed and sprayed with 0·05 per cent. ethanolic *p*-diethylaminobenzylidenerhodanine, which gives silver spots visible in ultraviolet light. These are cut out and wet-ashed and Ag in the residue is estimated colorimetrically with dithizone.

H. G. Bray.

4071

BERGMANN, F. and SEGAL, R. **The separation and determination of microquantities of lower aliphatic acids, including fluoroacetic acid.** *Biochem. J.*, 1956, **62,** 542–546. [Dept. Pharmacol., Hebrew Univ.-Hadassah Med. Sch., Jerusalem.]

Fluoroacetate, formate, acetate and other fatty acids could be separated by 2-dimensional paper chromatography of the hydroxamates with, first, 95 per cent. ethanol containing 5 per cent. NH_3, pyridine and water (3 : 1 : 1), then 95 per cent. ethanol, dioxan, water and acetic acid (60 : 20 : 19 : 1) as solvent mixture. Mixtures of formate, acetate and fluoroacetate in water and in serum were quantitatively analysed by elution from the paper, oxidation with iodine to nitrite and colorimetric measurement of the azo dye produced on addition of naphthylamine.

A. Hepburn.

4072

JAMES, A. T. and MARTIN, A. J. P. **Gas-liquid chromatography: the separation and identification of the methyl esters of saturated and unsaturated acids from formic acid to *n*-octadecanoic acid.** *Biochem. J.*, 1956, **63,** 144–152. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

The previous method of the authors (Abst. 77, Vol. 22) for the separation of micro amounts of fatty acids has been extended to include acids up to C_{18} by using a gas density meter and the methyl esters of the acids. The methyl esters of the saturated acids C_1 to C_6 were separated at 78·7° C. with a stationary phase of liquid paraffin or dioctyl phthalate. Esters from C_5 to C_{18} were separated at 197° or 205° C. with a stationary phase of a vacuum stopcock grease or an extract of a heavy lubricating oil. A good separation of normal from *iso*- or *anteiso*-saturated acids and mono- from di-unsaturated acids was obtained, but saturated acids could be distinguished from unsaturated acids of the same chain length only by the chromatographic behaviour of the latter before and after chemical modification.—A. Hepburn.

4073

VANDENHEUVEL, F. A. and VATCHER, D. R. **Partition chromatography of aliphatic acids. Quantitative resolution of normal chain even acids from C_{12} to C_{24}.** *Anal. Chem.*, 1956, **28,** 838–845. [Fish. Res. Board Canada, Halifax, N.S.]

Use is made of reversed-phase chromatography on silicic acid columns treated with silane, with *iso*-octane as stationary phase and aqueous methanol as eluting solvent. The procedure is applicable to less than 50 mg. material and takes about 5 hr. An automatic device for changing the composition of the eluting solvent and a semi-automatic microburette driven by motor are described.

H. G. Bray.

4074

HASHMI, M. H. and CULLIS, C. F. **Paper chromatography of fatty acids and halogenated organic acids.** *Anal. chim. Acta*, 1956, **14,** 336–338. [Dept. Chem., Imp. Coll. Sci. Technol., London.] French and German summaries.

The developing solvent consists of propanol 70 and strong ammonia 30 per cent. All the acids can be detected by spraying with B.D.H. universal indicator, iodo acids by treating with chlorine to liberate iodine, which gives a dark colour with ammonia, and bromo acids by spraying with fluorescein and subsequent treatment with chlorine; this liberates bromine, which converts fluorescein to eosin. Fluorescein is also used to differentiate between bromo and iodo acids. R_F values are given for a number of simple fatty acids and their bromo and iodo derivatives.

H. G. Bray.

4075

MANUS, L. J. and BENDIXEN, H. A. **Effects of lipolytic activity and of mercuric chloride on the Babcock test for fat in composite milk samples.** *J. Dairy Sci.*, 1956, **39,** 508–513. [Dept. Dairy Sci., State Coll. Washington, Pullman.]

The decrease of fat and the increase of free fatty acids in composite milk samples after storage was apparently due to lipolytic hydrolysis. Tablets of $HgCl_2$ added to preserve the milk seemed to increase the hydrolysis, but this effect was slightly reduced by copper as $CuSO_4$. Hydrolysis of fat in milk preserved with $HgCl_2$ was effectively prevented by heating to 160° F. for 30 to 60 sec. to inactivate the lipase.—A. Hepburn.

4076

FREEMAN, T. R. and LEWALLEN, W. F. **Applying Hillig's rapid method for water-insoluble acids to fresh milk.** *J. Dairy Sci.*, 1956, **39,** 219–220. [Kentucky Agric. Exp. Stat., Lexington.]

Milk was separated within 15 min. after it was drawn from individual cows and water-insoluble fatty acids were estimated in the cream by Hillig's method (Abst. 2754, Vol. 24). Values were roughly inversely proportional to the fat content

of the cream and could be varied considerably by changing the setting on the skimmed milk screw. Dilution of the cream with skimmed milk produced a greater increase than dilution with water. The variations in values indicated lipolysis. Heating the freshly drawn milk at 160° F. for 30 min. to inactivate lipase was considered to give the best results.—A. Hepburn.

4077

CERUTTI, G. and TAMBORINI, A. Sulla determinazione del "numero di acido butirrico" nel burro. [**Estimation of the butyric acid number of butter.**] *Ann. Sper. agrar.*, 1956, **10,** 447–450. [Ist. Indust. Agrar., Univ. Milan.] English summary.

For the estimation 5 g. fat was melted, filtered and saponified with 2 ml. KOH solution and 10 g. glycerine, and was then treated while warm with 150 ml. saturated aqueous K_2SO_4 solution. After cooling to room temperature, 5 ml. H_2SO_4 solution, 1 part acid to 2 parts water, was added, then 10 ml. saponified coconut oil and some powdered SiO_2. After filtration, samples were titrated with 0·1 *N* NaOH. The difference between the value obtained and that from a blank was multiplied by 1·4 to give the butyric acid number.

Reichert Meissl Wollny number, Polenske number, Tortelli Jaffe reaction and butyric acid number are tabulated for Italian butters, ewe milk butter, margarine, whale oil, lard and adulterated butters. Adulterated butters tended to have lower butyric acid numbers than pure butter, for which the lowest value was 19·5.—D. Duncan.

4078

BARNETT, A. J. G. and TAWAB, G. A. **The estimation of the total volatile fatty acids in cheese.** *J. Dairy Res.*, 1956, **23,** 277–282. [Div. Agric. Biochem., Dept. Biol. Chem., Univ. Aberdeen.]

Total volatile fatty acids in different cheeses were estimated by extraction with ether in a Soxhlet apparatus for 8 hr. and micro-distillation from a Markham Kjeldahl apparatus. The results compared favourably with those obtained by the more complicated method of Smiley *et al.* (Abst. 2528, Vol. 16) and the method was more convenient for multiple analyses.—A. Hepburn.

4079

DOMART, C., MIYAUCHI, D. T. and SUMERWELL, W. N. **The fractionation of marine-oil fatty acids with urea.** *J. Amer. Oil Chem. Soc.*, 1955, **32,** 481–483. [Fish. Technol. Lab., Seattle, Wash.]

Menhaden oil fatty acids were fractionated at 1° C. by formation of urea complexes, with methanol as solvent; the molar ratio of urea to fatty acid was varied from 4·6 : 1 to 23·0 : 1. At molar ratios of 12 : 1 to 13 : 1 almost all the saturated and monoethenoid acids were removed as urea complexes. With higher proportions of urea to fatty acid, fractions with iodine values above 300 were obtained in the filtrates.

With a urea : fatty acid ratio of 9·2 : 1 the fatty acids of menhaden, herring, tuna and seal oils and oils from salmon eggs, viscera and heads were fractionated at different temperatures. At 25° and 1° C. the urea complexes included saturated and monoethenoid fatty acids; at − 30° an increased content of dienoic acids was found in the complexes.—G. A. Garton.

4080

COLLINS, F. I. and SEDGWICK, V. E. **A rapid spectrophotometric method for determining the linoleic and linolenic acid components of soybean oil.** *J. Amer. Oil Chem. Soc.*, 1956, **33,** 149–152. [U.S. Dept. Agric., Urbana, Ill.]

A procedure is described in which soya bean oil is subjected to alkali isomerisation using 11 per cent. KOH in glycerol at 180°C. in open bottles in a forced-draught air oven. Optical densities in methanol are then measured at 268 mμ. and 233 mμ. in special cells and the percentages of linoleic and linolenic acid are calculated from a nomogram.

G. A. Garton.

4081

CORSINI, F. La determinazione degli acidi linoleico, linolenico e arachidonico nel latte e nel sangue. 3. La determinazione nel sangue. [**Estimation of linoleic, linolenic and arachidonic acids in milk and blood. 3. Estimation in blood.**] *Acta vitaminol.*, 1956, **10,** 64–69. [Ist. Clin. Pediat., Univ. Bologna.] French, English, German and Spanish summaries.

For previous parts see Absts. 4491, Vol. 21; 111, Vol. 25.

3. The fats are extracted from 2 ml. serum by boiling in Bloor's mixture (3 parts ethanol to 1 part ether) and saponified with KOH. The solvents are removed by evaporation and the fatty acids are then liberated with H_2SO_4 and extracted with ether. The ether extract is isomerised and examined in the Beckman spectrophotometer as described in Abst. 111, Vol. 25.

A negative value was commonly obtained for linolenic acid. The mean values for 5 estimations on the same sample were linoleic acid 55·6 ± 4·99, linolenic acid − 6·3 ± 2·48 and arachidonic acid 24·7 ± 3·06 mg. per cent.—D. Duncan.

4082

MICHALEC, Č. Metabolismus lipidů. Chromatografické dělení vyšších mastných kyselin v lidském krevním seru. [**Metabolism of lipids. Chromatographic separation of higher fatty**

acids in human blood serum.] *Čas. Lék. čes.*, 1956, **95,** 126–128. [Biochem. Lab. FN 1, Prague.] English and Russian summaries.

4083

JAMES, A. T. and WHEATLEY, V. R. **Studies of sebum. 6. The determination of the component fatty acids of human forearm sebum by gas-liquid chromatography.** *Biochem. J.*, 1956, **63,** 269–273. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

6. The procedure of James and Martin (see Abst. 4072) was applied to methyl esters of the fatty acids. Odd- and even-numbered straight-chain fatty acids and 2 types of branched-chain odd-numbered saturated fatty acids were found; the chief unsaturated fatty acids contained 14, 16 and 18 carbon atoms.—H. G. Bray.

4084

WITTENBERG, J. B., KOREY, S. R. and SWENSON, F. H. **The determination of higher fatty aldehydes in tissues.** *J. Biol. Chem.*, 1956, **219,** 39–47. [Dept. Biochem., Sch. Med., Western Reserve Univ., Cleveland, Ohio.]

A sample of total lipid extract, containing from 0·1 to 7·0 μ moles aldehyde, is concentrated almost to dryness in a stream of air at 70° C. and treated at 70° C. with *p*-nitrophenylhydrazine in solution in ethanol and H_2SO_4. The aldehyde phenylhydrazones are extracted with light petroleum, b.p. 60° to 70° C., the extract is concentrated and the residue is dissolved in ethanol and the optical density measured at 395 mμ. Lower aldehydes and keto acids do not interfere.—H. G. Bray.

4085

DOUSTE-BLAZY, L., POLONOVSKI, J. and VALDIGUIÉ, P. Chromatographie sur papier des phospholipides. [**Paper chromatography of phospholipins.**] *Bull. Soc. Chim. biol.*, 1956, **38,** 19–25. [Lab. Chim. Biol., Fac. Méd. Pharm., Toulouse.] English and German summaries.

A technique is described in which 2 non-miscible solvents are used simultaneously, one ascending and one descending the paper strip. Five pairs of solvents are described.—H. G. Bray.

4086

DOUSTE-BLAZY, L., POLONOVSKI, J. and VALDIGUIÉ, P. Fractionnement chromatographique des lipides sanguins. Étude des phosphatides. [**Chromatographic fractionation of blood lipids. Study of phosphatides.**] *Bull. Soc. Chim. biol.*, 1956, **38,** 27–33. [Lab. Chim. Biol., Fac. Méd. Pharm., Toulouse.] English and German summaries.

Material extracted from blood by mixtures of alcohol and ether was dissolved in chloroform and fractionated by precipitation with acetone. The solvents used for chromatography were acetic acid : methanol : water (10 : 10 : 1) and light petroleum : chloroform (21 : 4) (*cf.* preceding Abst.), and the detecting agents were Sudan black, phosphomolybdic acid, ninhydrin and silicotungstic acid. Experiments were also made on blood labelled with ^{32}P. The fractionations achieved are compared with those given by counter-current distribution.—H. G. Bray.

4087

FURMAN, R. H., NORCIA, L. N., FRYER, A. W. and WAMACK, B. S. **Lipoprotein recovery following ultracentrifugal fractionation at solvent density 1·21 as determined by cholesterol and lipid phosphorus analyses of supernatant and bottom fractions.** *J. Lab. Clin. Med.*, 1956, **47,** 730–734. [Cardiovascular Sect., Oklahoma Med. Res. Inst.]

It is concluded that methods commonly applied to the analysis of lipids in whole serum are not directly applicable under the conditions considered in this study.—H. G. Bray.

4088

BYERS, S. O. and FRIEDMAN, M. **The fractionation of cholesterol in body fluids by means of solvent extraction.** *J. Clin. Invest.*, 1956, **35,** 405–410. [Harold Brunn Inst., Mount Zion Hosp., San Francisco 15, Calif.]

Part of the cholesterol of samples of serum and lymph from rats could be extracted with a mixture of alcohol and ether (1 : 9 v/v). The amount extracted was found to be proportional to the lipid content of the sample.—H. G. Bray.

Other Organic Constituents

4089

HALSE, K. and VELLE, W. Om fargeintensiteten av Rotheras reaksjon på aceton i urin hos kyr ved varierende konsentrasjon av total acetonlegemer i blod. [**Intensity of colour in Rothera's reaction for acetone in urine in cows with different concentrations of total ketones in the blood.**] *Nord. Vet.-Med.*, 1956, **8,** 397–416. [Fysiol. Inst., Norges Vet.-Høgsk.] English and German summaries.

4090

NAIR, K. K. and MUTHE, P. T. **B.D.H. Universal and "4.5" indicators as spray reagents for the detection of organic acids.** *Naturwissenschaften*, 1956, **43,** 106. [Dept. Biol., Wilson Coll., Bombay.]

B.D.H. universal indicator gives rose spots on an almost white background and "4.5" indicator light brown spots against a green background.

H. G. Bray.

4091

SILBERSTEIN, O. O., ADJARIAN, R. M. and THOMPSON, J. F. **Determination of pipecolic acid in biological materials.** *Anal. Chem.*, 1956, **28,** 855–857. [U.S. Plant, Soil Nutrit. Lab., Agric. Res. Serv., Ithaca, N.Y.]

The method depends on the colour given by pipecolic acid and ninhydrin under acid conditions and is applicable to urine and plant extracts. Interference by salts and α-amino acids can be prevented by chromatography on the sodium form of Dowex 50-X 12.—H. G. Bray.

4092

WEBSTER, G. R. **Observations on the periodide method for the estimation of choline.** *Biochim. biophys. Acta*, 1956, **20,** 432–433. [Dept. Chem. Pathol., Guy's Hosp. Med. Sch., London.]

Choline is precipitated as its periodide which is separated by centrifuging, dissolved in chloroform and measured spectrophotometrically at 365 mμ. Acetyl, propionyl, butyryl, acetyl-β-methyl and benzoyl esters of choline and dimethylaminoethyl acetate also give precipitates with similar absorption characteristics. Phosphoryl and glycerophosphoryl choline give no precipitate. The use of the method in the investigation of enzymic degradation of phospholipins containing choline is discussed.—H. G. Bray.

See also Absts. 4057, 4059, 4074.

Inorganic Constituents

4093

DAVIS, S. and SIMPSON, T. H. (Jr.) **The determination of serum bicarbonate by flame photometry.** *J. Biol. Chem.*, 1956, **219,** 885–892. [Lab. Med. Res., Veterans Admin. Hosp., Indianapolis, Ind.]

Bicarbonate is precipitated by baryta and estimated in the washed precipitate by flame photometer. The results ranged from 96·0 to 103·4 per cent. of those by the Van Slyke procedure.—H. G. Bray.

4094

MAYNARD, J. P., NELSON, R. A. and MATHERS, A. P. **Determination of added distinctive cations in whisky. 3. Flame spectrophotometric determination of cesium and rubidium.** *J. Assoc. Off. Agric. Chem.*, 1956, **39,** 506–512. [Alcohol and Tobacco Tax Div. Lab., Int. Rev. Serv., Washington 25, D.C.]

For parts 1 and 2 see Title 2754, Vol. 26.

4095

YANAGISAWA, F. **New colorimetric determination of calcium and magnesium.** *J. Biochem., Tokyo*, 1955, **42,** 3–11. [Tokyo-to Labs. Med. Sci., Tokyo.]

An alkaline solution of disodium 1-hydroxy-4-chloro-2 : 2-diazobenzene - 1 : 8 - dihydroxy - naphthalene-3 : 6-disulphonic acid was found to change from purple to red in presence of Ca or Mg. In strongly alkaline solution the colour was due to Ca ions only, since Mg ions formed $Mg(OH)_2$. The colour was read in a Coleman spectrophotometer with a 620 mμ. filter, and the concentration of Ca or Mg was calculated from a curve of reference. Detailed procedures are given for estimating Ca and Mg in serum, water and food.—M. H. Pierce.

4096

LEIFHEIT, H. C. **Evaluation of a rapid micromethod for the determination of serum calcium.** *J. Lab. Clin. Med.*, 1956, **47,** 623–633. [Clin. Chem. Labs., New England Med. Centre, Boston, Mass.]

Ca and Mg in serum are estimated together by titration with sodium ethylenediamine tetra-acetate, with Eriochrome Black T as indicator. Mg is estimated photometrically by a Titan yellow method, in serum from which Ca has been precipitated as oxalate.—H. G. Bray.

4097

GRISWOLD, R. L. and PACE, N. **Microdetermination of calcium and magnesium in tissue ashes.** *Anal. Chem.*, 1956, **28,** 1035–1037. [Dept. Physiol., Univ. California, Berkeley.]

The ash is dissolved in water and applied to a Dowex-50 column (hydrogen form) which adsorbs all the cations and phosphate. Phosphate, magnesium and calcium are eluted one at a time with HCl. Mg and Ca are estimated in the appropriate eluates by titration with disodium ethylenediaminetetra-acetic acid, with Eriochrome Black T as indicator.—H. G. Bray.

4098

ZUNDEL, G. Sur la détermination de la calcémie et de la phosphorémie. [**Estimation of blood calcium and blood phosphorus.**] *Rec. Méd. vét.*, 1955, **131,** 1087–1107. [École Vét., Alfort.]

A 10-g. sample of blood was digested with concentrated HNO_3 and H_2SO_4 and, when clear, was diluted to 100 ml.; an 8-ml. portion of the digest was adjusted to *p*H 5 and made up to 200 ml. Molybdenum sulphate and stannous chloride were added to a 5-ml. portion and the blue colour which developed in from 12 to 18 min. was read in a colorimeter with a yellow filter. The amount of P was deduced by reference to a standard curve.

A 20-ml. portion of the digest was ashed and redissolved and Ca was precipitated as oxalate. The precipitate was dissolved in H_2SO_4 and potassium permanganate was added. The iodine

liberated from a crystal of potassium iodide was then titrated with 0·01 *N* potassium thiosulphate.
M. H. Pierce.

4099
VALDEHITA, M. T. and CARBALLIDO, A. Métodos colorimétricos para la determinación de hierro, fósforo y calcio en alimentos. [**Colorimetric methods for estimation of iron, phosphorus and calcium in foods.**] *An. Bromatol.*, 1954, **6,** 437–453. [Dept. Invest. Bromatol., C.S.I.C., Madrid.]

4100
MURTHY, G. K. and WHITNEY, R. M. **A plan for the rapid determination of the major cations in milk.** *J. Dairy Sci.*, 1956, **39,** 364–373. [Dept. Food Technol., Univ. Illinois, Urbana.]
Na, K and Ca are estimated by flame photometer in deproteinised milk which has been treated with an anion-exchange resin. Ca and Mg are estimated together by titration with ethylenediamine tetra-acetate and Mg is found by difference.
H. G. Bray.

4101
HERZMANN, J. Stanovení mědi v krevní plasmě. [**Estimation of copper in blood plasma.**] *Čas. Lék. čes.*, 1955, **94,** 1034–1036. [Inst. Care Mothers and Children, Prague.]

4102
PECKHAM, S. C., LEOPOLD, R. S. and HESS, W. C. **Determination of fluoride in organic and inorganic fractions of dentin and enamel.** *J. Dent. Res.*, 1956, **35,** 205–209. [Dept. Chem., U.S. Naval Dent. Sch., Bethesda, Md.]

4103
MENSCHENFREUND, D. **Microdetermination of iodine in dietary foods, vitamin-mineral preparations, and drugs.** *J. Assoc. Off. Agric. Chem.*, 1956, **39,** 523–528. [Food Drug Admin., Dept. Health, Los Angeles 15, Calif.]
The sample is ashed with KOH and extracted with water; iodine is oxidised to iodate with $KMnO_4$ and liberated by KI in acid solution. It is extracted with xylene. Absorption is measured at 494 mμ. and compared with that of a standard solution of I in xylene. Results were satisfactory when 1 or 2 tablets of proprietary preparations were taken for analysis; the A.O.A.C. official method required from 10 to 30 tablets.
D. Harvey.

4104
HERMANOWICZ, W. and SIKOROWSKA, C. Badania nad oznaczaniem jodu w wodzie metodą chromatografii bibułowej. [**Estimation of iodine in water by paper chromatography.**] *Rocz. Państwowego Zakł. Hig.*, 1956, **7,** 177–184. Russian and English summaries.

Iodine is separated from other substances in water by paper chromatography and estimated by a modified catalytic cerium method in which ferric thiocyanate is used to measure the unreduced cerium ions. As little as 0·5 μg. I per litre could be estimated. (From English summary.)
A. Hepburn.

4105
ZIEVE, L., VOGEL, W. C. and SCHULTZ, A. L. **Determination of protein-bound radioiodine with an anion exchange resin.** *J. Lab. Clin. Med.*, 1956, **47,** 663–668. [Dept. Med., Veterans Admin. Hosp., Minneapolis, Minn.]
The standard procedure for estimation of protein-bound radio-active I in plasma in which the precipitate is washed 4 times with trichloroacetic acid was found to give a total loss of about 15 per cent. when the plasma contained an excess of inorganic ^{131}I. A column of Amberlite resin efficiently removed inorganic I from plasma in one passage and the loss of protein-bound I was about 4 per cent., but passage of plasma through a series of resin columns produced losses comparable with those of the standard method. Passage through a resin column gave results similar to those of the dialysis method.—A. Hepburn.

4106
TRINDER, P. **The improved determination of iron in serum.** *J. Clin. Pathol.*, 1956, **9,** 170–172. [Dept. Biochem., Central Lab., Royal Infirmary, Sunderland.]
Iron is extracted by trichloroacetic acid at 90° to 95° C. and the supernatant fluid obtained by centrifuging is treated with a 4 : 7-diphenyl-1 : 10-phenanthroline reagent in the presence of thioglycollic acid to give a red colour which is measured photoelectrically. In control experiments recoveries of ferric iron added to serum ranged from 99·5 to 102 per cent.—H. G. Bray.

4107
NEILL, D. W. and NEELY, R. A. **The estimation of magnesium in serum using titan yellow.** *J. Clin. Pathol.*, 1956, **9,** 162–163. [Dept. Biochem., Royal Victoria Hosp., Belfast.]
A modification of previous methods is described in which hydroxylamine is replaced as colour stabiliser by gum ghatti. The effect of Ca is eliminated by its addition to the Mg standards. The normal adult serum Mg level was found to be from 1·9 to 2·7 mg. per 100 ml.—H. G. Bray.

4108
BARRETT, F. R. **Micro-determination of mercury in biological materials.** *Analyst*, 1956, **81,** 294–298. [Sch. Pub. Health Trop. Med., Univ. Sydney.]

4109
DRYER, R. L. **Semimicro flame photometry of serum sodium and potassium.** *Clin. Chem.*, 1956, **2,** 112–116. [Dept. Biochem., Coll. Med., State Univ. Iowa, Iowa City.]

The method uses lithium as internal standard and is applicable to as little as 0·1 ml. serum.

H. G. Bray.

4110
CARLES, J. Microdosage colorimétrique du phosphore. **[Colorimetric micro - estimation of phosphorus.]** *Bull. Soc. Chim. biol.*, 1956, **38,** 255–257. [Lab. Physiol. Vég., Inst. Catholique, Toulouse.] English and German summaries.

The portions of a paper chromatogram to be examined are dry-ashed and phosphate is estimated in the ash by a molybdate method applicable to from 0·5 to 10 μg. P.—H. G. Bray.

4111
BRUEMMER, J. H. and O'DELL, B. L. **Inhibition of color development in the Lowry-Lopez phosphorus method by sulfhydryl compounds and its counteraction by copper.** *J. Biol. Chem.*, 1956, **219,** 283–286. [Dept. Agric. Chem., Univ. Missouri, Columbia.]

4112
KLEEMAN, C. R., TABORSKY, E. and EPSTEIN, F. H. **Improved method for determination of inorganic sulfate in biologic fluids.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 480–483. [Dept. Int. Med., Sch. Med., Yale Univ., New Haven, Conn.]

Protein is removed with trichloroacetic acid and the supernatant fluid is treated with a benzidine solution. The next day glass powder is added and the benzidine sulphate precipitated is separated by centrifuging and washed with a mixture of ethanol and ether. The precipitate is suspended in an alkaline sodium borate solution and the benzidine is estimated colorimetrically with sodium β - naphthoquinone - 4 - sulphonate, with which it gives a red colour in the presence of acetone.

H. G. Bray.

See also Abst. 4258.

Hydrogen Ion Concentration

4113
BISHOP, A., HARTREE, E. F. and MCCONNACHIE, E. W. **A method for determining the pH of small quantities of fluid.** *Parasitology*, 1956, **46,** 216–219.

The construction and use of a micro-electrode of glass for measuring the *p*H of blood from the stomachs of mosquitoes are described.

H. G. Bray.

Enzyme Activity

4114
GILBOE, D. D. and WILLIAMS, J. N. (Jr.) **Colorimetric method for rapid determination of arginase activity.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 537–539. [Dept. Biochem., Univ. Wisconsin, Madison.]

The method described requires as little as 20 μg. liver. Arginine remaining after hydrolysis is estimated by a modified Sakaguchi reaction.

H. G. Bray.

4115
BUNCH, L. D. and EMERSON, R. L. **Serum lipase determination : four-hour technic with olive oil substrate.** *Clin. Chem.*, 1956, **2,** 75–82. [H. L. Snyder Mem. Res. Found., Winfield, Kans.]

The method described uses as substrate an emulsion of olive oil in phosphate buffer and requires 4 hr. Values are given for normal subjects and patients with different disorders.

H. G. Bray.

4116
NOUR-ELDIN, F. and WILKINSON, J. F. **The estimation of peptidase activity in the white blood cells by paper chromatography.** *J. Clin. Pathol.*, 1956, **9,** 175–177. [Dept. Haematol., Royal Infirmary, Manchester.]

A glycerol extract of white cells is used, with glycylglycine, glycylglycylglycine, or leucylglycylglycine as substrate. The amino acids liberated are estimated by chromatography on paper. Values are given for normal subjects and for patients with leucaemia.—H. G. Bray.

4117
AURAND, L. W., ROBERTS, W. M. and CARDWELL, J. T. **A method for the estimation of peroxidase activity in milk.** *J. Dairy Sci.*, 1956, **39,** 568–573. [Dept. Animal Indust., N. Carolina State Coll., Raleigh.]

Peroxidase in milk was estimated colorimetrically by its oxidative action on *p*-phenylenediamine in presence of H_2O_2. The results agreed well with those of the method of Sumner and Gjessing (Title 2829, Vol. 13).—A. Hepburn.

4118
REYNOLDS, O. B., REYNOLDS, M. D. and WALKER, B. S. **Yeast adenylic acid as a substrate for serum acid phosphatase.** *Clin. Chem.*, 1956, **2,** 117–124. [Sch. Med., Boston Univ., Mass.]

No advantage was found from the use of yeast adenylic acid as substrate instead of β-glycerophosphate.—H. G. Bray.

4119

SIEGENTHALER, E. Ein Beitrag zur Durchführung der Phosphataseprobe mit Natrium-p-Nitrophenylphosphat. [**Phosphatase test with sodium-*p*-nitrophenylphosphate.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1956, **47**, 1–3. [Lab. Verbandsmolkerei, Berne.] French and English summaries.

The substrate can be freed from *p*-nitrophenol by filtration through activated charcoal.

H. G. Bray.

4120

ZITTLE, C. A., DELLAMONICA, E. S., CUSTER, J. H. and RUDD, R. K. **Determination of xanthine oxidase in milk with triphenyl tetrazolium chloride.** *J. Dairy Sci.*, 1956, **39**, 522–527. [E. Reg. Res. Lab., Philadelphia, Pa.]

A mixture containing xanthine, phosphate buffer, triphenyltetrazolium chloride and diluted milk was incubated at 30° C. in a test tube through which nitrogen was bubbled. After the reaction was stopped by adding acetic acid the red reduced triphenyltetrazolium chloride, stable in air, was extracted with toluene and measured spectrophotometrically to give the amount of xanthine oxidase. (See also Title 4227, Vol. 26).

A. Hepburn.

Miscellaneous

4121

ELSKEN, R. H. and KUNSMAN, C. H. **Further results on moisture determination of foods by hydrogen nuclei magnetic resonance.** *J. Assoc. Off. Agric. Chem.*, 1956, **39**, 434–444. [Agric. Res. Serv., U.S. Dept. Agric., Albany 10, Calif.]

The method previously described (Absts. 2785, Vol. 24; 2756, Vol. 26) was shown to be applicable to any type of material containing little soluble solids, *e.g.*, many vegetable tissues. The correction of results for soluble solids is considered.

H. G. Bray.

4122

KIERMEIER, F. and PIRNER, G. Über die Eignung verschiedener Methoden zum Nachweis der Wässerung von Buttermilch. [**Suitability of different methods for demonstrating the addition of water to buttermilk.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1956, **103**, 437–441. [Inst. Süddeutsch. Versuchsanst. Milchwirtsch., Weihenstephan.]

4123

HANCOCK, C. K. and BURDICK, R. L. **Determination of water in cooked cottonseed meats by a modified indirect conductivity method.** *J. Amer. Oil Chem. Soc.*, 1956, **33**, 175–177. [Texas Eng. Exp. Stat., College Station.]

The sample is mixed with a mixture of alcohol and acetone and the conductivity of the supernatant fluid is measured. The water content is found from a calibration curve constructed from water contents estimated by oven-drying.

H. G. Bray.

4124

CHEMISCHER ARBEITSAUSSCHUSS. Festlegung von Standardmethoden auf dem Milchgebiet. 3. [**Establishment of standard methods for investigation of milk. 3.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1956, **103**, 305–306.

For previous parts, dealing with methods of sampling and of estimating fat, see *Milchwissenschaft*, 1954, **9**, 94 and Abst. 4080, Vol. 24.

3. The Soxhlet Henkel value is the number of ml. of 0·25 *N* NaOH required with 4 ml. phenolphthalein and 100 ml. milk to match a cobalt sulphate colour standard. Precise details of the procedure recommended are given.—W. M. Deans.

4125

Bestimmung der Soxhlet-Henkel-Zahl (SH). Milchwirtschaftliche Einheitsmethode Nr. 6. (M. 6—1955). [**Estimation of the Soxhlet Henkel number (SH). Standard method No. 6 for milk (M. 6—1955).**] *Milchwissenschaft*, 1956, **11**, 25–26.

See above Abst.

4126

FEDER, E. and ANDREWS, F. C. **Measurement of butter quality by chemical and flavor tests.** *J. Farm Econ.*, 1956, **38**, 113–125. [Univ. Nebraska.]

Analyses of butter samples, primarily U.S. Grades B and C, showed that there was a small negative correlation between *p*H and water-insoluble acids (WIA) and a general tendency for fat acidity to increase as WIA increased, but the correlation between the last two was not high enough for accurate prediction of WIA from fat acidity. The Federal grades of butter, evaluated organoleptically, were negatively correlated with fatty acid and with WIA. The variation in chemical values was very large and tended to increase as a grade declined. Chemical values used as a measure of age and decomposition did not, therefore, appear to be related to flavour.

A. Hepburn.

4127

SCHIFFMANN, J. **A microscopic method for evaluating the nutritional quality of brans.** *Ktavim, Rec. Agric. Res. Stat., Rehovot*, 1955, **4**, No. 3, 49–56.

Since bran consists chiefly of grain coats and very little endosperm, and since the aleurone layer of

the grain coat contains most of the nutrients in it, this was used as the basis of the method, which consisted in separating the grain coat from the endosperm and then estimating the area of aleurone layer in the grain coat under the microscope. The repeatibility of the results was good. The results were treated statistically and it is shown how they can be used to compare the feeding values of different brans. It was also shown that there was a highly significant negative correlation, $r = -0{\cdot}98$, between the percentage of carbohydrate and of grain coat, and a highly significant positive correlation, $r = +0{\cdot}94$, between the area of aleurone surface and the percentage of protein estimated chemically.—T. D. Bell.

4128

SCHIFFMANN, J. **A method for classifying brans according to feeding quality as determined by microscopic analyses.** *Ktavim, Rec. Agric. Res. Stat., Rehovot*, 1955, **4,** No. 3, 57–62.

A wide variety of terms, with no universal standard, are applied to bran. A method was sought by which all milling by-products could be classified and compared for feeding value and storage capabilities. The method included examination for adulteration by weed seeds and unwanted plant material, signs of rodent and insect infestation, mineral impurities and deterioration, and for nutritional value estimated by the microscopic method described in the previous Abst. Account was taken in the classification of possible added germs of the cereals, which enhanced the feeding value but reduced the storage quality. The method showed that of 933 samples of wheat, rye and barley brans obtained commercially in Israel, 12, 21 and 28 per cent., respectively, were valueless or actually harmful, and only 63, 54 and 52 per cent. were fair or good. The method is presented as a suggested basis for general use, which would need modification for other places and conditions.—T. D. Bell.

4129

SANDERS, G. P., HUPFER, J. A. and WISEMAN, H. G. **A phosphatase test for determining heat treatment of alfalfa meal.** *J. Dairy Sci.*, 1956, **39,** 561–567. [E. Utilization Res. Branch, Agric. Res. Serv., Philadelphia, Pa.]

Alfalfa hay contains both acid and alkaline phosphatase ; the latter is completely inactivated by the temperatures used in drying by artificial heat. The estimation of alkaline phosphatase by a modification of the spectrophotometric method of Sanders and Sagers (*J. Dairy Sci.*, 1947, **30,** 909), in which phenol is liberated from phenyl phosphate and reacts with 2 : 6-dibromoquinonechloroimide to give a blue indophenol, is used to detect the adulteration of meal made from artificially dried alfalfa with ground alfalfa hay, which is much poorer in carotene and other nutrients. As little as 1 per cent. adulteration could be detected.

A. Hepburn.

4130

MABROUK, A. F., HUSSEIN, A. A. and AREF, H. **A rapid method for the determination of total solids in tomatoes.** *J. Sci. Food Agric.*, 1956, **7,** 257–261. [Dept. Agric. Indust., Fac. Agric., Univ. Cairo, Giza.]

The percentage total solids, TS, of Egyptian tomatoes calculated from the equation

$$TS = 522{\cdot}60\ N_D - 695{\cdot}26,$$

where N_D is the refractive index at 20° C., was very near the value obtained by vacuum drying. An equation derived in the United States for Californian tomatoes (Cruess, " Commercial Fruit and Vegetable Products ", 1948, McGraw-Hill Co., New York) was not satisfactory owing to a difference in the ratio of soluble to insoluble solids.

A. Hepburn.

4131

HERNÁNDEZ - GUTIÉRREZ, F. Estudio sobre los agentes conservadores y antisépticos para harinas y productos derivados. Su investigación. [**Preservatives and antiseptics for flour and flour products. Their investigation.**] *An. Bromatol.*, 1956, **8,** 39–72. [Inst. " Alonso Barba ", C.S.I.C., Fac. Farm., Barcelona.] English summary.

Spanish food legislation permits the use only of sodium diacetate, acetic acid, sodium or calcium propionate or propionic acid as chemical preservatives for flour and baking products. The estimation of these substances is described. Detection of propionate is proof that it has been added, but acetate may be produced by fermentation.

There are 119 references.—D. Duncan.

4132

DESHUSSES, J. and DESBAUMES, P. Recherche des colorants artificiels dans les denrées alimentaires et identification des colorants par chromatographie sur papier. 1. Vins, vermouths, apéritifs, liqueurs, sirops et limonades. [**Artificial pigments in foods and their identification by chromatography on paper. 1. Wines, vermouths, aperitifs, liqueurs, syrups and lemonades.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1956, **47,** 15 – 19. [Lab. Cantonal Chim., Geneva.] German and English summaries.

See also Abst. 4179.

MICROBIOLOGICAL

4133

FERNELL, W. R. and ROSEN, G. D. **Microbiological evaluation of protein quality with *Tetrahymena pyriformis* W. 1. Characteristics of growth of the organism and determination of relative nutritive values of intact proteins.**

ROSEN, G. D. and FERNELL, W. R. **2. Relative nutritive values of proteins in foodstuffs.** *Brit. J. Nutrition*, 1956, **10**, 143–156; 156–169. [Res. Dept., J. Bibby and Sons, Ltd., Liverpool.]

1. Studies were made on the effects of time, oxygen limitation and glucose concentration on the growth and metabolism of *Tetrahymena pyriformis*, W. The organism required a plentiful supply of oxygen. Production of ammonia was much less when the concentration of glucose in the culture medium was high, which was considered to be due to sparing of amino acids as a primary source of energy. With graded levels of protein growth of *T. pyriformis* did not necessarily accord with the values expected from accepted ratings.

Growth of *T. pyriformis* in relation to production of ammonia N was taken as an index of protein utilisation and used to calculate the relative nutritive values of the proteins of partly-purified meatmeal, fishmeal, herring meal, whalemeat meal, egg albumin, wheat germ, vitamin-free casein, which was used as the standard, soya bean meal, cottonseed meal, sunflower meal, linseed cake, overheated soya bean meal, sesame meal, groundnut meal, overheated groundnut meal, gelatine, gelatine plus 2 per cent. tryptophan, raw egg white and autoclaved egg white. The results were in general agreement with chemical data and with biological assays on growing rats. In general, the vegetable proteins were inferior to those of animal origin. Overheated groundnut and soya bean proteins had reduced nutritive values. The beneficial effect of supplementing gelatine with tryptophan was demonstrated. With fresh egg white, sterilised by filtration, *T. pyriformis* did not grow, but with autoclaved egg white a relative nutritive value of 115 was obtained.

2. Protein quality was estimated microbiologically with *T. pyriformis* in 20 different fat-extracted animal and vegetable foodstuffs without previous separation of the protein. These foodstuffs were vitamin-free casein, which was used as the standard, beanmeal, cottonseed meal, groundnut meal, sesame meal, soya bean meal, dried whole egg, herring muscle, herring meal, pilchard meal, whale meal, fin-whale meal, condensed whale solubles, spray-dried whale solubles, cod muscle, white-fish meal, Scottish fishmeal, bloodmeal, grassmeal and grass protein concentrate; of these, only the last 3 gave little or no growth. For satisfactory estimation a constant ratio of foodstuff N : glucose in the medium had to be maintained. The results compared favourably with the relative nutritive values for growing rats obtained by other workers.

These studies indicate that microbiological estimation of intact proteins may be a valuable preliminary to feeding trials on monogastric animals.—G. F. Garton.

4134

TÄUFEL, K. and MÜLLER, K. Zur Bestimmung von Glucose, Maltose und sonstigen vergärbaren Oligosacchariden sowie von Dextrinen unter Einsatz von Kulturhefe. [**Estimation of glucose, maltose and other fermentable oligosaccharides and of dextrins with the help of cultured yeast.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1956, **103**, 272–284. [Inst. Ernährungsforsch., Potsdam-Rehbrücke.]

A differential fermentation method.

H. G. Bray.

CLINICAL AND EXPERIMENTAL

4135

TUDHOPE, G. R. and WILSON, G. M. **The use of ^{86}rubidium as a label for red cells.** *Brit. J. Haematol.*, 1956, **2**, 75–79. [Dept. Pharmacol., Univ. Sheffield.]

The uptake of ^{86}Rb by erythrocytes *in vitro* does not differ significantly from that of ^{32}P : its leakage from labelled cells into inactive plasma was less than that of ^{32}P. The half-time of disappearance of ^{86}Rb from labelled cells *in vivo* was from 36 to 54 hr. compared with 24 hr. for ^{32}P.

H. G. Bray.

4136

MEYER, L. M. **Blood volume determinations with radioactive chromium (Cr^{51}) labeled erythrocytes : feasibility of routine total red blood cell volume determinations in a general hospital.** *J. Amer. Med. Assoc.*, 1956, **160**, 1312–1315. [S. Nassau Communities Hosp., Oceanside, N.Y.]

4137

PAMPUS, F., PROKOP, O. and HEIDELMANN, C. Direkte Bestimmung der zirkulierenden

Blutmenge mit nicht agglutinierbaren Erythrocyten durch Differentialhämolyse. [**Direct estimation of circulating blood volume with non-agglutinable red cells by differential haemolysis.**] *Langenbecks Arch. klin. Chirurg.*, 1955–1956, **281,** 555–572. [Neurochirurg. Klin., Univ. Bonn.]

4138

MOIR, T. W., PRITCHARD, W. H. and FORD, A. B. **The early disappearance of I^{131} serum albumin from the circulation of edematous subjects and its implications in the clinical determination of the blood volume.** *J. Lab. Clin. Med.*, 1956, **47,** 503–512. [Dept. Med., Sch. Med., Western Reserve Univ., Cleveland, Ohio.]

See Title 3203, Vol. 24.

4139

IKKOS, D. **Measurement of the extracellular fluid volume by thiosulphate. 1. The measurement of the apparent volume of distribution of thiosulphate.**

IKKOS, D., LJUNGGREN, H., LUFT, R. and SJÖGREN, B. **2. The relation between the apparent volume of distribution of thiosulphate and the volume of distribution of inulin.** *Acta physiol. scand.*, 1956, **35,** 240–253; 254–264. [Dept. Endocrinol., Serafimerlasarettet, Stockholm.]

1. Results are given for the apparent volume of distribution of thiosulphate in 43 tests on normal subjects and patients with different diseases. The method used was that of Cardozo and Edelman (*J. Clin. Invest.*, 1952, **31,** 280).

2. These values were found to be of the same magnitude. An equation is given for calculation of the volume of distribution of inulin from the apparent volume of distribution of thiosulphate.

H. G. Bray.

4140

DUMONT, B. L. Sur le dosage de l'antipyrine dans le plasma sanguin. [**Estimation of antipyrine in blood plasma.**] *Ann. Zootech.*, 1955, **4,** 285–296. [Stat. Recherches Élevage, C.N.R.Z., Jouy-en-Josas.]

A critical examination of the method of Brodie *et al.* (Abst. 1770, Vol. 19), which depends on measurement of the absorption of nitrosoantipyrine at 350 mμ.—H. G. Bray.

4141

DUMONT, B. L. La mesure de l'eau totale de l'organisme chez les porcins par la méthode à l'antipyrine. [**Measurement of total body water in pigs by the method with antipyrine.**] *Ann. Zootech.*, 1955, **4,** 305–313. [Stat. Recherches Élevage, C.N.R.Z., Jouy-en-Josas.]

4142

DUMONT, B. L. L'utilisation de l'antipyrine pour la mesure *in vivo* de l'eau totale du corps chez les ovins. [**Use of antipyrine to measure total body water in sheep *in vivo*.**] *Ann. Zootech.*, 1955, **4,** 315–319. [Stat. Recherches Élevage, C.N.R.Z., Jouy-en-Josas.]

4143

WHITTEMBURY M., G., RAMIREZ V., M., FERNÁNDEZ Ñ., J. and MONGE C., C. **A nomographic system for calculation of water requirements.** *Acta physiol. Latino Amer.*, 1955, **5,** 117–121. [Med. Sch., Lima.]

A nomogram is presented which relates water requirement and volume of urine to excretion of solutes and sp. gr. of urine on different diets. Its use in clinical medicine is discussed.—D. Harvey.

4144

WOODWARD, E. R., SCHAPIRO, H. and FELTS, J. **Measurement of gastric secretion by cation exchange compounds.** *Surgery*, 1956, **39,** 776–779. [Dept. Surg., Med. Centre, Univ. California, Los Angeles.]

A comparison was made between basal gastric secretion as estimated by direct aspiration of gastric contents and by estimation of quinine excreted in urine after administration of Diagnex, a quininium cation-exchange resin. No correlation was found except in the region of anacidity. It is concluded that ion-exchange resins are unsuitable for the estimation of basal gastric secretion.

H. G. Bray.

4145

WHITE, T. D., SWIGART, R. H. and REHM, W. S. **Limitations of the use of indicators for determination of acidity in the gastric lumina.** *Amer. J. Physiol.*, 1956, **184,** 453–456. [Dept. Physiol., Sch. Med., Univ. Louisville, Ky.]

4146

ISLAMI, A. H. **Description and uses of a new gastric and intestinal tube.** *Surgery*, 1956, **39,** 780–786. [Div. Exp. Surg., Sloan-Kettering Inst., New York.]

A historical review and a description of a single all-purpose tube suitable for drainage and decompression, for instilling fluids and for aspirating secretions.—H. G. Bray.

4147

MADSEN, K. F. En universaltympan. [**Stomach tube and suction pump for treatment of tympanites.**] *Nord. Vet.-Med.*, 1956, **8,** 446–453. [Kværndrup.] English and German summaries.

The apparatus is designed for use in control of bloat. It has a perforated collecting cylinder retractable within a second, scraping cylinder to prevent blocking of the perforations and is connected to a vacuum pump and collecting bottle for use if samples of rumen contents are to be withdrawn.—I. Leitch.

4148

BERNSTEIN, E. F. **An efficient stool collector.** *Surgery*, 1956, **39,** 821–824. [Dept. Surg., Coll. Med., State Univ. New York.]

4149

SCHROEDER, W. Ein neues Dauerinfusionsgerät für tierexperimentellen und klinischen Gebrauch. [**New apparatus for continuous infusion for animal experiments and clinical use.**] *Arch. exp. Pathol. Pharmakol.*, 1956, **228,** 576–577. [Inst. Animal. Physiol., Univ. Frankfurt a.M.]

With the apparatus described and illustrated here, the rate of infusion can be varied continuously from 0·1 to 1·4 ml. per min. and can be read off directly. The container for fluid is easily exchanged and the whole infusion head with container and infusion tube can be removed for sterilisation in high-pressure steam by undoing only one screw.—W. M. Deans.

4150

HAMLIN, E. (Jr.) and VICKERY, A. L. **Needle biopsy of the thyroid gland.** *New Engl. J. Med.*, 1956, **254,** 742–746. [Dept. Surg., Harvard Med. Sch., Boston, Mass.]

The technique of needle biopsy adopted by the Thyroid Clinic of the Massachusetts General Hospital is described in detail. The Vim-Silverman needle is used and specimens up to 2 cm. long and 2 mm. diameter can be obtained. Biopsy should not be used to confirm a diagnosis of cancer.

Of the 175 biopsies made in the past 4 years, 74 per cent. aided diagnosis, the greatest value being in the diagnosis of thyroiditis. This study is illustrated with photomicrographs showing thyroiditis and nodular goitre in biopsy samples.

B. W. Simpson.

4151

DAILEY, M. E. and SKAHEN, J. R. **A statistical appraisal of the serum protein-bound iodine as a test of thyroid function.** *New Engl. J. Med.*, 1956, **254,** 907–909. [Dept. Med., Univ. California Sch. Med., San Francisco.]

4152

LAMBERG, B. A., WAHLBERG, P. and FORSIUS, P. I. **The serum protein-bound iodine as a diagnostic aid.** *Acta med. scand.*, 1956, **154,** 201–210. [4. Med. Clin., Univ. Helsinki.]

4153

KERBER, R. B. and BIRD, F. H. **A rapid method for preparing chick carcass samples for analysis.** *Poultry Sci.*, 1956, **35,** 486–487. [Eastern States Farmers' Exchange, Inc., Feed Res. Centre, RFD 3, Rockville, Conn.]

After cleaning, the whole carcase is homogenised in a Waring blendor and freeze-dried with dry ice and ethanol. The method is rapid and convenient and many carcases or portions can be prepared in a day. The same technique could be used for other tissues or small animals.—T. D. Bell.

4154

DREPPER, K. Über die Differenz der " wahren " und " scheinbaren " N-Retention, ermittelt durch verschiedenartige Methoden zur Wertbeurteilung des Nahrungsstickstoffs. [**The difference between " true " and " apparent " N retention, found by different types of method for evaluating the nitrogen of the feed.**] *Naturwissenschaften*, 1956, **43,** 203. [Inst. Physiol. Ernährung Tiere, Univ. Munich.]

Bender and Miller (Title 2726, Vol. 23) gave simplified methods for finding the net protein value of a food for rats either by ascertaining the N retained by estimation of N in their bodies or by calculating it from the water content of their bodies. The present work confirmed that, for whole egg and a complete rat diet, both methods gave results in good agreement with those obtained by multiplying Mitchell's biological value by the true digestibility, and the same was found by Wilmer (Fishing Indust. Res. Inst., Cape Town, *Annu. Rep.* **8,** 1955, p. 34) for fishmeal. But the mean N retention found by estimating body N by the Kjeldahl method in groups of rats of equal age and bodyweight of which some had and some had not the food in question was about 40 per cent. less than that found in the usual way, as difference between N consumed and N excreted. The former is taken to be the " true " N retention. On investigation, losses during analysis were found to account for 12 per cent. at most. It is thought probable that some of the N of the food is excreted in a combined form that escapes analysis, or in gaseous form. Further investigations are going on.—W. M. Deans.

4155

KOMLÓS, E. and FÖLDES, I. Metodika kolichestvennogo izucheniya dvigatelnykh pishchevykh uslovnykh refleksov u melkikh zhivotnykh. [**Method of studying the motor feeding reflex in small animals.**] *Acta physiol. hung.*, 1955, **8,** 135–145. [Hungarian Res. Inst. Tuberculosis, Budapest.] German summary.

A cage is described and illustrated; the rat opened a door to get food and the door was

connected to a manometer system which thus provided a record of feeding activity. The strength with which the door was pushed, as well as the number of times it was opened, could be used to study the rat's appetite. (From summary.)

D. Duncan.

4156

KNOLL, J., KELEMEN, K. and KNOLL, B. **Experimental studies on the higher nervous activity of animals. 4. A method for elaborating and studying active conditioned feeding reflex. Experimental analysis of differences between active conditioned defensive and feeding reflexes.** *Acta physiol. hung.*, 1956, **9**, 99–109. Russian summary.

Previous parts (*Acta physiol. hung.*, 1955, **8**, 327 ; 347 ; 369) did not concern feeding.

4157

OYAMA, V. I. and EAGLE, H. **Measurement of cell growth in tissue culture with a phenol reagent (Folin-Ciocalteau).** *Proc. Soc. Exp. Biol. Med.*, 1956, **91**, 305–307. [Lab. Infect. Dis., Nat. Microbiol. Inst., Nat. Insts. Health, Bethesda, Md.]

This method is based on estimation of protein by the method of Lowry *et al.* (Abst. 4458, Vol. 21) and development of colour with the phenol reagent of Folin and Ciocalteu (*J. Biol. Chem.*, 1927, **73**, 627). The average coefficient of variation in the protein content of 4 flasks was 3 per cent.—D. Duncan.

4158

ERWIN, E. S., DYER, I. A., ENSMINGER, M. E. and MOORE, W. **A portable metabolism stall for beef steers.** *J. Animal Sci.*, 1956, **15**, 435–439. [Dept. Animal Husb., State Coll. Washington, Pullman.]

A modification of a metabolism stall first proposed by Nelson *et al.* (Abst. 4188, Vol. 24) is described. The stall has wheels and a hand jack and tractor hitch to facilitate the exchange and loading of animals, easily removable water cups, a detachable rear door for use when transporting a steer, and rubber lining on the floor to make the animal more comfortable and to prevent it slipping or falling.—T. R. Preston.

4159

STRITE, G. H. and YACOWITZ, H. **A simplified method for estimating the rate of oxygen consumption of young chicks.** *Poultry Sci.*, 1956, **35**, 142–144. [Ohio Agric. Exp. Stat., Wooster.]

The respiration chamber consisted of an inverted 2000-ml. beaker painted black, in which the chicken stood on a wire mesh over a petri dish of 20 per cent. KOH solution ; the whole was sealed by standing in a glass dish of water through which the oxygen tube entered. The oxygen passed through a gas burette. Production of CO_2 could be estimated from the KOH solution.

In 10 chickens 2 weeks old fasted for 18 hr., 2 consecutive measurements of oxygen consumption gave mean values of 27·4 and 26·6 c.c. per kg. per min. Thyroprotein at 150 mg. per lb. feed produced a highly significant increase in oxygen consumption.—D. Duncan.

4160

HEUSNER, A. Technique de mesure de courte durée de la consommation d'oxygène et de l'activité du rat. Étude critique du circuit de Benedict. [**Technique for short-term measurements of oxygen consumption and activity in the rat. Critical study of the Benedict circuit.**] *C.R. Soc. Biol.*, 1956, **149**, 2254–2257. [Inst. Physiol., Fac. Méd., Strasbourg.]

The Benedict apparatus can be improved by keeping not only the metabolism cage but also the absorbers and the spirometer at constant temperature, by keeping both cage and circuit to the minimum volume, by increasing the rate of flow of air and by preventing the evaporation of urine. In such conditions the errors in estimation of oxygen consumption are only 2 to 3 c.c., or about 5 per cent. in 15-min. experiments with rats. The adaptations are described.—D. Duncan.

4161

BAINTNER, K., BARABÁS, E., PACS, I. and CZIMBALEK, G. **Új bélsár- és vizeletgyűjtő felszerelés tehenek részére emésztési és nitrogénforgalmi kisérletek végrehajtásához.** [**A new method of collecting faeces and urine of cows.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1**, No. 4, 65–72. [Inst. Animal Nutrit., Univ. Agric. Sci., Budapest.] Russian, German and English summaries.

Equipment for separate collection of urine and faeces from cows is described and illustrated.

D. Duncan.

4162

DUMONT, B. L. Méthode de prise de sang chez le porc à la veine cave antérieure. [**Method for drawing blood from the pig from the anterior vena cava.**] *Ann. Zootech.*, 1955, **4**, 297–303. [Stat. Recherches Élevage, C.N.R.Z., Jouy-en-Josas.]

By the procedure described 50 ml. blood can be collected in about 20 sec. and 6 samples taken from the same animal within 2 hr.—H. G. Bray.

4163

GERARDE, H. W. **Toxicological studies on hydrocarbons. 1. A method for the quantitative**

collection of femoral marrow in small laboratory animals. *Arch. Indust. Health*, 1956, **13,** 331–335. [Bur. Biol. Res., Rutgers Univ., New Brunswick, N.J.]

Extensions of the femoral canal are made at each end by drilling out the cancellous bone of the epiphyses. A blunt needle attached to a syringe containing 5 per cent. acetic acid is introduced into one extension, pressure is applied to the plunger and the marrow is extruded from the distal end of the canal and collected.—H. G. Bray.

4164

ERWIN, E. S., DYER, I. A., MEYER, T. O. and SCOTT, K. W. **Uses of aspiration biopsy technique.** *J. Animal Sci.*, 1956, **15,** 428–434. [State Dept. Washington, Dept. Animal Husb., Pullman.]

An appliance consisting of cannula, trocar and syringe is described by which biopsy samples of liver, 1·0 to 1·25 g., from cattle and baby pigs, and of back fat from older pigs can be obtained. The method described is quick and easy and no ill effect has been seen.—T. D. Bell.

4165

BENARDE, M. A., FABIAN, F. W., ROSEN, S., HOPPERT, C. A. and HUNT, H. R. **A method for the collection of large quantities of rat saliva.** *J. Dent. Res.*, 1956, **35,** 326–327. [Dept. Microbiol. Pub. Health, Michigan State Univ., East Lansing.]

A multiple rat-holder is described. The animals are anaesthetised with Nembutal before administration of the sialogogue pilocarpine nitrate. From 2 to 5 ml. saliva can be collected within 20 min. from an adult rat.—H. G. Bray.

4166

GADDUM, J. H. **The estimation of the safe dose.** *Brit. J. Pharmacol.*, 1956, **11,** 156–160. [Dept. Pharmacol., Univ. Edinburgh.]

Simple methods are given for obtaining an estimate of the safe dose when the relation between log dose and effect is linear, with 3 examples from rat feeding tests, one with antimalarial drugs and the others with insecticides which might leave residues in foods.—W. M. Deans.

4167

HARPER, R. **Factor analysis as a technique for examining complex data on foodstuffs.** *Appl. Statistics*, 1956, **5,** 32–48. [Dept. Psychol., Univ. Leeds.]

A description of a sample of a given foodstuff may become very long, including the results of tests of a number of physical and chemical characteristics, which may involve both objective measurements and skilled judgements. Hence the comparison of different samples may become unmanageable, and factor analysis may serve to provide a simplified statement of the main features of the results. The assumption is made that there are only a small number of underlying variables, and that the result of each different test is influenced in a slightly different way by them. From a study of the interrelations of the test results from a large number of samples, estimates can be made of the number of factors required and of the factor levels in terms of linear combinations of test results. Even if the objective reality of the factors may be a matter of doubt, a useful simplification of the data is achieved, and at least some light is shed on the interrelations of the attributes under test.

The ideas of factor analysis are illustrated in this paper by reference to a study of Cheshire cheeses. A geometrical model is used to show how the measurements on the cheeses would be interpreted in terms of three independent underlying factors, and tentative suggestions are made as to how these factors could be identified objectively.

Unfortunately computational processes are laborious, but this drawback would be overcome if electronic computers were more numerous. There remains the question whether factor analysis is theoretically applicable to any given problem of this type, or whether special statistical techniques should be devised to fit the idiosyncrasies of each particular set of measurements.—I. McDonald.

4168

CHURCH, B. M. and LIPTON, S. **The use of an electronic computer in the estimation of sampling errors in a nutritional survey.** *Brit. J. Nutrition*, 1956, **10,** 27–32. [Rothamsted Exp. Stat., Harpenden, Herts.]

A valuable by-product of any exhaustive set of data consists of the information it contains on the accuracy which would have been obtained from only a sample of the data. In principle this information is quite easy to extract, but in practice little has been done on these lines because of the large amount of arithmetical drudgery involved. Now that electronic computers are coming into use, all that is necessary is to lay out appropriate routines of calculation, or "programmes", and the machine can work through the data and produce the results demanded. A description is given in this paper of a programme suitable for dealing with numerical sequences. This was applied to data from a diet survey consisting of 61 observations on weekly intakes of each of 13 dietary constituents relating to a total period of 63 weeks, the records for 2 of the weeks being missing. The programme takes account of missing observations and could easily be applied to any other numerical sequence.—I. McDonald.

4169

BOYNE, A. W. and GREIG, W. A. **The value of repeated observations in biological sampling.** *J. Agric. Sci.*, 1956, **47**, 145–149. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Increases in precision will often be obtained more economically by repeating observations on individual animals than by increasing the number of animals under study. A method is outlined whereby the advantage to be gained by such repetition may be predicted, for any measurement for which repeat readings are available on a number of animals. The method is applied to a number of haematological observations made on 8 pairs of monozygous twin calves on each of 3 successive days. Since the differences between the members of each pair are comparatively small, it is found that great improvements in accuracy can be achieved by making a number of observations on each animal. In making comparisons between unrelated animals, on the other hand, little additional accuracy can be obtained by making more than about 3 observations on each, since these repeats do not cut down the large between-animal variability. It follows that in these haematological measurements, at least, the full advantage of using identical twins is not achieved unless at least 10 readings are made on each.—I. McDonald.

4170

LUCAS, H. L. **Switchback trials for more than two treatments.** *J. Dairy Sci.*, 1956, **39**, 146–154. [Dept. Exp. Statistics, N. Carolina State Coll., Raleigh.]

A switch-back or double-reversal trial is one in which observations are made in 3 consecutive periods. One treatment is applied in the first and third of these, and a second treatment in the middle period. The comparison of the effects of the treatments on the same animal is very much more accurate than a comparison between animals, at least in experiments on the performance of dairy cattle. Period effects must be eliminated by using pairs of cows and applying the treatments in reverse order to the second cow.

Switch-back designs can be extended to compare more than 2 treatments by taking each possible pair of treatments and applying these as described above. A comparison of p treatments would thus require the use of $p\ (p-1)$ cows. The method of analysis for such an experiment is described in great detail, as are also reduced designs with half the number of cows, which are permissible when the number of treatments is odd and not less than 5.

It may not always be convenient to put all the cattle on experiment at the same time, but a valid analysis is still possible provided that they are divided into blocks in a suitable way and the animals in one block are put on experiment at one time. A description is given of the consequent modifications of the analysis, and also of the treatment of any missing values.

The method of analysis is illustrated numerically from uniformity data.—I. McDonald.

4171

GESELLSCHAFT FÜR ERNÄHRUNGSPHYSIOLOGIE DER HAUSTIERE. Richtlinien zur Durchführung und Auswertung von praktischen Fütterungsversuchen an Haustieren. [**Guide to the performance and interpretation of practical feeding experiments on domestic animals.**] *Ztschr. Tierernährung Futtermittelk.*, 1956, **11**, 126–130.

Standard procedures for evaluation of feeds are suggested. Proper training and supervision of technical assistants is essential. Feeds should be analysed chemically or when necessary biologically for crude protein, crude fat, crude fibre and ash, and for other components as necessary; for chemical analyses the methods in "Handbuch der Landw. Versuchs- u. Untersuchungsmethodik", Bd. 3, Neumann-Verlag, Radebeul and Berlin, 1951, are suggested.

Animals of the same strain, age and sex and similar in bodyweight should be used, and preferably those similar in conformation and state of nutrition, and they must pass a veterinary inspection. Young animals should when possible be littermates and the feeding of the mother in pregnancy should be known, as well as that of the young from birth. In arranging groups the arithmetic mean of the initial weights should be similar and also the distribution of individual weights. For dairy and beef cattle and sheep the smallest group should be 8, young calves and pigs 6, chickens 30 and laying hens 60.

A "normal" group should always be included. For vitamin assays one group should always receive the carrier without the active substance. Digestibility trials are sometimes useful. The duration of experiments with dairy cows should be at least 2 months, with a fore-period of 1 to 2 months, but for mineral preparations a year is needed; with fattening cattle, calves, sheep and pigs the whole fattening period; with chickens at least 8 weeks, young birds 12 weeks, and laying hens at least 9 months beginning in October.

It is advantageous to use 3-day mean weights. Fattening animals should be weighed weekly. Yield of fattening animals is based on weight increase and carcase studies. Milk yield and fat content must be known and analyses of dry matter and protein may be necessary. For laying trials trap-nests must be used.

The evaluation and presentation of results is discussed briefly. Comparison of results with

those of others is possible only when all the conditions of environment, number of feedings and nutritional state of the animals are comparable.

D. Duncan.

4172

HOMB, T. Bestemmelse av biologisk verdi av proteinet i fôrmidler. [**Estimation of the biological value of protein in fodders.**] *Nord. Jordbrugsforsk.*, 1955, **37**, 106–124.

This survey deals with estimation of biological value by N balance experiments and the importance of the N content of the ration, the estimation of metabolic N in faeces, the negligible effect of fat, the consistency of the faeces, true and apparent digestion, endogenous N in urine and the reliability of the balance method. Six older methods are rejected for obvious sources of error. It is not, at present, possible to assess biological value from a complete analysis of amino acids and knowledge of the requirement of each one, but Mitchell and Block's method of comparison with egg protein gives results in good agreement with balance tests. It is impossible to say whether, or to what extent, such a chemical method may be developed to replace animal experiments.—I. Leitch.

4173

ANDERSON, R., CHENG, E. and BURROUGHS, W. **A laboratory technique for measuring phosphorus availability of feed supplements fed to ruminants.** *J. Animal Sci.*, 1956, **15**, 489–495.

The technique described made use of fermentation tubes as artificial rumens.

Cellulose digestion during a 24-hr. fermentation period by washed suspensions of rumen inocula to which were added the sources of phosphorus under investigation was estimated. As a preliminary a P-deficient medium was used, and then a standard phosphate source, 2 parts dibasic Na phosphate and 1 part monobasic K phosphate, was tested. The amount of phosphate was expressed in μg. per ml. medium. Maximum response to P was facilitated by the addition of specially hydrolysed casein or feather meal. The rumen inocula were obtained from cows with a fistula, and results from different cows or on different days agreed well. When the method was used to compare P sources commonly in use for cattle, composite dicalcium phosphate was almost as good as the standard phosphate when added in amounts supplying 10, 20 or 40 μg. P per ml. medium. An acidulated phosphate product at the same levels was only 60 to 70 per cent., steamed bonemeal 30 per cent., and Curação rock phosphate 10 per cent. as effective. Soft phosphate with colloidal clay was ineffective at 10 μg. and only 2 per cent. effective at higher levels. The technique is not yet perfected, and further work is necessary to establish its value in relation to actual conditions.—T. D. Bell.

4174

MEYER, J. H. and LOFGREEN, G. P. **The estimation of the total digestible nutrients in alfalfa from its lignin and crude fiber content.** *J. Animal Sci.*, 1956, **15**, 543–549. [Dept. Animal Husb., Univ. California, Davis.]

Lignin, crude fibre and N were estimated in 31 widely different samples of alfalfa hay, which were also used in 152 digestibility trials with wethers. Calculated total digestible nutrients (TDN) of the hays ranged from 36·2 to 63·4 per cent. The regression of lignin content of dry matter on TDN was $y = 84{\cdot}57 - 3{\cdot}21\,x$, with correlation $r = -0{\cdot}88$. For crude fibre the equation was $y = 79{\cdot}7 - 0{\cdot}84\,x$, with $r = -0{\cdot}86$. The correlation with percentage N was not quite so close, $r = +0{\cdot}77$, with the equation $y = 9{\cdot}25\,x + 27{\cdot}8$. TDN could be satisfactorily predicted from either lignin or crude fibre content, but this applies to alfalfa hay, and not to other forages.—T. D. Bell.

4175

VAN DER KLEY, F. K. **A simple method for the accurate estimation of daily variations in the quality and quantity of herbage consumed by rotationally grazed cattle and sheep.** *Netherlands J. Agric. Sci.*, 1956, **4**, 197–204. [Div. Grassland Husb., Agric. Univ., Wageningen.]

The method requires careful cutting of as many sample areas of the pasture as possible. The herbage must be cut to a constant level, below the level grazed by the animal, and hand clipping is recommended. It is shown how the daily quantity of herbage available to the grazing animal, and the quality of that day's herbage, can be estimated from the clippings. With careful clipping and analysis, the accuracy is high. Quality and intake of dry matter were found to decline on consecutive days on the same pasture, but on the first day excess might be taken.—T. D. Bell.

4176

VAN DER KLEY, F. K. Is radioactief bariumsulfaat bruikbaar om de hoeveelheid mest van weidend vee te schatten? [**Can radio-active barium sulphate be used to measure the quantity of faeces produced by grazing cattle?**] *Landbouwk. Tijdschr.*, 1956, **68**, 665–671. [Afd. Graslandcultuur, Landbouwhogesch.] English summary.

The characteristics of a suitable inert marker for measurements of fodder eaten and residues excreted by grazing cattle are that it should be well tolerated, not retained, uniformly distributed in faeces and excreted at a uniform rate. In tests with 4 bullocks, of about 450 kg. weight, fed indoors on cut grass, and given, in the main part of the experiment, for 16 days 2 capsules daily, to provide 2, 4, 6 or 8 g. barium sulphate with 0·1

mC. ^{35}S per g., there was no sign of intolerance, but $BaSO_4$ tended to be retained, was not uniformly distributed in faeces and was irregularly excreted. Such a heavy substance is therefore considered unsuitable as a marker.—I. Leitch.

4177

DEIJS, W. B. and BOSMAN, M. S. M. De bepaling van de verteerbaarheid van voedingsstoffen met behulp van plantaardige gekleurde verbindingen, die in het voer voorkomen. [**Estimation of the digestibility of feedingstuffs with the help of plant pigments that are present in the feed.**] 1. Algemene beschouwingen en colorimetrie. [**1. General considerations and colorimetry.**] 2. Toepassingen. [**2. Applications.**] 3. Plantaardige gekleurde verbindingen in gras en in mest van runderen. [**3. Plant pigments in grass and in faeces of cattle.**] 4. Toepassing bij grazende runderen. [**4. Application to grazing cattle.**] *Centraal Inst. Landbouwk. Onderzoek, Overdruk* No. 213–214, 1953 (1954), 155–160, 160–166 ; *Overdruk* No. 275–276, 1954 (1955), 219–223, 224–228. English summary.

1. An extract of grass made with 85 per cent. acetone has 2 maxima in the absorption spectrum, at 433 and 665 mμ. When oxalic acid, 0·03 *M*, is added to the acetone, the extract is green and the absorption maxima are at 412 and 666 mμ., which correspond to phaeophytin. Similar extracts of faeces showed maxima at 414 and 665 mμ. with acetone alone, and oxalic acid increased the optical density at 414 mμ. Extracts of silage with acetone alone gave maxima at 412 mμ. and oxalic acid had little effect. Acetone extracts of hay had little colour and no clear maximum ; oxalic acid increased density and gave a maximum at 414 mμ. When, therefore, plant chromogens are to be used in the estimation of digestibility, to get comparable results with feed and faeces acetone, 85 per cent. with 0·03 *M* oxalic acid, should be the solvent and absorption should be measured at wavelengths between 415 and 420 mμ.

2. Tests were made with cows stall-fed on hay, silage and dried grass, the silages made with molasses and with A.I.V. fluid, or stall-fed on fresh cut grass, or grazing, the pasture being sampled at the same time. In all the feedingstuffs and in faeces, dry matter (soil-free), crude protein, pigments and Cu were estimated. Digestibilities of crude protein by the chromogen method and calculated by the method of Dijkstra (*Landbouw*, 1951, **13,** 23) agreed well. Cu was absorbed in each of the tests in which the cows were stall-fed, most from molassed silage, and the Cu content of blood rose correspondingly. In 7 grazing tests with 52 cows in all, mean balance of Cu was positive only once.

3. Chromatography on aluminium hydroxide separated 4 pigment fractions from extracts of fresh grass and of faeces of grazing and stall-fed cows made with acetone, 85 per cent., containing 0·03 *M* oxalic acid. These were : carotene, phaeophytin, xanthophyll and a residual mixture of porphyrins of which one was phylloerythrin.

4. Another experiment with grazing cattle is described in which pigments were extracted from grass and faeces with acetone and oxalic acid, but as reference chromogen the residue after removal of the carotene and xanthophyll fractions was used. Again digestibility of crude protein so measured agreed well with that calculated by Dijkstra's method. Cu and Mn were estimated also. Per kg. dry matter grass contained 9·3 mg. Cu and 55·0 mg. Mn, and of these amounts 1·8 and 4·2 mg. were absorbed. When grass was cut into top, middle and base portions chlorophyll, crude protein and Cu in terms of dry matter all decreased from top to bottom ; the ratio of crude protein to Cu remained almost the same. The correlation between pigment and protein reduces the error when the cut sample of grass does not exactly correspond to the grass eaten.

Since the absorption spectra of extracts of grass in acetone, with and without oxalic acid, have maximum densities at 412 mμ. and 430 mμ., and the graphs of density cross at 422·5 mμ., it is suggested that an extract of grass without oxalic acid may be comparable, in terms of phaeophytin, with an extract of faeces when examined at that wavelength, and the possibility will be tested.

I. Leitch.

See also Absts. 4570, 4589, 4664, 4785, 4857.

COOKING, STERILISATION AND PRESERVATION OF FOOD

4178

BUSHILL, J. H. **War-time food processing problems in retrospect.** *Chem. and Indust.*, 1956, No. 21, 446–452. [Lyons Labs., London, W.14.]

4179

VILLANUA, L. and WOJCIECH, R. El problema de la coloración artificial de los alimentos y métodos analiticos para su investigación. [**Artificial colouring of foods and analytical**

methods for its investigation.] *An. Bromatol.*, 1954, **6**, 473–557.

Different types of colouring agents and work on their cancer-producing effects are summarised and legislation on their use is discussed. The Spanish list of permitted colours is reproduced, with details of those permitted in other countries. Analytical procedures for their identification are tabulated. There are 111 references.—D. Duncan.

4180

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD, FOOD STANDARDS COMMITTEE. **Recommendations relating to the use of colouring matters in food.** *J. Roy. Inst. Pub. Health Hyg.*, 1956, **19**, 36–37.

4181

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD, FOOD STANDARDS COMMITTEE. **Recommendations for limits for copper in foods.** *J. Roy. Inst. Pub. Health Hyg.*, 1956, **19**, 37–38.

4182

NATIONAL RESEARCH COUNCIL, U.S.A., FOOD AND NUTRITION BOARD, FOOD PROTECTION COMMITTEE. **Artificial sweeteners.** *J. Amer. Med. Assoc.*, 1956, **160**, 875.

A brief account of recent studies on saccharin and the cyclamates (sucaryl, sucaryl sodium, the calcium and sodium salts of *cyclo*hexylsulphamic acid). The sweeteners are considered safe for use in special diets but their unrestricted use in ordinary foods and beverages is not favoured.

W. M. Deans.

4183

CARENA, A. L'influenza della penicillina, della streptomicina e della cloromicetina sulla flora microbica e sulle qualita casearie del latte. [**The influence of penicillin, streptomycin and chloromycetin on the microbial flora and suitability of milk for cheesemaking.**] *Ann. Sper. agrar.*, 1956, **10**, 865–897. [Ist. Zootec. Piemonte, Turin.] English summary.

The milk samples were obtained from healthy cows and to them were added, per ml., 0·1, 0·5, 1 or 5 units penicillin, or 0·1, 0·5 or 2·5 μg. streptomycin, or 0·1, 0·5 or 2·5 μg. chloromycetin. Larger amounts of antibiotics prevented fermentation. The results of 1890 tests were analysed statistically.

Penicillin was most effective in slowing down the production of lactic acid in the milk, which was reduced by 35 per cent. after 4 hr. even with the smallest amounts of penicillin. After 12 hr. the acidity was almost normal when only 0·1 unit penicillin per ml. was added, but the larger doses still retarded acid formation to from 40 to 25 per cent. of the normal. The largest amounts of streptomycin and chloromycetin reduced acid formation in 12 hr. to 50 and 13 per cent. of normal. Reduction of methylene blue was affected in the same way as acidity.

The rate of coagulation was appreciably slower with 0·5 unit or more of penicillin or 2·5 μg. chloromycetin per ml., but the effect of streptomycin was slight. The maturation of curd was much delayed by chloromycetin, least by streptomycin. There was no interaction between the antibiotics. All the effects were highly significant.

D. Duncan.

4184

SHILLINGER, YU. I. and ORLOVA, N. V. O dopustimosti upotrebleniya v pishchu moloka korov, obrabotannykh preparatanii DDT v tzelyakh bor'by s kozhnym ovodom. [**The admissibility of using for food the milk of cows treated with DDT preparations against ecto-parasites.**] *Vop. Pitan.*, 1956, **15**, No. 3, 30–33. [Otdel Pishchev. Gig., Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

4185

GOLDBLITH, S. A. and PROCTOR, B. E. **Radiation preservation of milk and milk products. 1. Background and problems.**

BIERMAN, G. W., PROCTOR, B. E. and GOLDBLITH, S. A. **2. Off-flavors in milk and cream induced by ionizing radiations as judged by organoleptic tests.**

WERTHEIM, J. H. and PROCTOR, B. E. **3. The thiobarbituric acid test as a means of evaluating radiation-induced changes in milk.** *J. Dairy Sci.*, 1956, **39**, 374–378; 379–390; 391–401. [Dept. Food Technol., Massachusetts Inst. Technol., Cambridge.]

4186

TESSIER, H. and ROSE, D. **Composition of the liquid portion of frozen milk.** *Canad. J. Technol.*, 1956, **34**, 211–212. [Div. Appl. Biol., Nat. Research Labs., Ottawa, Ont.]

The recovery of citrate, P, Na, K and Ca relative to the chloride concentration was estimated in the liquid portion of frozen ultrafiltrates of skimmed milk and concentrated milk.—A. Hepburn.

4187

TOEPFER, E. W., PRITCHETT, C. S. and HEWSTON, E. M. **Boneless beef: raw, cooked, and served. Results of analyses for moisture, protein, fat and ash.** *U.S. Dept. Agric. Tech. Bull.* No. 1137, December 1955, pp. 33. [Human Nutrit. Res. Branch, Agric. Res. Serv.]

This report is in 3 parts.

Beef as cut for the United States army is known as 4-way boneless beef: 7 cuts for oven roasts or broiled steaks, 5 for pot roasts or Swiss steaks,

diced beef for stews, and ground beef for meat loaves, hamburgers and the like. Army and civilian retail cuts are shown in a diagram.

In 1951 preliminary studies were made of yield and composition of the different cuts and forms, raw frozen or after cooking by army methods, from 8 carcases of Army grade B (= U.S. Choice). The detailed results are given in tables. Boneless beef formed 66 per cent. of carcase weight. Thaw juices ranged from 3·8 to 5·0, mean 4·2 per cent. of raw frozen weight of cuts. Yields of drained cooked beef ranged from 64 per cent. of raw frozen beef for oven roasts (drippings 3·6 per cent.) to 77 per cent. for Swiss steaks. Energy, moisture, protein (N × 6·25), fat, ash, and, in some, total carbohydrate by difference are tabulated per 100 g. of the different cuts and forms, raw and cooked, and of the drippings. The factors for calculating energy value of different products are stated. Losses of protein and fat in thaw juices were small, as were losses of protein in drippings, except for Swiss steaks and pot roasts. On a carcase basis, the cooked beef contained 85 per cent. of the energy in the raw, 94 per cent. of the protein and 82 per cent. of the fat. From data on separable lean and separable fat, it was deduced that on the average, the separable fat contributed about half the energy of the cooked beef though it formed only about 20 per cent. by weight of the raw beef.

In the second part a large-scale study of plate waste from oven roasts, with fat trimmed to 3/4 in. or to 1/4 in., is reported (23 meals, 4854 men, at one army location). Trimming reduced percentages of beef not served from 7·2 to 4·3 and of plate waste from 6·0 to 4·4, but not drippings or scrapings. Of protein in raw beef issued, about 80 per cent. was in beef presumed eaten, and trimming made little difference. On the assumption that the fat dripping from trimmed cuts would be used and consumed as gravy, and no more than this, it was concluded that further trimming of surface fat at meat-packing plants would save weight to be handled and freezing space without impairing nutritive value.

Finally, in 1952–53, a study of composition of boneless beef as cooked and served on a still larger scale (542 meals, nearly 110,000 men, at 5 army locations in different states) is reported. Weight of beef issued varied considerably from the standard issue ; the amount, but not the percentage, of plate waste was a linear function of weight issued. Plate waste per standard issue for 100 men (42 lb. for most forms) ranged from 1·132 ± 1·08 lb. for hamburgers to 4·417 ± 2·33 for broiled steaks. Percentage of fat in plate waste was significantly correlated with that in beef served.

For protein and fat content of raw beef, the values for 8 carcases (part 1) were found to be representative of those in the largest field study, except for ground meat, which had significantly more fat in the field study. The beef presumed eaten was calculated to contain 67 per cent. of the energy, 84 per cent. of the protein and 51 per cent. of the fat of the beef issued. The plate waste contained 10, 6 and 11 per cent. and the unserved edible beef 7, 9 and 6 per cent.—W. M. Deans.

4188

FENTON, F., FLIGHT, I. T., ROBSON, D. S., BEAMER, K. C. and HOW, J. S. **Study of three cuts of lower and higher grade beef, unfrozen and frozen, using two methods of thawing and two methods of braising.** *Cornell Univ. Agric. Exp. Stat. Memoir* No. 341, March 1956, pp. 68. [New York State Coll. Home Econ.]

One-third of the beef produced in the United States in 1953 is said to have been from dairy animals, and in New York State about 300,000 cows and 700,000 calves are annually slaughtered off dairy farms. Only certain parts are sold as beef ; the rest goes for sausages or processing.

To get information about cow beef, a statistically planned experiment was made with 4-lb. boned and rolled joints from top and bottom round and chuck from 6 cow carcases, U.S. Utility grade, and 6 bullock carcases, U.S. Good or Choice grade. After storage in cellophane wrappings for a few days in a household refrigerator or for 6 months at — 18° C. the meat was braised in an oven at 149° C. (300·2° F.), or in a pressure cooker at 116° C. (240·8° F.) and 10 lb. pressure with intermittent escape of steam. Some of the deep-frozen meat was thawed to 1·1° C. (34° F.) before cooking. There were 144 joints in all. In raw and cooked meat moisture, fat, N, vitamin B_1 and riboflavin were estimated. The results are tabulated and analysed statistically.

For all the joints mean loss of weight was 39 per cent., fat loss in drip 4, mean evaporation loss 20 and cooking drip 14 per cent. Among significant differences were the following. Weight loss was greater for cow beef and with pressure-braising. Fat loss was greatest from chuck. Evaporation loss was greater with pressure-braising but cooking drip was less. Cooking drip was greater for cow beef. Differences in shrinkage were probably not of practical importance.

Moisture content, fat content after trimming and N content (mean 15 per cent.) of lean on a dry fat-free basis did not differ between grades. When cooked, chuck had least N.

Mean vitamin B_1 content of lean on a dry fat-free basis was 0·273 g. per 100 g. raw and 0·104 cooked (drip not analysed). Chuck had less than round. For cow beef only, thawing before cooking and oven-braising were advantageous.

Mean riboflavin content was 1·34 mg. per 100 g. raw and 0·795 cooked. Chuck had more than

round. Pressure-braising was at least as good as oven-braising. Freezing, and thawing before cooking, did not affect riboflavin content.

W. M. Deans.

4189

MIYADA, D. S. and TAPPEL, A. L. **The hydrolysis of beef proteins by various proteolytic enzymes.** *Food Res.*, 1956, **21,** 217–225. [Dept. Food Technol., Univ. California, Davis.]

For the extraction of meat proteins 0·1 *N* NaOH was superior to 0·5 per cent. KCl or 20 per cent. urea, and when collagen and elastin were estimated in the residue the values agreed well with those deduced from the amount of hydroxyproline present (for method of estimating hydroxyproline see Abst. 4061, Vol. 26).

Soluble beef proteins were well hydrolysed by papain, bromelin, ficin, trypsin and Rhozyme P-11, a fungal enzyme. Collagen was hydrolysed by all 5 and elastin by papain and ficin. All were powerful proteolytic enzymes and might be useful for making meat tender.—A. Hepburn.

4190

BELTRAN, M. M. Tratamiento y conservación de las carnes de vacuno por el frío industrial. [**Preparation and storage of beef in industrial refrigeration.**] *An. Bromatol.*, 1956, **8,** 109–122. English summary.

4191

KOTSCHEVAR, L. H. **Taste testing frozen meat cooked before and after thawing.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 444–449. [Dept. Home Econ., Montana State Univ., Missoula.]

4192

HENRICKSON, R. L., BRADY, D. E., GEHRKE, C. W. and BROOKS, R. F. **Dehydrated pork studies. Removal of glucose by yeast fermentation.** *Missouri Agric. Exp. Stat. Res. Bull.* No. 586, June 1955, pp. 12.

To prevent the "browning reaction" in dried pork, which was thought to be due to the reaction between amino groups and free aldehyde groups of glucose, an attempt was made to remove the glucose by fermentation with yeast.

Washed cells of *Saccharomyces cerevisiae* were used in concentrations of 1·7 to 20 per cent. with pork ground to 1/2 or 1/8 in. or blended in a Waring blendor. Pork was used cooked or uncooked. The 1/2-in. and blended products had an unsatisfactory texture. During 2 months' storage the 1/8-in. particles treated with yeast were more stable than those not treated. The best product was obtained with 5 per cent. yeast and fermentation for 4 hr. When 10 or 20 per cent. yeast was used, yeast flavour was detected in the finished product. Fermenting for more than 4 hr. did not improve the process. When the pork was cooked the glucose was more readily fermented and the product was better.—T. D. Bell.

4193

DESKINS, B. and WINTER, A. R. **Cooked, edible meat in parts of poultry. 2. Geese.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 211–213. [Sch. Home Econ., Ohio State Univ., Columbus.]

Studies similar to those on chickens (broilers) (Abst. 4677, Vol. 25) were made on young geese aged from 8 to 24 weeks. For 55 geese, liveweight from 7 to 13 lb., dressing loss was between 13 and 14 per cent. and average evisceration loss was 28·5 per cent. of liveweight. More detailed study of 19 geese showed that the average cooking loss of the carcase, excluding giblets and neck, was 38 per cent. at 24 weeks (7 birds) and 33 per cent. for the younger birds; loss of fat accounted for from 2·8 to 9·4 per cent. of this, increasing with age. Legs and breast formed a smaller percentage of the carcase than in chickens of the same age. In cooking, breast lost 39·3, back 38·3, legs 34·0 and wings 26·0 per cent. Edible meat formed 39 per cent. of eviscerated weight in the younger birds and 42 per cent. in the older, compared with 51·4 per cent. in chickens. In the cooked carcases, edible meat amounted to 64 per cent., compared with 69 per cent. in chickens.—W. M. Deans.

4194

FEKETE, L. A vágóhídi vér tartósítása nyáron. [**Conservation of slaughterhouse blood in summer.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1,** No. 8, 13–21. [Inst. Animal Breeding, Univ. Agric. Sci., Budapest.] Russian, German and English summaries.

Blood from the slaughterhouse was mixed within 6 hr. of collection with an equal weight of barley grits and the mixture was dried in the open in layers not more than 2½ to 3 cm. deep, stirred every half hour. Drying took about 4 to 6 hr. in the open, longer in a closed air space. As no heat was needed, the process was very cheap. The product was free from disagreeable odour and could be stored. One man without mechanical aids could preserve about 250 kg. blood in 8 hr. The product was readily accepted by pigs and poultry and also by breeding bulls. If pig blood is used it is advisable to boil the feed for 10 min. before giving it to pigs, but the risk of spreading infections could be reduced by giving pig blood to poultry and blood of other species to pigs. (From English summary.)—D. Duncan.

4195

KAWABATA, T. **Studies on the radiological contamination of fishes. 1. A consideration on**

the distribution and migration of contaminated fishes on the basis of the compiled data of radiological survey. 2. Actual state of radiological contamination in fishes and its possible routes on the basis of the findings of "Bikini Expedition". 3. Radio-chemical studies of contaminated fish. *Jap. J. Med. Sci. Biol.*, 1955, **8**, 337–346; 347–358; 359–372. [Dept. Food Control, Nat. Inst. Health, Tokyo.]

4196

RAMOS, V. P. Auto-oxidação e antioxigénios nas gorduras alimentares. [**Auto-oxidation and anti-oxidants in edible fats.**] *Agronom. lusitana*, 1955, **17**, 17–53. [Estação Agronom. Nac., Portugal.] English summary.

The material studied consisted of 12 samples of natural fats. Their stability to active oxidation at 100° C. ranged from 3 hr. for both liquid and solid phases of palm oil to from 9 to 17 hr. for different olive oils. In an incubator at 60° C. the stability of palm oil was 3 days, that of pure groundnut oil 9 days. In ordinary storage conditions the solid fraction of palm oil was stable for 8 months, the liquid fraction for over 12.

The stability of whole palm oil and of both fractions was slightly improved by from 0·01 to 0·03 per cent. nordihydroguaiaretic acid, butylhydroxyanisole, ethyl gallate or hydroquinone. Beneficial effects of critic and phosphoric acids are ascribed to their forming inactive complexes with Fe or other metallic oxidants.—D. Duncan.

4197

BRIDGES, R. G. **The fate of labelled insecticide residues in food products. 5. The nature and significance of ethylene dibromide residues in fumigated wheat.** *J. Sci. Food Agric.*, 1956, **7**, 305–313. [Pest Infestation Lab., London Rd., Slough, Bucks.]

For previous parts see Abst. 3902, Vol. 20 (DDT); *J. Sci. Food Agric.*, 1955, **6**, 251; 261; 269 (methyl bromide).

5. Laboratory studies with ethylene dibromide labelled with ^{82}Br showed that thorough airing is needed to remove ethylene dibromide sorbed by wheat. There was evidence suggesting that ethylene dibromide reacted with some constituent of wheat protein, but only to a very small extent. On heating, some of the ethylene dibromide sorbed on wheat breaks down to HBr and ethylene glycol, which is less toxic than ethylene dibromide, but may react with the SCH_3 group of methionine; and the HBr causes some breakdown of starch granule sheaths. None of these changes is considered at all likely to endanger human beings or affect the nutritive value of wheat for them; there may be some risk to chickens given unheated wheat.—W. M. Deans.

4198

LE GROS CLARK, F. **A new assize of bread.** *Med. Officer*, 1956, **95**, 289–290.

The question of the extraction rate of flour is rediscussed, with criticisms of the opposing points of view. The suggestion is made that flour of 70 per cent. extraction should be enriched with riboflavin as well as with vitamin B_1, nicotinic acid and Fe, but to assume that such enrichment will restore the difference between flour milled to 70 per cent. and that milled to 80 to 85 per cent. extraction is not wise.—W. M. Deans.

4199

BECHTEL, W. G., HAMMER, G. E. and PONTE, J. G. (Jr.) **Effect of calcium stearyl-2 lactylate in bread made with nonfat milk solids of varying baking quality.** *Cereal Chem.*, 1956, **33**, 206–212.

Addition of 0·5 per cent. calcium stearyl-2 lactylate to the dough improved the quality, especially the texture, of bread baked from flour containing 3, 4, 6 or 8·5 per cent. roller- or spray-dried non-fat milk solids, irrespective of the baking quality of the latter. Experiments with wheat starch and gluten separately suggested that calcium stearyl-2 lactylate alters the structure of gluten and retards the swelling of starch during baking.—W. M. Deans.

4200

TÄUFEL, K. and POHLOUDEK-FABINI, R. Das Auftreten von Acetoin und Diacetyl im fadenziehenden Brot. [**Occurrence of acetoin and diacetyl in ropy bread.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1956, **103**, 430–437. [Inst. Ernährungsforsch., Potsdam-Rehbrücke.]

4201

KIERMEIER, F., RICKERL, E. and KAMARIJANI. Über die Ursachen der Verfärbung gedämpfter Kartoffeln. 3. Die Bedeutung der Dämpfzeit, der Temperatur und eventuell vorhandener Enzymreste. [**Causes of discolouration of steamed potatoes. 3. Significance of time of steaming, temperature and possible enzyme residues.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1956, **103**, 285–290. [Deutsch. Forschungsanst. Lebensmittelchem., Munich.]

Previous papers dealt with chlorogenic acid (Abst. 188, Vol. 26) and bivalent iron (Abst. 1540, Vol. 26).

3. With or without added Fe, maximum blackening of potato meal or dough required 20 minutes' steaming. Discolouration by added Fe did not occur unless the potatoes reached at least 80° C. during steaming, and that was about the temperature at which chlorogenic acid was set free. All

these experiments were with a single variety (Ackersegen), but chlorogenic acid in varying amount was found in 5 other varieties liable to blacken on cooking. No evidence that blackening was caused by enzyme residues was found. It was concluded that blackening was due to the reaction between bivalent Fe, chlorogenic acid and some unknown substance in potatoes.

W. M. Deans.

4202

ARTHUR, J. C. (Jr.) and MCLEMORE, T. A. **Properties of polyphenolases causing discoloration of sweet potatoes during processing.** *J. Agric. Food Chem.*, 1956, **4**, 553–555. [S. Reg. Res. Lab., New Orleans 19, La.]

4203

LEE, F. A. **The effect of sunlight on crude lipids extracted from fresh and frozen vegetables.** *Food Res.*, 1956, **21**, 254–263. [Dept. Food Technol., New Jersey Agric. Exp. Stat., Rutgers Univ., New Brunswick.]

When crude lipids prepared as previously described (Abst. 1734, Vol. 25) from asparagus, sweet corn, Lima beans, peas, spinach and snap beans, blanched or unblanched and fresh or stored for a year or more at 0° F., were exposed for up to 120 min. to bright mid-day sunlight, peroxides developed more rapidly and to a greater extent in unblanched than in blanched samples, except in Lima beans. Frozen storage made little difference except to sweet corn (*cf.* Abst. 190, Vol. 26). Little peroxide was found after brief (5-min.) exposure. Lipids from stored blanched spinach developed little peroxide, which is attributed to their high carotene content. The absorption spectra of solutions of the crude lipids in ether are reproduced. There was evidence that visible light was the active agent, not ultraviolet; this is being investigated.—W. M. Deans.

4204

REITH, J. F. Over het gebruik van difenyl als schimmelwerend middel bij sinaasappelen en andere citrusvruchten. [**Use of diphenyl as protective against fungus for oranges and other citrus fruits.**] *Voeding*, 1956, **17**, 169–174. [Afd. Chem. Levensmiddelenleer, Rijksuniv. Utrecht.]

The amount of diphenyl to be found on treated fruit, the metabolism of diphenyl in experimental animals and its toxicity are briefly discussed on the basis of published reports. The Netherlands has, so far, made no regulation of its use; the United Kingdom prescribes an upper limit of 40 mg. per sq. in wrapping paper, the United States does not restrict its use.—I. Leitch.

4205

NIESAR, K. H. Lagerung und Qualität des Leinsamenmehles. [**Storage and quality of linseed meal.**] *Ztschr. Tierernährung Futtermittelk.*, 1956, **11**, 109–112. [Inst. Physiol. Tiere, Univ. Munich.] English summary.

A sample of linseed meal was found to contain crude fat 33, crude protein 20 and ash 4 per cent. and, in mg. per 100 g., Ca 266, P 630, vitamin E 20, vitamin B_1 1, riboflavin 0·6, nicotinic acid 3·9 and vitamin B_6 2.

The meal, stored in sacks at the temperature and humidity of a room or of a byre [not further specified], with or without dry ice to provide an atmosphere of CO_2, was examined after 2, 5 and 10 months; vitamin E was estimated and acid value, saponification value, iodine value and Lea (peroxide) value were ascertained. Although after 12 months there was no change in appearance, feel, smell or taste the chemical studies revealed moderate changes. After 5 months the vitamin E content had fallen by between 15 and 20 per cent., and then remained steady; the fall may have been due to the grinding. After 10 months the acid value had increased tenfold, the saponification value had decreased by about 20 per cent. and the peroxide value had doubled. Changes in iodine value were slight until 10 months had elapsed, and there was no fall then when dry ice was added; otherwise, dry ice made little difference. Feeding trials would be required to test whether these changes affect the feeding value.—W. M. Deans.

4206

DEIJS, W. B. and SPRENGER, J. J. I. De bereiding van eiwit uit groenvoedergewassen. [**The preparation of protein from green crops.**] *Centraal Inst. Landbouwk. Onderzoek, Overdruk* 166, 1952 (1953), 178–185. English summary.

Laboratory methods of isolating protein from green crops are briefly discussed. The Powling process (E. M. Bentall and Co., Maldon, Essex) is described in terms of composition of the product, a press cake, residue, loss of soluble components, and costs. The machinery is thought to be satisfactory, but not the details of processing. The main application, when these details have been improved, may be to the conversion of crop residues, such as beet leaves, to more valuable feeds.—I. Leitch.

4207

BREIREM, K. and ULVESLI, O. Resultater fra ensileringsforskningen. [**Results of research in silage making.**] *Landbrukshøgsk. Inst. Husdyrernæring Fôringslære*, 1954, Særtrykk No. 145, pp. 35.

A lecture.

4208

DIJKSTRA, N. D. De verandering van het drogestofgehalte van het geënsileerde gras tijdens de bewaring. [**Changes in dry matter content of ensiled grass during conservation.**] *Landbouwk. Tijdschr.*, 1956, **68**, 724–726; *Landbouwvoorl.*, February 1956, 83–84. [Rijkslandbouwproefstat., Hoorn.] English summary.

Data for the dry matter (DM) of grass, fresh or wilted, and that of the corresponding silage, made with or without preservative, are shown in a graph and, from the equation of the fitted parabola, a table is derived giving the dry matter of silage from grass of 13 to 50 per cent. DM by unit steps. The point at which no change occurs is 22·8 per cent. DM; above that, moisture is lost, below it moisture is gained.—I. Leitch.

4209

MURDOCH, J. C., HOLDSWORTH, M. C. and WOOD, M. **The chemical composition and loss of nutrients in silage made with the addition of sodium metabisulphite and halogenated acetate of glycol.** *J. Brit. Grassland Soc.*, 1956, **11**, 16–22. [Nat. Inst. Res. Dairying, Univ. Reading.]

Metabisulphite was used at rates of from 4 to 16 lb. per ton of herbage. In 3 small-scale trials the silages produced were generally of better quality than the control silages made without additive. Nutrient losses were lower and volatile acid and base formation were reduced. There appeared to be little effect on lactic acid production. In one instance metabisulphite had little effect because, it is suggested, rain leached it out of the silage. Results from 2 trials on a larger scale were not clear-cut, and it is suggested that this was due partly to the difficulty of securing even distribution of the metabisulphite. The results of 2 preliminary trials with the glycol compound ("Sovilon") were inconclusive.—J. L. Corbett.

4210

KARPOV, M. C. Primenenie bakterial'nykh zakvasok pri silosovanii kormov. [**Use of bacterial fermentation in ensilage of fodders.**] *Zhivotnovodstvo*, 1955, No. 9, 83–84.

The use of bacterial cultures in the preparation of silage has proved its value as shown by results at several experimental stations. The cultures contained large amounts of lactic acid bacteria. The smell and quality of the silage were improved and in some cases there was direct evidence of increased production by cows and pigs given this silage.—H. Scherbatoff.

4211

SEREN'EV, V. M. and VIL'NER, R. A. Pitatel'nost silosa iz pochatkov kukuruzy. [**Feeding value of silage from maize cobs.**] *Zhivotnovodstvo*, 1956, No. 3, 77. [Inst. Zernov. Khozyaistva Nechernozemnoi Polosy.]

One hundred kg. ensiled cobs of waxy ripeness contained 65 feed units, *i.e.*, 3 times as much as in cobs ensiled at the milky stage.—H. Scherbatoff.

See also Absts. 4056, 4131, 4231, 4236, 4238, 4241, 4253, 4311, 4316, 4387, 4389, 4516, 4880, 5111, 5262.

CULTURE OF MICRO-ORGANISMS FOR FOOD

4212

MOJONNIER, M. L., HEDRICK, L. R. and PORTER, T. **The microbiological assay of the amino acids of five genera of yeasts grown under controlled conditions.** *J. Nutrition*, 1955, **57**, 579–591. [Univ. Chicago, Ill.]

The amino acids of *Candida krusei*, *Pichia membranaefaciens*, *Saccharomyces carlsbergensis*, *Hansenula anomala* and brewer's yeast grown in a synthetic medium containing glucose and $(NH_4)_2SO_4$ as sources of C and N were estimated microbiologically. Total N in the first 4 ranged from 5·57 to 7·45 per cent., compared with 8·76 per cent. for brewer's yeast. The amino acids (18) accounted for 73 to 79 per cent. of the total N. All the yeasts contained the 8 essential amino acids and were relatively rich in lysine but poor in cystine and methionine. When KNO_3 replaced $(NH_4)_2SO_4$, *H. anomala* produced the same amount of protein but the amino acid composition was quite different.—A. Hepburn.

4213

VAVRA, J. J. and JOHNSON, M. J. **Aerobic and anaerobic biosynthesis of amino acids by bakers' yeast.** *J. Biol. Chem.*, 1956, **220**, 33–43. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

4214

GARRIDO, J. M. and WALKER, T. K. **Mycological formation of fat. 2. Synthesis of fat from various carbohydrates in surface cultures of *Aspergillus nidulans*, *Penicillium javanicum* and *Penicillium spinulosum* and the influence of the nitrogen source on the synthesis of fat from glucose.**

MURRAY, S. and WALKER, T. K. **3. Media conducive to formation of fat from sucrose by *Penicillium soppii* Zaleski in surface culture.** *J. Sci. Food Agric.*, 1956, **7**, 233–237 ; 237–240. [Div. Indust. Biochem., Fac. Technol., Univ. Manchester.]

See also Abst. 3332, Vol. 25 ; *J. Sci. Food Agric.*, 1954, **5**, 339.

2. By methods similar to those reported earlier the effects of different carbohydrates on fat production by moulds were studied. The best results were given by xylose, glucose, maltose and inulin. *Aspergillus nidulans* produced the greatest weight of fat from glucose and also the greatest amount of fat per g. sugar utilised. With xylose, *P. javanicum* gave the best result, with maltose, again *A. nidulans*. For all 3 moulds ammonium nitrate was the best source of N, though *A. nidulans* used $NaNO_3$ as successfully and urea slightly less well.

3. The growth of *Penicillium soppii* on inorganic media was improved by addition of maize steep liquor. With suitable media, mycelia were obtained with more than 40 per cent. fat and a production of 12·5 g. fat per 100 g. sucrose metabolised.

D. Duncan.

2. CHEMICAL COMPOSITION OF FOODSTUFFS

(Except Vitamins, for which see Section 3)

ENERGY VALUE, PROXIMATE PRINCIPLES AND INORGANIC CONSTITUENTS

GENERAL

4215

STROO, M., NUNNIKHOVEN, R. and WÖSTMANN, B. S. J. De aminozuursamenstelling van het gemiddeld dieet der Nederlandse bevolking. [**Amino acids of the average diet of the Netherlands population.**] *Voeding*, 1956, **17**, 132–136. [Nederlands Inst. Volksvoeding, Amsterdam.] English summary.

The composition of the average diet is taken as described by van der Rijst *et al.* (Abst. 876, Vol. 26). A corresponding mixture of foods was dried, hydrolysed with HCl and concentrated ; N was estimated by the Kjeldahl method and amino acids were separated by column chromatography by the method of Moore and Stein (Absts. 4469, Vol. 21 ; 3200, Vol. 25) as modified by Schram *et al.* (Abst. 44, Vol. 24). The result is shown in a table in terms of 23 amino acids together with the requirements of growing rats for 12 of them according to Rose *et al.* (Abst. 5101, Vol. 19) and to Williams *et al.* (Abst. 4768, Vol. 24), requirements for 8 of them of grown men derived from experiments in which N equilibrium was the criterion, to be doubled for safety according to Rose (Abst. 3891, Vol. 19), and intake of 10 amino acids in the United States per 100 g. dry diet, according to Block and Bolling (Abst. 3814, Vol. 23).

The Netherlands diet appears to supply less than rats need of several amino acids. It supplies much more than twice the need of human adults for N equilibrium, except for methionine. The United States diet, per 100 g. dry food, supplies more of all 10 amino acids shown. There is no evidence to show whether or not the amino acid composition of the Netherlands diet is optimum.

I. Leitch.

4216

Suplemento de la tercera edición de la tabla de composición de alimentos de Centro América y Panamá. [**Supplement to the third edition of the tables of composition of foods of Central America and Panama.**] *Bol. Ofic. sanit. panamer.*, 1955, Suppl. No. 2, 232–236. [Inst. Nutrición Centro Amér. y Panamá, Guatemala.]

See Title 4249, Vol. 24.

4217

Indice de nombros comunes de alimentos de Centro América y Panamá. [**Index of common names of foodstuffs of Central America and Panama.**] *Bol. Ofic. sanit. panamer.*, 1955, Suppl. No. 2, 237–250. [Inst. Nutrición Centro Amér. y Panamá, Guatemala.]

See also Abst. 4133, 4956.

FOODSTUFFS OF ANIMAL ORIGIN

Milk and Milk Products

4218

BASSIR, O. **Nutritional studies on breast milk of Nigerian women : some biochemical features of breast milk of Lagos women during the first year of lactation.** *J. Trop. Med. Hyg.*, 1956, **59**, 139–144. [Dept. Physiol., Univ. Coll., Ibadan.]

A milk sample compounded of 2 small samples taken before and after the 6 a.m. feed was obtained from 200 Nigerian mothers of healthy babies up to 12 months old. The samples were analysed for " cream ", lactose, N, Ca and P. The mean values for the 3 major constituents were similar to those reported for European and American series. The

individual variation was extremely large, *e.g.*, from 1·8 to 16·0 per cent. for "cream". The mean Ca and P contents, 20·3 and 9·54 mg. per 100 ml., were much lower than the usual published figures from European and American sources, but the mean Ca : P ratio was similar.—F. Hytten.

4219

McGillivray, W. A. and Porter, J. W. G. **Reviews of the progress of dairy science. Nutritive value of milk and milk products.** *J. Dairy Res.*, 1956, **23**, 283–299. [Massey Agric. Coll., Palmerston North, N.Z.; Nat. Inst. Res. Dairying, Univ. Reading.]

4220

Pounden, W. D., Frank, N. A. and Krauss, W. C. **The resistance of milk samples to the activity of *Streptococcus agalactiae* as affected by pasture.**

Pounden, W. D., Frank, N. A., Brown, R. W. and Scherer, R. K. **The resistance of milk samples to the activity of *Streptococcus agalactiae* as affected by feeding silage.** *Amer. J. Vet. Res.*, 1956, **17**, 227–230; 231–234. [Dept. Vet. Sci., Ohio. Agric. Exp. Stat., Wooster.]

(a) The resistance of milk to *Streptococcus agalactiae* was judged by the amount of acid produced: the more acid, the less resistance. Milk was obtained from 3 groups of Holstein and Jersey cows, initially on the same feeds indoors. One group of 17 cows then went out on bluegrass pasture, one of 23 cows on legume and bromegrass pasture, and 14 cows were fed mainly on hay.

In both groups which went to pasture there was on the average an increase of 27 per cent. in acid production by *Str. agalactiae* cultures in the milk within a week. Experiments were repeated in the next 2 years, but the increases were smaller, 15·4 and 12·7 per cent. Sometimes the increase was maintained, sometimes it became less as the pasture season went on.

(b) When silage was given to cows which had been for 1½ years on hay and grain, acid production by *Str. agalactiae* in the milk increased, but this was not found when cows coming in from pasture were given silage. The interpretation of the results is discussed.—D. Duncan.

4221

Bhimasena Rao, M. and Dastur, N. N. **Buffer value of milk and colostrum.** *Indian J. Dairy Sci.*, 1956, **9**, 36–43. [S. Reg. Stat., Nat. Dairy Res. Inst., Bangalore.]

4222

American Dairy Science Association, Committee on Milk Protein Nomenclature. **Nomenclature of the proteins of bovine milk.** *J. Dairy Sci.*, 1956, **39**, 536–541. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

It is recommended that for milk proteins the nomenclature α-, β- and γ-casein, α- and β-lactoglobulin, α-lactalbumin, serum albumin, euglobulin and pseudoglobulin should be used at present even though none of these may be entirely homogeneous. References are given for preparations and also data for percentage of each protein in total milk protein, concentration in milk, molecular weight, isoelectric point and electrical mobility at *p*H 8·6.—A. Hepburn.

4223

Marckmann, E. and Hingst, G. Erfahrungen und Ergebnisse einer einjährigen Untersuchung des Eiweissgehaltes der Milch von 1500 ganzjährig kontrollierten Kühen in Schleswig-Holstein. [**Tests and results of a one-year study of the protein content of the milk from 1500 cows recorded for a whole year in Schleswig-Holstein.**] *Milchwissenschaft*, 1956, **11**, 169–176. [Landeskontrollverband Schleswig-Holstein e.V.]

Milk accounts for 28 to 30 per cent. of farmers' income in Schleswig-Holstein. Of the yearly amount, 1·3 to 1·4 million metric tons, sold to dairies only 18 per cent. is sold liquid in Schleswig-Holstein and Hamburg; about 41,000 tons of butter and 11,000 tons of cheese are made yearly. Hence the protein content of the milk is important as well as the fat. From November 1953 to November 1954 it was estimated in samples obtained during 3-week milk recording from about 1750 cows [p. 170; about 2000 on p. 174, col. 1 and 1498 in col. 2] from 99 farms, some in the Eutin district and others from dry and marshy land in the Husum district, from herds of 20 and 11 cows on the average, mostly of the Black Pied Schleswig-Holstein breed, with some of the Red Pied Schleswig-Holstein and Angeln breeds.

Starting from work of Schulz and colleagues at Kiel [*Kieler Milchwirtsch. Forschungsber.*, 1953, **5**, 273], a routine method of formol titration was developed, by which, with the aid of automatic pipetting devices such as are used in routine estimation of milk fat by the Gerber method, protein could be estimated in 12 milk samples simultaneously and in 150 or even 200 daily. Much of the paper is devoted to the experimental details. An accuracy of 0·06 per cent. is claimed. Attempts were made to find a less dangerous preservative for the milk samples than corrosive sublimate with guaiacol, but neither potassium oxalate, hydrogen peroxide, sodium fluoride nor guaiacol alone proved satisfactory.

The results are appearing in full in publications of the *Deutsche Gesellschaft für Züchtungskunde*.

together with their biological and genetic implications. The most important are summarised at the close of this paper.

Significant positive correlations, from 0·5837 to 0·6852, were found between protein content and fat content ; as the fat content rises, the protein content rises one-third as rapidly on the average ; but the relation is not very close, for many cows show deviations from it. For a given fat content, a protein content higher by 0·25 per cent. may be expected in summer than in winter. The scatter of protein values was only about half that of fat values : protein ranged from 2·71 to 3·70 per cent. for 97·5 per cent. of the cows, and fat between from 3·01 to 5·00 per cent. for 97·6 per cent., and for 73·2 and 73·1 per cent., respectively, the protein and fat ranges were from 2·91 to 3·40 and from 3·41 to 4·40 per cent. Hence it is suggested [in the summary, not in text] that 2 to 3 times a month will suffice for testing milk to be used for cheese-making.

An effect of breed or locality on the protein-fat relation was not established. In mixed milk the protein content fell gradually from November to a minimum in April, rose suddenly when the cows went out to pasture, fell again to a second, less low point in July and rose again towards autumn. For fat content the minimum was in June. For cows at the stage of maximum yield (7- to 10-year-olds in the Eutin district) minimum fat occurred always during the time at pasture, *i.e.*, at different stages of lactation, but protein had a second, more pronounced, low point at the second to fourth test after calving. The fat content of milk from autumn calvers was 0·2 or 0·3 per cent. higher than from winter or spring calvers : for protein content the advantage of autumn calvers was about half that. Season of calving did not affect the protein-fat relation. Milk yield was highest in the sixth lactation ; the fifth and seventh were nearly as good ; it fell from the eighth onward. Fat and protein content were highest in the second and third lactation ; protein declined thereafter, but fat remained fairly constant until after the age of 10. Unlike fat, protein was nearly up to average in the first lactation. Except in extreme cases, yearly milk yield did not affect fat or protein content or the relation between them. From results for individual cows with the same yield and fat content of milk, it was found that the difference between actual and expected protein content was greatest from December to February, possibly owing to a decline in the quality of the feed in late winter ; but since in the June-July tests the protein content was highest in milk from autumn calvers and higher in winter calvers than in spring calvers, it may have been due to the cows' own need for more protein after calving and milking heavily.—W. M. Deans.

4224

DE VLEESCHAUWER, A. and HEYNDRICKX, G. V. Onderzoekingen over het verband tussen veten eiwitgehalte in melk. [**Relation between fat and protein content of milk.**] *Nederlands Melk Zuiveltijdschr.*, 1956, **10,** 10–17. [Leerstoel Technol., Rijkslandbouwhogesch., Ghent.] English summary.

Data on the composition of milk are not in agreement with reference to whether fat and protein or fat and particular components of the protein complex are correlated.

In this series fat and total protein were estimated in 28 samples, 9 of bulk milk and 19 of milk from individual cows, mostly of the red and white and black and white breeds. Total protein is (total N − N.P.N.) × 6·38. In 55 other samples, 8 of bulk milk and 47 from 28 cows individually, fat, total protein, casein, and albumin plus globulin were estimated by Rowland's methods (Absts. 12, 124, Vol. 8) and 4 fractions, probably α- and β-casein and β- and α-lactoglobulin, by electrophoresis by Tiselius's method. Between fat and total protein and fat and total casein there were significant correlations ($P = 0{\cdot}01$), but between fat and the casein fractions separately the correlation was less ($P = 0{\cdot}05$). It was also less but significant ($P = 0{\cdot}01$) for the albumin plus globulin and the sum of the α- and β-lactoglobulin fractions ; but with the lactoglobulin fractions separately there was no significant correlation.

I. Leitch.

4225

STARY, Z. and CINDI, R. Über den Gehalt der Milchproteine an Galaktose und Hexosamin. [**The galactose and hexosamine content of milk protein.**] *Naturwissenschaften*, 1956, **43,** 179–180. [Inst. Biochem., Univ. Istanbul.]

Examination of casein hydrolysates by the method of Gurin *et al.* (*J. Biol. Chem.*, 1940, **133,** 467) showed that the hexose part of casein consists of galactose only. No hexosamine could be detected by the reaction with acetylacetone and dimethylaminobenzaldehyde. Whey protein, on the other hand, contained from 0·5 to 1·0 per cent. hexosamine, and about 5 per cent. hexose, mostly galactose. Cow colostrum contained more hexosamine and less galactose than the subsequent milk.—W. M. Deans.

4226

PATTON, S. and POTTER, F. E. **The presence of α-ketoglutaric acid in milk.** *J. Dairy Sci.*, 1956, **39,** 611–612. [Dept. Dairy Sci., Pennsylvania State Univ.]

α-Ketoglutaric acid was identified in milk by paper chromatography and by isolation of its dinitrophenylhydrazone. Skimmed milk contained about 15 mg. per litre.—A. Hepburn.

4227

ZITTLE, C. A., DELLAMONICA, E. S., CUSTER, J. H. and RUDD, R. K. **The fat-globule membrane of milk : alkaline phosphatase and xanthine oxidase in skimmilk and cream.** *J. Dairy Sci.*, 1956, **39,** 528–535. [E. Reg. Res. Lab., Philadelphia, Pa.]

See also Abst. 4120, Vol. 26.

4228

BALIGA, B. S. and BASU, K. P. **Phospholipids in milk. 2. Variations in the lecithin, cephalin, sphingomyelin and total phospholipid contents of milk due to species, breed, season and stage of lactation.** *Indian J. Dairy Sci.*, 1956, **9,** 24–35. [S. Reg. Stat., Nat. Dairy Res. Inst., Bangalore.]

For method of estimation see Abst. 2720, Vol. 26.

2. The total phospholipin content of the milk of cows, buffaloes, sheep and goats, respectively, was 31·37, 21·03, 58·51 and 49·69 mg. per 100 ml., and the fat content 4·4, 6·7, 8·1 and 5·1. In all the species the proportions of lecithin, cephalin, and sphyngomyelin were similar, 30 : 45 : 25.

When different breeds of cow were compared, total phospholipins in the milk of Sindhi, Gir, Tharparkan and Ayrshire × Sindhi, respectively, were 31·55, 28·73, 33·71 and 31·39 mg. per ml., and fat 5·0, 4·5, 5·0 and 4·6.

Between sheep of different breeds a range from 51·78 to 67·38 mg. phospholipin per 100 ml. milk was found, and between milks from individual goats with wide differences in fat percentage even greater variation was found, from 25·84 to 82·38 mg. per 100 ml.

The effect of season was studied in cows and buffaloes. There was little effect in the former, any change found being no greater than might be due to individual variation. In buffaloes total phospholipins were low during the winter and high in the rainy season.

When the effect of lactation was studied, similar changes in cow and buffalo were found. Average values for colostrum phospholipins were from 45 to 50 mg. per 100 ml., but during the first 2 days they reached a peak of 60 to 70 mg. and fell quickly, then more slowly, till a value for normal milk of 30 mg. was reached by the 15th to 17th day. For 6 months values then remained constant. During the last months of lactation there was a steady rise to values similar to those of the later colostrum.—T. D. Bell.

4229

EVENHUIS, N. and DE VRIES, T. R. **The condition of calcium phosphate in milk. 1. 2.** *Nederlands Melk Zuiveltijdschr.*, 1955, **9,** 146–157 ; 1956, **10,** 1–9. [Lab., Co-op. Milk Products Factory, Bedum.] Dutch summary.

4230

ORTEGA, M. Determinacion por fotometría de llama del contenido en sodio y potasio de leches de diverso origen. [**Estimation by flame photometry of sodium and potassium in milks of different origin.**] *An. Bromatol.*, 1954. **6,** 423–427. [Inst. Español Hematol., Madrid.]

The photometer used was of the Perkin Elmer type with an internal lithium standard, which gives greater accuracy than direct photometry. Mean values for K and Na in mg. per 100 ml. were for cow's milk 177 and 31·2, for human milk 46·8 and 20·7 and for ass's milk 64·4 and 44·4.

D. Duncan.

4231

ADACHI, S. **New amino-acid-glycosides isolated from tryptic hydrolysates of milk products.** *Nature*, 1956, **177,** 936–937. [Lab. Animal Products Technol., Fac. Agric., Tohoku Univ., Sendai.]

Three amino acid glycosides were identified by paper chromatography in tryptic hydrolysates of evaporated milk and dried skimmed milk. One of these was also prepared from casein and whey protein and probably was originally present in raw milk. The other 2 contained lactose or lactulose and had identical aglycones. It was concluded that the former was converted into the latter.

A. Hepburn.

4232

ZEHREN, V. L. and JACKSON, H. C. **A survey of United States butterfat constants. 1. Reichert-Meissl, Polenske and refractive index values.**

KEENEY, M. **2. Butyric acid.** *J. Assoc. Off. Agric. Chem.*, 1956, **39,** 194–212 ; 212–225. [Dept. Dairy Food Indust., Univ. Wisconsin, Madison.]

1.2. The Reichert Meissl value, Polenske value, refractive index and butyric acid content were ascertained for over 500 samples of butter, obtained monthly for 1 year from 42 different sources in the U.S., covering 25 states with as wide a geographical range as possible. The results were analysed statistically.

The maximum average Reichert Meissl and Polenske values occurred during the late winter and the minimum average in midsummer. The maximum average refractive index was found in midsummer and the minimum average in late winter. The range of butyric acid values was from 9·6 to 11·3 mol. per cent. ; the arithmetic mean was 10·41 and the standard deviation 0·30 mol. per cent.—G. A. Garton.

4233

STADHOUDERS, J. and MULDER, H. **The composition of Dutch butter fat. 2. Seasonal variations in the saturated fatty acid composition of butter fat.** *Nederlands Melk Zuiveltijdschr.*, 1956,

10, 53–59. [Lab. Dairying, Agric. Univ., Wageningen.] Dutch summary.

For part 1 see Abst. 1562, Vol. 26.

2. The saturated fatty acid composition of 6 samples of Dutch butterfat was ascertained by the reversed-phase partition chromatographic method of Boldingh as described by van de Kamer *et al.* (Abst. 1435, Vol. 26).

In spring the butterfat contained much more butyric, caproic, caprylic and capric acid and more lauric acid than in autumn. The proportion of myristic and palmitic acids was greater in winter butterfat than in summer butterfat ; in spring the amounts of these acids suddenly fell. The amount of stearic acid was not correlated with that of any other higher fatty acid.—G. A. Garton.

4234

STEEN, K. Nyere undersøgelser over kendingstal for dansk smørfedt. [**Recent studies of values for Danish butterfat.**] *Forsøgslab. København. Beretn.*, 1956, No. 287, pp. 94. English French and German summaries.

Samples of butter were procured from the State Grading Centre (Statens Smørbedømmelser) which receives butter every week from 100 or more creameries. A compound sample was made each week and these totalled 367 [? 392] in the series between 1943 and 1951, 41 in 1953 and 47 in 1954. In addition, in 1953 and 1954, individual samples from 5 creameries chosen weekly at random totalled 212 and 237. Results in terms of Reichert Meissl, Polenske, saponification (Køttstorfer), Juckenack-Pasternak difference, and iodine number for part of the time, are reported in detail. Values for Polenske number corresponding to given Reichert Meissl values are given on p. 8 and means for the other numbers considered to be normal on p. 9. These standards are not Danish and are shown to be of doubtful validity in view of the changes in composition of butterfat which occur from one season to another and which have followed changes in feeding practice in recent years. According to these standards, of Polenske values in the series 1943 to 1951, there were, per cent., 43 above and 12 below normal, in 1953, 27 above and 51 below and in 1954 2 above and 70 below. The shift of Polenske in relation to Reichert Meissl values, which themselves appear to have risen, is attributable to the policy of increased use of home-grown feedingstuffs. Similar changes were found in the other values.

Data for iodine number of summer and winter butter are given separately. Softness of Danish summer butter, for instance in 1954, has been attributed to rise of iodine number, but the iodine number did not rise, so that the change must be in composition of pasture, or in the process of making butter. The iodine number of winter butter is low enough to account for brittleness and there are also complaints of " beety " taste. Both defects are explicable by increased use of home-grown feeds and reduction of the fat content of oilcakes and meals. Not only so, but iodine value of oilseeds and their products decreases from seed to cake to meal, which suggests that unsaturated acids may be removed before the more saturated.—I. Leitch.

4235

CERUTTI, G. and TAMBORINI, A. Sulle caratteristiche del burro attualmente in commercio. [**Characteristics of butter on the market.**] *Ann. Sper. agrar.*, 1956, **10,** 443–446. [Ist. Indust. Agrar., Univ. Milan.] English summary.

Of 95 samples of butter analysed, 40 were found to be adulterated with other fats. Thirty of these showed sufficient variation from normal standards to be illegal, the fats used, easily detectable, being from whale, dolphin, fish, or cocoa, or lard, palm oil or oleomargarine. In the other 10 the added fat was ewe's butterfat. The need for careful analysis and stringent application of the law is stressed.—T. D. Bell.

4236

WAUSCHKUHN, B. F.i.T.-Änderungen in Weichkäse während der Reifung. [**Changes in fat content of dry matter of soft cheese during ripening.**] *Milchwissenschaft*, 1956, **11,** 176–178. [Milchwirtsch. Lehranst., Hameln.] English and Spanish summaries.

A preliminary report on the fat content of the dry matter of small (80-g.) and normal-sized (125-g.) Camembert cheeses of nominal fat content 30 or 45 per cent., during ripening. The fat content first falls and then rises, but the curves vary so much with conditions that it is considered that standard curves should be established for different sorts and sizes of cheese. This would be of practical use in preventing the packaging and marketing of cheese too soon, *i.e.*, before it has reached its maximum fat content.—W. M. Deans.

4237

CERUTTI, G. and CRISTALLO, G. Sulle variazioni delle costanti chimico-fisiche e della composizione del grasso dei formaggi. [**Variations in the physicochemical constants and the composition of the fat of cheeses.**] *Ann. Sper. agrar.*, 1956, **10,** 439–442. [Ist. Indust. Agrar., Univ. Milan.] English summary.

The oleic acid content, Reichert Meissl Wollny number, Polenske number, refractometric index and peroxide number are tabulated for 30 samples of Italian cheeses. Four samples contained propionic acid and one *iso*valeric acid. The conditions governing production of these acids are to be studied.—D. Duncan.

4238

HARPER, W. J. and LONG, J. E. **Italian cheese ripening. 4. Various free amino and fatty acids in commercial Provolone cheese.**

LONG, J. E. and HARPER, W. J. **5. Various free amino and fatty acids in commercial Romano cheese. 6. Effects of different types of lipolytic enzyme preparations on the accumulation of various free fatty and free amino acids and the development of flavor in Provolone and Romano cheese.** *J. Dairy Sci.*, 1956, **39,** 129–137 ; 138–145 ; 245–252. [Dept. Dairy Technol., Inst. Nutrit. Food Technol., Ohio State Univ., Columbus.]

For parts 1 and 2 see *Butter, Cheese and Milk Prod. J.*, 1952, **43,** (5), 24 and (8), 22.

4. The sources, type and principal organisms of the starters were recorded and are tabulated with descriptions of flavour and data for moisture and water-soluble N in 10 Provolone cheeses after ripening for 9 months under standard conditions. Free amino acids, estimated in water extracts, were qualitatively the same in all samples. Quantitatively, histidine, α-aminobutyric acid and threonine were present in small amounts only ; the amounts of the other acids varied greatly. Amino acids were not present in the same ratios as in the original casein. The amounts were not related to the type of rennet paste used but were related to the predominating organism, being higher with *Lactobacillus lactis* than with *L. bulgaricus*.

Free acetic, propionic and butyric acids were estimated ; the contents were not related to the type of starter but that of butyric acid was related to intensity of desired flavour. Twenty more commercial samples were analysed for butyric and glutamic acids only ; in these and in the 10 other cheeses the concentrations of these acids rose with the intensity of desired flavour and the ratio butyric : glutamic acid remained at about 1 : 2.

5. Samples from 14 Romano cheeses were analysed by the same methods as in part 4 and estimations also were made of fatty acids with more than 5 carbon atoms. Ages of the cheeses differed, their periods of ripening in months and numbers being 4 and 7 ; 10 and 3 ; 18 and 3 ; 26 and 1. The 4-month cheeses had been under standard conditions ; the others were commercial samples. In general the findings were similar to those for Provolone cheese but levels of free amino and fatty acids were higher in Romano cheese, possibly because the temperature during moulding is lower than that to which Provolone cheese is heated.

6. Eight vats of the same milk in one factory and with the same starter, *Lactobacillus bulgaricus*, were made, in pairs, into Provolone and Romano cheese. The type of enzyme differed for the pairs, being rennet extract alone or with a calf or kid glandular preparation or an imported crude rennet preparation from kids. Processing data are given. The cheeses were stored for 1 year under standard conditions and analyses were made generally at 1, 14, 30, 60, 90, 220 and 370 days.

In both types of cheese development of characteristic flavour was least with rennet extract alone ; flavour and butyric acid content were more pronounced and greater with the kid preparations than with the calf one. There was no relation between free amino acid content and the enzyme product used. The patterns of free amino acids were the same but concentrations were higher in Romano than in Provolone cheese.

The development of desired flavour was related to contents of both butyric and glutamic acid in Provolone but only to that of butyric acid in Romano cheese.—D. Harvey.

4239

HINTZ, P. C., SLATTER, W. L. and HARPER, W. J. **A survey of various free amino and fatty acids in domestic Swiss cheese.** *J. Dairy Sci.*, 1956, **39,** 235–244. [Dept. Dairy Technol., Inst. Nutrit. Food Technol., Ohio State Univ., Colombus.]

Swiss cheeses made under commercial conditions with the same starters were analysed after from 1 to 11 months. The findings are tabulated. Two amino acids not previously recorded in Swiss cheese were cysteic acid, in all 16, and taurine, in 10 of the samples. Valeric acid, also not recorded previously, was present in 6 of 7 cheeses tested for it. Before 3 months the glutamic acid content was low. There was some indication of a relation between the contents of proline and propionic acid ; if these were, respectively, below 2 and 5 mg. per g. cheese the rating for characteristic Swiss cheese flavour tended also to be low.—D. Harvey.

4240

SHARARA, H. A. **Retention of calcium and phosphorus in Egyptian Domiati cheese.** *Indian J. Dairy Sci.*, 1956, **9,** 17–23. [Fac. Agric., Univ. Cairo.]

Samples of Domiati cheese were prepared over a year from 10 lots each of cow's and of buffalo's milk. The average Ca content of the milks was 0·137 and 0·223 and of the cheese 0·588 and 0·624 g. per 100 g. ; corresponding values for P were 0·053, 0·102 and 0·144, 0·196 g. In the cheese the mean retention of Ca was for cow's milk 70·6 and for buffalo's milk 67·9 per cent., with corresponding values for retention of P of 48·9 and 49·0 per cent.

D. Harvey.

4241

SCHORMÜLLER, J. and GELLRICH, W. Beiträge zur Biochemie der Käsereifung. 17. Das

Vorkommen freier Aminosäuren und verschiedener Transaminasen in reifendem Sauermilchkäse. [**Biochemistry of cheese ripening. 17. Presence of free amino acids and of transaminases in ripening sour milk cheese.**]

SCHORMÜLLER, J. and HUTH, H. 18. Atmung und Gärung im Verlaufe der Reifung von Sauermilchkäse. [**18. Respiration and fermentation during the ripening of sour milk cheese.**] *Ztschr. Lebensmittel - Untersuch. Forsch.*, 1956, **103,** 291–305; 361–379. [Inst. Lebensmittelchem., Tech. Univ., Berlin-Charlottenburg.]

17. The problem of transaminases in ripening cheese (see part 11 of the series, *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **100,** 200) was attacked again with a different method of analysis, described in detail, in which free amino-acids were separated and estimated by circular paper chromatography, generally with a 4 : 1 : 5 mixture of *n*-butanol, glacial acetic acid and water, with ninhydrin for detection. Isatin was a more sensitive detector for proline and hydroxyproline and for prolyl-peptides (see part 12, *idem*, p. 380), and diazotised sulphanilic acid for histidine and tyrosine. Comparison was with a standard mixture of 13 amino acids. Certain amino acids were not clearly separated by the above solvent; bands containing glutamic acid and threonine, or aspartic acid, glycine and serine, were separated by a 10 : 5 : 5 mixture of pyridine, *iso*amyl acetate and water, and this mixture, or a 25 : 5 : 5 mixture of *iso*propanol, glacial acetic acid and water, served to separate tyrosine and α-aminobutyric acid, or γ-aminobutyric acid and tryptophan, or valine and methionine. The separated acids were estimated by a modification of the method of Giri *et al.* (Abst. 41, Vol. 24) in which the ninhydrin-copper complex was measured photometrically.

When this method was applied to an ultrafiltrate of a 20 per cent. suspension of ripe cheese there was interference from lower peptides (see part 12), including leucylglycine and leucylglycylglycine, and to avoid this the ultrafiltrate was subjected to mild hydrolysis with HCl. (Further investigation of peptides is going on.)

All the main constituents of casein, namely, glutamic acid, proline, leucine, *iso*leucine, lysine, aspartic acid and valine, were found in fairly large amounts; but the leucines were plentiful only in the hydrolysates, which showed that in many (but not all) ultrafiltrates they were bound in peptides of low molecular weight. Only very small amounts of tyrosine, threonine and phenylalanine were detected, no arginine, and histidine only in traces; alanine and glycine were much more plentiful, so that the amounts in casein and the amounts of free amino acids by no means always conform. Only very small amounts of tryptophan and methionine were found and cystine and cysteine could not be detected. These results are mostly in agreement with earlier ones (Absts. 4263, Vol. 24; 220, Vol. 25; 2859, Vol. 26).

Attempts to isolate glutamic acid-aspartic acid transaminase were only partly successful. By estimation of glutamic acid by the method described above, transamination between α-ketoglutaric acid and 14 amino acids in presence of an active cheese suspension which had been centrifuged and dialysed to remove salts and free amino acids was investigated. Glutamic acid formed from peptides and proteins by proteolytic enzymes, or by transamination between α-ketoglutaric acid and amino acids set free by proteolysis, was allowed for by a blank experiment with α-ketoglutaric acid, cheese suspension and no amino acid. Transamination occurred with aspartic acid, and with methionine, leucine, *iso*leucine, valine and γ-aminobutyric acid to about half the extent, and with phenylalanine to a less extent; not with cystine, arginine, lysine, β-alanine or proline; α-aminobutyric acid and histidine gave doubtful results and require further investigation.

18. Respiration of a fine 10 per cent. suspension of cheese with *M*/15 Sörensen phosphate buffer, measured in a Warburg manometer at 37° C., was greatest between the 6th and 10th days of ripening and between *p*H 6 and *p*H 7·5. At *p*H 7·2 respiratory activity was greater in rind than in interior, and in unsalted curd than in normally ripening cheese; but, strange to say, addition of NaCl did not inhibit respiration. At the natural *p*H of the particular stage of ripening, the respiratory quotient was much the same for unsalted curd as for normal cheese, between 0·8 and 0·9; from the absence of extreme values it was concluded that under aerobic conditions decarboxylation does not occur. Respiration of washed suspensions was stimulated by L-glutamic acid, L-proline, L-lysine, DL-phenylalanine and DL-alanine (but 8 other amino acids from casein were without effect), and by glucose, DL-lactic acid, pyruvic acid, acetic acid and ethanol.

In normal cheese anaerobic fermentation set in about the 6th day and rose to the 10th day; it varied more with *p*H than did respiration, maximum at *p*H 6 to 7, but, unlike respiration, was unaffected by temperature. In addition to CO_2, hydrogen was produced, about a fifth as much.

The results are discussed at length. One practical conclusion is that sour milk cheese should not be wrapped in cellophane or other airtight material until respiration is maximum, or just after this.

W. M. Deans.

4242

MAOLI, G. Contributo alla conoscenza della composizione chimica e del valore nutritivo della ricotta ottenuta dal siere di latte di pecora.

[Chemical composition and nutritive value of "ricotta" made from whey of sheep's milk.] *Ann. Sper. agrar.*, 1956, **10**, 565–576. [Ist. Sper. Zootec., Rome.] English summary.

Ricotta, or albumin cheese, is made by rapidly cooking the whey left after making cheese. Sheep's whey gives a better product than cow's and in Italy that from the Sopravissima breed is acknowledged the best. The original milk has 8·1 per cent. butterfat, and the residual whey 3·5 to 5·0 per cent., which is included, with the whey protein, in the ricotta.

Ten samples of ricotta were analysed. Average dry matter was 43·14, which was made up of crude protein 20·24, fat 71·11, ash 1·30 and lactose 7·20 per cent. The energy supplied by 100 g. fresh material was 330 Cal., 85 per cent. of which was from the fat, 11 per cent. from the protein and 4 per cent. from the lactose. Most of the protein was lactalbumin, with one-tenth as much lactoglobulin, and traces of N.P.N., and had a high biological value. The fat was high in caproic, caprylic and capric acids, but these did not impart any unwelcome flavour.—T. D. Bell.

See also Abst. 4028, 4042, 4043, 4186, 4996, 5218-20, 5224, 5259.

Eggs

4243

MATSUDA, Y. and IWAMURA, I. **Chemical studies on the fertility and sex differences of eggs. 1. The ratio of arginine to tryptophane in fertilized and nonfertilized eggs of domestic fowl.** *Bull. Fac. Agric. Univ. Miyazaki*, 1956, **1**, 196–200. [Lab. Animal Feeding, Fac. Agric., Univ. Miyazaki.] In Japanese: English summary.

The percentage of arginine on a fresh weight basis in the fertilised germinal discs of 6 eggs from White Leghorn hens was 0·75 and from Barred Plymouth Rock hens 0·83. For tryptophan the values were 1·10 and 1·11. Corresponding values for other portions were: non-fertilised germinal discs 0·71, 0·81 and 1·07, 1·16; fertilised egg yolks 0·71, 0·87 and 1·04, 1·13; non-fertilised egg yolks 0·73, 0·83 and 0·98, 1·14. The arginine : tryptophan ratios in these 4 groups calculated from the above data were 0·71, 0·68, 0·73 and 0·74 [these differ slightly from the ratios given]. The arginine content of the acid hydrolysates of fertilised and non-fertilised germinal discs was 1·52 and 1·41 per cent.—A. Hepburn.

4244

RHODES, D. N. and LEA, C. H. **Composition of egg phospholipids.** *Nature*, 1956, **177**, 1129–1130. [Low Temp. Res. Stat., Downing St., Cambridge.]

Egg yolk phospholipins were selectively hydrolysed in the α′-position to yield lysolecithins by the action of snake venom; these compounds were found to have a residual unsaturation of about 0·15 double bond per molecule, indicating the presence in egg yolk of lecithins containing 2 unsaturated fatty acid residues in the molecule. The fatty acids of the lysolecithins were hydrogenated and found, by partition chromatography, to consist of palmitic acid 67 and stearic acid 33 per cent. Highly unsaturated lecithins were prepared by chromatography on silica columns and found to contain acids in the α′-position with an average unsaturation of 5 unconjugated double bonds per molecule; hydrogenation of these acids followed by chromatography showed that components of C_{20} and C_{22} chain length were present.—G. A. Garton.

Meat (All Kinds)

4245

ANDO, N. **Chemical studies on the beef of Korean cattle.** *Mem. Fac. Agric. Univ. Miyazaki*, 1955, **1**, 1–135. [Lab. Chem. Technol. Animal Products, Fac. Agric., Univ. Miyazaki.]

A study on 57 bulls, 11 cows and 12 bullocks is reported. Differences in composition of beef and visceral and external fat were investigated. Four cuts of beef were compared in each class of animal, the tenderloin, psoas major, loin, longissimus dorsi, fore shank, deltoideus and hind shank, biceps femoralis.

Significant differences were found between cuts in fat percentage and energy values, in both sexes being higher in the tenderloin. Fat and energy were highest in cows, lowest in bulls and intermediate in bullocks. The beef of young bulls 3 to 5 years old had more water and less fat and glycogen than that of bulls 6 to 10 years old. The range of age of the cows was only 7 to 11 years, and was too small to show clear differences. The beef of fat bulls had higher percentages of fat, protein and ash than that of medium or thin bulls.

A growth trial was made with bullocks castrated at 1, 2 or 3 years old, and intact bulls, all fattened for 310 days when they were 7 years old. Castration increased growth rate, improved efficiency and gave better carcase grades, the greatest improvement being after castration at 1 year old. In the bullocks the cut with the highest fat percentage was the loin.

Glycogen content of the muscle of bulls was not affected by site or standard of nutrition. In loin it was greatest in cows, intermediate in bullocks and least in bulls.

Digestibility of the protein of the beef of bulls was 95·85 per cent. and that of bullocks 96·13; these were not significantly different, and in neither class was there any difference between cuts.

Differences in distribution of N and total N were found due to sex, and to castration. Cows had higher total N, water-soluble N and amino N than bullocks, and bullocks more than bulls.

Visceral adipose tissue from the kidney, omentum and mesentery of bulls and cows and of external fat from the buttocks of cows were analysed. Great variation was noted between individual bulls. Of visceral adipose tissues, kidney fat had more fat and less water. External adipose tissue in cows had less fat and more water than kidney adipose tissue. The extracted fat of visceral adipose tissue had a higher melting-point and a lower iodine number than that of external adipose tissue from cows; the properties of visceral fat did not differ between sexes.—T. D. Bell.

4246

COVER, S., BUTLER, O. D. and CARTWRIGHT, T. C. **The relationship of fatness in yearling steers to juiciness and tenderness of broiled and braised steaks.** *J. Animal Sci.*, 1956, **15,** 464–472. [Texas Agric. Exp. Stat., College Station.]

The relationship of fatness to juiciness and tenderness in meat was investigated in samples from the carcases of 38 yearling Hereford and Hereford × Brahman steers. Fatness was determined by physical separation, visual assessment of marbling fat, and ether extracts of trimmed muscles; palatability scores for juiciness and tenderness were made on broiled and braised steaks from loin and bottom round.

The best correlation between juiciness and fatness was in broiled loin steaks and between tenderness and fatness in bottom round. Juiciness and fatness scores were more closely correlated with ether extract than with other measures of fatness. No correlation was high and although there was no doubt that fatness and eating quality were associated, variation in fatness accounted for no more than 30 per cent. of the variation in juiciness and only 10 per cent. of the variation in tenderness.—T. R. Preston.

4247

MILLER, M. and KASTELIC, J. **Chemical responses of connective tissue of bovine skeletal muscle.** *J. Agric. Food Chem.*, 1956, **4,** 537–542. [Dept. Home Econ. Res., Iowa Agric. Exp. Stat., Ames.]

This formed part of a thesis (Miller, Iowa State Coll., 1954). After a brief critical review of the literature, detailed studies of the connective tissue of beef muscle (semitendinosus and semimembranosus) are reported. The muscle was comminuted in a silent cutter and after extraction with a mixture of 0·6 *M* KCl and 0·03 *M* $NaHCO_3$, or with 0·1 *N* or *N* NaOH, stroma proteins were collected on glass wool. N was estimated by the micro-Kjeldahl method, and also calculated from hydroxyproline, estimated by the method of Neuman and Logan (Abst. 1335, Vol. 20). Digestion studies were made with papain or testicular hyaluronidase.

The more alkaline the extracting solution, the smaller the N content of the residue. The differing fractionations with KCl and NaOH, the differing absorption spectra of hydrolysates of the fractions, and the differing results of subsequent digestion with papain are shown in diagrams. The results are discussed and it is concluded that the traditional emphasis on the fibres, collagen and elastin, rather than the amorphous ground substance of mucopolysaccharides and complexes of these with proteins, does not really throw light on the nature of connective tissue or explain changes in tenderness of meat.—W. M. Deans.

4248

ZIMMERMANN, W. Die Bestandteile des Schweineschinkens und ihre quantitativen Beziehungen zum Ganzen und untereinander. [**Components of the pig ham and their quantitative relations to the whole and to each other.**] *Züchtungskunde*, 1956, **28,** 212–219. [Inst. Tierzucht., Univ. Göttingen.]

The 250 pigs studied were of several breeds and were killed at 180 to 240, mean 210, days old. Liveweight was from 97 to 120, mean 108·8, and carcase weight from 78 to 98·5, mean 88·5 kg. All were from a testing station. The weight of the ham was from 9543 to 13,132, mean 10,431 g. The hams were dissected and their parts weighed separately.

There was a weak positive correlation, $r = 0{\cdot}378$, between carcase weight and weight of ham; the latter depended also on the type of pig. The total weight of the ham depended on both flesh and fat content, but less on bone and skin. There was a weak negative correlation, $r = -0{\cdot}358$, between flesh and fat. There was no correlation between external and internal fat. The total weight of flesh could be deduced with high probability from the weight of the gastrocnemius muscle.

The pig with a full-looking ham did not always produce qualitatively the best; there was often more meat in the leaner ham.—D. Duncan.

4249

SCHWEIGERT, B. S. **Meat and future health needs.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 409–411. [Div. Biochem. Nutrit., Amer. Meat Inst. Found., Chicago.]

See also Abst. 4187, 4188, 4193, 5294.

Fish

4250

KARKHANIS, Y. D. and MAGAR, N. G. **Component fatty acids in body fats of some marine fishes.** *J. Amer. Oil Chem. Soc.*, 1955, **32,** 492–493. [Inst. Sci., Bombay.]

The component fatty acids of 3 species of Indian marine fish, white pomfret (*Stromateus cinerus*), black pomfret (*Str. niger*) and pala (*Hilsa ilsha*), were found by the method of ester-fractionation. The saturated fatty acids of all 3 species consisted mainly of palmitic acid, with stearic and myristic acids; traces of arachidic acid were present in black pomfret and pala fats. About 32 per cent. (mol.) of the total acids of each fat was oleic acid. The amount of palmitoleic acid, 20 per cent. (mol.), in the acids of black pomfret fat was much greater than that found in the other fats. Polyunsaturated acids were present in black and white pomfret fats, but only in traces in pala fat.—G. A. Garton.

4251

KYTE, R. M. **Constituent fatty acids of salmon egg fat.** *J. Amer. Oil Chem. Soc.*, 1956, **33,** 146–149. [Fish. Products Lab., Ketchikan, Alaska.]

The constituent fatty acids in the egg fat from pink salmon (*Oncorhynchus gorbuscha*) were estimated by Hilditch's method. The percentages of C_{18}, C_{20} and C_{22} unsaturated fatty acids were 31, 31 and 15 with average unsaturation of 3·6, 7·3 and 11·8 hydrogen atoms. The alteration in fatty acid esters during vacuum distillation was calculated from the correlations of refractive index, carbon chain length and unsaturation given by Hammond and Lundberg (*J. Amer. Oil Chem. Soc.*, 1954, **31,** 427). The unsaturated fraction in the vacuum distillation was significantly altered by heat even in the first sub-fraction, and analysis by Hilditch's method gave low values for unsaturation and chain length.—A. Hepburn.

4252

MCBRIDE, J. and MACLEOD, R. A. **The sodium and potassium content of British Columbia sea foods. 2. Some commercially important fresh fish.** *Fish. Res. Board Canada, Progr. Rep. Pacific Coast Stat.*, 1956, No. 105, 19–21. [Technol. Stat., Vancouver, B.C.]

For part 1, dealing with canned salmon and tuna, see same journal, No. 101, 17.

2. In samples of the raw flesh of fresh spring salmon Na content ranged from 31·0 to 61·5 mg. per 100 g. and K from 320 to 470 mg. For coho, sockeye, pink and chum salmon the ranges were from 33·0 to 70·0 mg. for Na and from 340 to 485 mg. for K. For lingcod, graycod, halibut and herring the range for Na was from 48·0 to 83·5 mg. and for K from 355 to 485 mg. There was considerable variation between species, and also within species, according to the size of the fish.

J. S. Thomson.

4253

VARELA, G. and WOJCIECH, R. Sobre algunos procesos bioquímicos en la descomposición de la merluza ("*Merlucius merlucius*"). [**Some biochemical changes during decomposition of hake, *Merlucius merlucius*.**] *An. Bromatol.* 1956, **8,** 5–18. [Lab. Nutrición, Esc. Bromatol., Univ. Madrid.] English summary.

Fresh hake was bought in the Madrid market in slices of 500 to 750 g. The fish was analysed fresh or kept under different conditions before analysis.

Fresh hake contained 18·31 per cent. of dry matter, composed of protein 91·13, ash 6·81 and fat 1·56 per cent. When it was stored at 6° C. for 7 days the *p*H rose from 6·4 to 7·5, and dimethylamine N from 0·70 to 2·31 mg. per 100 g. fresh muscle, trimethylamine N from 9·48 to 37·71 and tyrosine from 18·08 to 40·08. Similar changes occurred under other conditions of storage. Dimethylamine N could be used as an index of decomposition. The form of the container had an important influence on keeping quality. The iodimetric test of Truttwin (Title 1554, Vol. 24) was much influenced by the degree of trituration of the sample.—D. Duncan.

4254

DA COSTA, A. and STERN, J. A. **The calcium and phosphorus contents of some foreign and domestic canned sardines.** *Food Res.*, 1956, **21,** 242–249. [Sch. Fish., Univ. Washington, Seattle.]

The sardine is not a particular fish; the term is applied to different small species of the genera Clupea, Sardinops and Sardina. This partly explains the wide range of Ca and P contents found in the literature, from which some are quoted. Ca and P contents are also affected by seasonal and physiological changes in the fish and still more by scaling of the larger fish or by removal of skin and bones.

Ash, Ca, P and Ca : P ratio are tabulated for 42 samples of canned sardines, representing at least 3 brands from each of the following regions (probable species in brackets): Portugal (*Clupea pilchardus*), Japan (*Sardinops melanosticta*), Norway and Sweden (*C. harengus* or *C. sprattus*), Maine, U.S. (*C. harengus*), California, U.S. (*S. caerula*); and also for tinned squid, anchovy fillets and tuna from Portugal and tuna from California. Ca was estimated by the A.O.A.C. micro-method (Abst. 3286, Vol. 22) and P by the methods of Fiske and Subbarow (*J. Biol. Chem.*, 1925, **66,** 378) and Lowry and Lopez (Abst. 1353, Vol. 16) in the fish drained of oil or tomato sauce.

Portuguese sardines in oil or tomato sauce were the best with Ca 580, 593 and P 624, 595 mg. per 100 g., respectively. Almost all the other kinds had only 2/3 as much Ca, or less, and 5/6 as much P, or less. Boneless sardines and particularly boneless and skinless sardines had much less Ca than whole sardines.

For whole sardines the Ca : P ratio was nearly unity for all regions but for skinless and boneless sardines it approached 1 : 6.

The other canned sea foods had about half as much P as sardines, and tuna and squid had little Ca.—W. M. Deans.

4255

WIERZCHOWSKI, J. Badanie i ocena krajowych pasztetów rybnych pod wzgledem zawartości niektórych składników odżywczych. [**Investigation and evaluation of fish pastes of Polish make with reference to the content of certain nutrients.**] *Rocz. Państwowego Zakł. Hig.*, 1955, **6**, 437–442. Russian and English summaries.

Tables are given of the results of analysis of 2 types of fish paste, made from fish liver or from minced fish.

The energy value of 100 g. fish paste was calculated with the coefficient 9·3 for fat and 4·1 for protein plus carbohydrate. The protein plus carbohydrate content was calculated by subtracting from the total mass the estimated contents of water, fat and ash. Fat was estimated by Gerber's method.

The 2 types of fish paste were found to differ considerably. For liver and minced fish pastes, respectively, the average protein content was 12·9 and 22·5 per cent. and the average fat content 37·4 and 22·3 per cent. The average energy values per 100 g. were about 425 Cal. and 280 Cal.

W. Z. Billewicz.

See also Abst. 5072.

Other Types

4256

DE SIQUEIRA, R., PECHNIK, E., LOPES, N. and GUERNELLI, O. Pesquisas sôbre o sururu alagoano. [**Studies of *Mytilus mundahuensis*.**] *Arq. brasil. Nutrição*, 1954, **10**, 299–333. [Esc. Med. Cirurg., Rio de Janeiro.]

Mussels (sururu, *Mytilus mundahuensis*) were collected from the north side of a lake, at a mean depth of 2 m. They are sold cooked, pickled in vinegar, or shelled and sun-dried. The fresh mussels contained, per cent., moisture 62·8, protein 19·4, ether extract 2·3, ash 11·9 and other substances 3·6, Ca 0·14, P 0·28, Fe 0·006 and Si 0·38; vitamin A was not found, vitamin B_1 16 μg. per 100 g., riboflavin a trace and nicotinic acid 3300 μg. per 100 g. The nicotinic acid content was reduced in the pickled mussels. The dried flesh contained 64 per cent. protein. The mussel is thus a good source of protein, nicotinic acid and Fe.

The nutritive value of mussel protein in an experiment with rats was about equal to that of casein. The amino acids detected by paper chromatography were aspartic acid, glutamic acid, glycine, serine, threonine, alanine, arginine, lysine, tyrosine, tyrptophan, valine, phenylalanine, leucine, *iso*-leucine, methionine, cystine, histidine, proline and hydroxyproline.

The mussels could be collected in good quantities from a series of brackish lakes near the Atlantic coast of Brazil. They form an important part of the animal protein supply of the very poor inhabitants of the area. Production in 1952 was 1,074,600 kg. in the shell and 32,000 kg. meat.

Some methods of cooking the mussels are described.—D. Duncan.

See also Abst. 5073.

FOODSTUFFS OF VEGETABLE ORIGIN

General

4257

QUISENBERRY, K. S. **New and improved plants for human use.** *J. Amer. Dietetic Assoc.*, 1956, **32**, 412–416. [Agric. Res. Serv., U.S. Dept. Agric., Washington, D.C.]

4258

CAMPEN, W. A. C. Het gehalte aan fytinefosfor in veevoeders. [**Phytin phosphorus in stock feedingstuffs.**] *Landbouwk. Tijdschr.*, 1956, **68**, 727–730. [Rijkslandbouwproefstat., Maastricht.] English summary.

Inorganic and phytin P are estimated together, after digestion of the sample in HCl, by precipitation as Ca salts, solution of the precipitate in mixed sulphuric, perchloric and nitric acids and estimation by the vanadium method or by colorimetry. Inorganic P is estimated separately in the original extract and deducted to give phytin P.

A table gives total, phytin, inorganic and undefined P in 44 feedingstuffs, most of them concentrates, and a second table compares the estimates of phytin P in 14 of these with values given by Common (Abst. 122, Vol. 10). There is no phytin P in potato and relatively little in beet pulp, 0·01 in a total of 0·08 per cent., or dried grass, 0·04 in 0·40; most cereals and oilcakes have from 60 to 80 per cent. of P as phytin P.—I. Leitch.

4259

Tabla de composición de forrajes y concentrados forrajeros del área centroamericana. [**Tables of composition of fodders and fodder concentrates in the area of Central America.**] *Bol. Ofic. sanit. panamer.*, 1955, Suppl. No. 2, 227–231. [Inst. Nutrición Centro Amér. y Panamá, Guatemala.]

4260

WADE, G. C. **The known distribution of trace element deficiencies of plants other than**

pastures in Tasmania. *J. Austral. Inst. Agric. Sci.*, 1956, **22,** 37–39. [Tasmanian Dept. Agric.]

4261

RÖSELER, M. Neue Untersuchungen über den Nährstoffgehalt einiger noch wenig gebräuchlicher Futtermittel (Phacelia, Melilotus albus, Kochia, Elodea canadensis). [**New studies of the nutrient content of some little-used feeds : *Phacelia, Melilotus albus, Kochia, Elodea canadensis.***] *Arch. Tierernährung*, 1956, **6,** 50–54. [Inst. Tierernährungslehre, Humboldt Univ., Berlin.]

Five samples of fresh *Phacelia tanacetifolia*, taken weekly from the end of May to the end of June, showed the following ranges : dry matter 14·75 to 30·26 per cent., containing crude protein 22·6 to 15·0, true protein 18·1 to 11·4, crude fat 3·0 to 4·8, crude fibre 14·5 to 23·2, ash 18·1 to 14·1, N-free extract 40·0 to 44·6 per cent. For 3 samples of *Melilotus albus* (white melilot), 2 in July and one from a second cut in September, the corresponding ranges were 15·25 to 17·54 ; 21·7 to 30·0, 16·4 to 19·5, 3·3 to 4·0, 20·8 to 27·0, 11·3 to 15·3, 35·5 to 28·5. These are compared with values in the literature and it is concluded that both would be useful as fodder plants.

A sample of *Kochia trichophylla* (summer cypress) a garden plant belonging to the Chenopodiaceae, had 18·36 per cent. dry matter, containing crude protein 21·2, true protein 15·0, crude fat 2·6, crude fibre 24·8, ash 16·8, N-free extract 34·8. Thus it resembles fodder plants, but cultivation and feeding trials are required.

For a sample of *Elodea canadensis* (Canadian water-weed), a fresh-water pest, the corresponding values were 16·59 ; 15·2, 14·3, 1·6, 9·6, 42·8, 30·9. Owing to the extraordinarily high ash content, much of it silicate, it is not likely that this plant will be useful for animal feeding.—W. M. Deans.

Cereals

4262

BOURDET, A. Nos connaissances actuelles dans le domaine des protides de céréales. [**Recent knowledge on the proteins of cereals.**] *Rev. Ferment. Indust. aliment.*, 1956, **11,** 19–33 (conclusion). [Inst. Nat. Recherche Agronom.]

See Title 2880, Vol. 26.

4263

STEPURINA, Z. K. Dinamika proteina, mineral'nykh veshchestv i karotina v kukuruze v zavisimosti ot faz vegetatzii. [**Changes in protein, minerals and carotene content of maize in relation to stage of growth.**] *Zhivotnovodstvo*, 1956, No. 3, 78. [Stavropol'sk. Sel'skokhoz. Inst.]

The highest crude protein, 31·1 g., and carotene contents, 65 mg. per kg. green matter, were present in maize before flowering, at the stage of stalk formation. The Ca and P contents ranged from 1·28 to 1·69 and from 0·53 to 0·82 g. per kg. green matter, respectively, during the different stages of growth, being highest at the wax stage of the cobs. At all stages of growth there was more Ca than P, the ratio being of the order 2 : 1.

H. Scherbatoff.

4264

WEINMANN, H. **Studies on the chemical composition and nutrient uptake of maize.** *Rhodesia Agric. J.*, 1956, **53,** 168–181.

4265

GONZÁLEZ, M. B., VEIGUINHA, A. S. and GONZÁLEZ, J. L. B. La selección de líneas de maíz de " tallos azucarados " y el rendimiento de sus híbridos, en relación al doble aprovechamiento de su grano y sus plantas. Resultados de los estudios realizados dés 1951 hasta 1954. [**Selection of lines of maize on the basis of sugar content and the yield of their hybrids in relation to the double production of grain and foliage. Results of trials from 1951 to 1954.**] *Agronom. lusitana*, 1955, **17,** 61–86. [Misión Biol. Galicia, Consejo Sup. Invest. Cient.]

4266

DÉVÉNYI, T. and SZÖRÉNYI, E. Artspezifität der Prolamine vom Gesichtspunkt der N-endständigen Aminosäuren. [**Species specificity of prolamines from the standpoint of N-terminal amino acids.**] *Acta physiol. hung.*, 1956, **9,** 301–308. [Biochem. Inst., Ungarisch. Akad. Wiss. Budapest.] Russian summary.

The findings of Deutsch (Abst. 1796, Vol. 25) that gliadin from wheat had phenylalanine as an N-terminal amino acid and that gliadin from rye had phenylalanine and glutamic acid were confirmed ; but no free N-terminal amino acid was found in gliadin from a rye-wheat hybrid or from *Agropyrum cristatum*, or in hordein from barley (*Hordeum vulgare*). Zein from maize had phenylalanine and threonine and avenin from oats had threonine as N-terminal amino acids.

W. M. Deans.

4267

CHMIELNICKA, J. and MONIKOWSKI, K. Badanie nad rozmieszczeniem chloru w ziarnie pszenicy i żyta. [**Studies on the distribution of chlorine in wheat and rye grains.**] *Rocz. Państwowego Zakł. Hig.*, **6,** 461–467. Russian and English summaries.

To determine distribution of chlorine in wheat and rye, material for analysis was obtained by drilling the grain with dental drills varying in diameter, so that the substance analysed could be identified as belonging to different layers of the grain. It is admitted that this method is not perfect, since the grain is not perfectly cylindrical and therefore the first drilling will contain more substance near the crease than subsequent drillings, but the effect is considered too small to influence the results.

After dry ashing, chlorine was estimated by Roberts' method (H. F. Milton, "Methods of Quantitative Microanalysis", 1949, 182).

The chlorine content of the germ was estimated separately. Dental drills of 0·5, 1·0 and 1·5 mm. were used in turn and the grain was drilled lengthwise. Taking the whole grain as 100, the relative sizes of the layers were : wheat, layers 1–4, counting outwards from the centre, 12·8, 17·2, 40·0, 22·18 per cent., germs 7·82 per cent. ; rye, layers 1–4, 13·2, 15·9, 37·1, 24·5 per cent., germs 9·3 per cent. The chlorine content, in mg. per 100 g. dry substance, was found to be : wheat, layers 1–4, 6·3, 7·4, 6·7, 10·6, germs 2·5 ; rye, layers 1–4, 3·72, 12·9, 3·9, 9·3, germs 2·1. The percentage ratio of Cl to ash was found to be in wheat, layers 1–4, 9·6, 7·3, 0·89, 1·07, and in rye, layers 1–4, 5·18, 14·28, 0·71, 1·04. For the whole grain the proportions were 1·48 and 1·23 for wheat and rye, respectively. A table also is given showing percentage ash, percentage Cl and percentage Cl in 100 g. ash for different grades of wheat and rye flour. The results resemble those of the above analysis. [First row of col. 3 of this table (4) should read 1·23 per cent. Cl per 100 g. ash, not 1·74.]—W. Z. Billewicz.

4268

Casale Buonoconto, B. Caratteri chimici e fisici di alcune cultivar selezionate di frumento. [**Chemical and physical characteristics of some selected varieties of wheat.**] *Ann. Sper. agrar.*, 1956, **10**, 905–921. [Staz. Sper. Granicolt. Sicilia, Catania.] English summary.

4269

Melville, D. B. and Eich, S. **The occurrence of ergothioneine in plant material.** *J. Biol. Chem.*, 1956, **218**, 647–651. [Dept. Biochem., Cornell Univ. Med. Coll., New York.]

Ergothioneine occurs in animal blood, but has not hitherto been detected in plant material, nor has the administration of radio-active compounds shown its synthesis. Light has been thrown on the mystery by the discovery in oats of a compound identical in all respects with ergothioneine. It is thought probable that other plants contain ergothioneine.—A. Hepburn.

4270

Prokhorova, N. T. Soderzhanie letuchikh kislot v rzhanom khlebe kak pokazatel ego kislotnosti. [**Volatile acids in rye bread as an indicator of its acidity.**] *Vop. Pitan.*, 1956, **15**, No. 3, 26–30. [Otdel Gig. Pitan., Nauch.-Issled. Sanit.-Gig. Inst., Leningrad.]

Volatile acids were estimated in 22 samples of rye bread. They accounted for 40 to 50 per cent. of the total acidity. The total volatile acid was made up of acetic acid 37·8 to 68·4, propionic acid 28 to 52 and formic acid 1·16 to 10·7 per cent. The total volatile acid content was higher the sourer the flavour of the bread.—D. Duncan.

4271

Kulp, K., Golosinec, O. C., Shank, C. W. and Bradley, W. B. **Current practices in bread enrichment. Nutritive content of enriched bread.** *J. Amer. Dietetic Assoc.*, 1956, **32**, 331–334. [Amer. Inst. Baking, Chicago, Ill.]

In 255 samples of wrapped sliced enriched bread purchased in 52 cities in 39 states during 1952–54 moisture, protein, fat, ash, Ca and Fe were estimated by A.O.A.C. methods (Abst. 3286, Vol. 22), lactose by Munsey's method (*J. Assoc. Off. Agric. Chem.*, 1952, **35**, 697) and vitamin B_1, riboflavin and nicotinic acid by methods of the Association of Vitamin Chemists, Inc. (Abst. 2976, Vol. 21).

Average results on a 38 per cent. moisture basis were : protein 8·21, ash 1·90, milk solids calculated from lactose 2·59, fat 3·19 per cent., Fe 10·96, Ca 397·1, vitamin B_1 1·15, riboflavin 0·81 and nicotinic acid 10·56 mg. per lb. Average amounts of Fe and B vitamins exceeded the minima for enriched bread specified by the Food and Drug Administration, namely, 8, 1·1, 0·7 and 10·0 mg. per lb., respectively ; Fe was low in 4·7 per cent. of samples, vitamin B_1 in 24·5, riboflavin in 7 and nicotinic acid in 24·3, though many were only slightly below standard. Eighty per cent. of samples had from 7·5 to 8·5 per cent. protein and from 300 to 600 mg. Ca per lb. ; 0·8 and 15·6 per cent., respectively, had less. Seventy-five per cent. of samples had from 2·0 to 3·5 per cent. non-fat dried milk solids and 17·4 per cent. had less. More fat and milk solids and Ca and considerably more Fe and B vitamins were found than in studies made before 1941, when enrichment was recommended.—W. M. Deans.

See also Absts. 4198, 4880.

Roots

4272

Lunden, A. P. Undersøkelser over forholdet mellom potetenes spesifikke vekt og deres tørrstoff- og stivelsesinnhold. [**Specific gravity of potatoes and their dry matter and**

starch content.] *Forskning og Forsøk Landbruket*, 1956, **7**, 81–107. [Norges Landbrukshøgsk.] English summary.

The relations of dry matter and starch to sp. gr. in 1356 samples of potatoes of different varieties grown in different soils and under widely different weather conditions (1937 to 1947) are as follows:

$$Y = 17{\cdot}016 + 209{\cdot}038\ (X - 1{\cdot}0949),$$
$$Z = 24{\cdot}045 + 215{\cdot}732\ (Z - 1{\cdot}0949),$$

where Z=sp. gr. (Reimann's balance): Y= starch ("autoclave" method described by von Schéele *et al.*, *Nord. Jordbruksforsk.*, 1936, **17-18**, 17), and Z is dry matter (electric oven, 90° to 92° C. for 20 hr., 98° to 100° C. for 4 hr.). Correlation coefficients between sp. wt. and dry matter and between sp. gr. and starch were 0·969 and 0·945. In comparison with other data Norwegian potatoes have a high dry matter for the same sp. gr.—I. Leitch.

4273

LE TOURNEAU, D. **Carbohydrate components of the potato tuber.** *J. Agric. Food Chem.*, 1956, **4**, 543–545. [Dept. Agric. Chem., Univ. Idaho, Moscow.]

When potatoes (Russet Burbank) were extracted with hot 80 per cent. ethanol, sucrose, fructose and glucose were detected chromatographically in the extract. After further extraction with ether the dried ground residue was fractionated in different ways and found to contain, besides 80 per cent. starch, which was removed by hydrolysis with saliva, pectin, an araban-galactan soluble in 50 per cent. ethanol, hemicellulose and cellulose. The main sugars found on hydrolysis of fractions were arabinose and galactose.—W. M. Deans.

4274

MULDER, E. G. and BAKEMA, K. **Effect of the nitrogen, phosphorus, potassium and magnesium nutrition of potato plants on the content of free amino-acids and on the amino-acid composition of the protein of the tubers.** *Plant and Soil*, 1956, **7**, 135–166. [Agric. Exp. Stat., Groningen, Netherlands.]

Potatoes of 2 varieties, Noordeling and Voran, were grown in the years 1951 to 1954 on sandy, peaty soils originally low in one or more of N, P, K and Mg. The manurial treatments in kg. per ha. were (1) N as ammonium nitrate limestone 40 or 160, (2) P as superphosphate 0 or 300, (3) K_2O as potassium sulphate 0, 200 or 400, (4) MgO as magnesium sulphate 5 or 160, (5) K 400, N 150. In representative samples prepared after storage for 1 to 6 months from 25 tubers, water-soluble protein of about 90 per cent. purity was obtained by precipitation with salt, centrifuging, washing and drying, and was hydrolysed with 6 *N* HCl. Amino acids were estimated in the filtrate (soluble N.P.N.) and protein hydrolysate by the paper chromatography method of Thompson and Steward (Title 3040, Vol. 21), of which full details are given. The results are tabulated in g. amino acid per 16 g. amino acid N or g. per 100 g. protein (16 g. N), respectively, and also in mg. per 10 g. dry matter. Values are also given for the ratio protein N: soluble N.P.N. in 12 varieties, including the 2 mentioned, and for amino acids in the protein of crosses of *Solanum andigenum* or *S. demissum* with ordinary potatoes.

The amino-acid composition of potato protein (8 samples), in g. per 16 g. protein N, was glycine 5·5 ± 0·16, alanine 5·0 ± 0·29, serine 6·2 ± 0·30, cystine plus cysteine 0·9 ± 0·11, threonine 6·2 ± 0·21, valine 6·7 ± 0·18, methionine plus methionine sulphoxide 2·4 ± 0·19, leucines 16·5 ± 0·39, phenylalanine 5·2 ± 0·10, tyrosine 4·5 ± 0·22, proline 4·0 ± 0·21, tryptophan 1·9 ± 0·04, aspartic acid 9·5 ± 0·45, glutamic acid 9·7 ± 0·09, arginine 4·3 ± 0·37, lysine 4·2 ± 0·18, histidine 2·7 ± 0·11; ammonia 1·6 ± 0·03. On the whole these agree with values quoted from the literature.

Amino acid composition of potato protein, unlike protein content, was unaffected by the supply of N, P or K, and there was little evidence of varietal difference. Amino acid composition of soluble N.P.N. was affected by both fertiliser and variety. Amides formed a higher proportion of soluble N.P.N. in potatoes from soils high in N or low in P or K. There was no relation between the amounts of amino acids occurring free and those in the protein. Of some amino acids, free amino acids formed a considerable proportion of the total, *e.g.*, 30 to 50 per cent. for tyrosine, glutamic acid and arginine, and smaller proportions for valine, methionine and phenylalanine. An ample supply of N gave tubers containing from 30 to 40 per cent. more of almost every amino acid, owing to the effect on the protein content of the tuber, and tubers from plants deficient in P or K also had high contents of most amino acids.

As was found previously by Mulder (*Plant and Soil*, 1949, **2**, 59) K-deficient plants gave tubers with much tyrosine, which may cause blackening.

W. M. Deans.

Leafy Vegetables

4275

SPEIRS, M., MILLER, J., PETERSON, W. J., RIGNEY, J. A., MILLER, E. V., LUCAS, H. L., COCHRAN, F. D., REDER, R., CORDNER, H. B., O'DELL, G. V., FERNÁNDEZ, M. DEL C. C., RICHARDSON, L. R., WHITACRE, J., KAPP, L. C., BRITTINGHAM, W. H. and BEESON, K. C. **Influence of environment on the chemical composition of plants. 2. Variations in the composition of turnip greens with location, season, and concomitant environment.** *Southern Coop. Ser.*

Bull. No. 42, June 1955, pp. 123. [Puerto Rico Agric. Exp. Stat., Río Piedras.]

For part 1, a review, see Abst. 3366, Vol. 25.

2. A detailed account is given of an extensive investigation of turnip greens (leaves without midrib) of the Seven Top variety at 5 experimental stations in 4 southern states and Puerto Rico. At all but the last there were plots at 2 or 3 sites differing in soil type, and plants were also grown in pots of sand. Fertilising was uniform, except that at one station additional N was applied to ensure adequate growth, and cultivation was by the usual methods. From 1 to 3 sowings in rows 3 ft. apart were made in the spring and autumn of 1949, 1950 and 1951; plants were later thinned to about 3 in. apart. Samples were taken about 5 weeks after sowing and repeated weekly for 6, 4 and 2 weeks according to the sowing. Altogether about 1000 samples from field plants were analysed. Full details are given of methods of collecting soil and weather data and of sampling. Methods of estimating Ca, P, Mg, carotene, vitamin B_1, riboflavin and ascorbic acid have already been described (W. J. Peterson *et al.*, *Southern Coop. Ser. Bull.* No. 10, 1951). Na and K were estimated by flame photometer and Fe by the *o*-phenanthroline method as described by Sheets and Ward (Abst. 2331, Vol. 11). The basic data and the findings, on both fresh and dry basis, are presented in many tables and are analysed statistically. Portions have been published already (Ca and P, Abst. 122, Vol. 14; Fe, Abst. 1769, Vol. 18). Frequency distributions for the nutrients are shown graphically.

The all-over averages on a dry basis for plants grown in the ordinary way, with standard deviations, were: crude fibre 7·46 $\pm$ 0·83, ether extract 4·46 $\pm$ 1·38, total N 5·55 $\pm$ 0·99, P 0·575 $\pm$ 0·106, Fe 38·35 $\pm$ 17·17 per cent.; Ca 143·5 $\pm$ 29·3, Mg 35·8 $\pm$ 12·3, K 97·0 $\pm$ 29·4, Na 15·5 $\pm$ 11·3 m. equiv. per 100 g.; carotene 50·06 $\pm$ 12·87, ascorbic acid 1088 $\pm$ 170 mg. per 100 g.; vitamin B_1 1428 $\pm$ 332, riboflavin 2628 $\pm$ 570 μg. per 100 g. Values for plants grown in sand did not differ much from these except that Na was lower.

Analysis of variance showed that year, *i.e.*, weather, had a significant effect on dry matter and on crude fibre, ether extract, Ca, P, Mg, K and all vitamins but riboflavin, on both fresh and dry basis. Locality significantly affected P, Fe, K, Na and all vitamins but vitamin B_1. Soil type significantly affected N, all minerals and all vitamins but riboflavin. Differences between spring and autumn were mostly ascribed to weather, except for total N, carotene and riboflavin at some stations. Calendar date of sowing had little effect. The general conclusion was that organic constituents are affected chiefly by weather, inorganic by both soil and weather, and this was supported by comparison of plants grown in the field and in pots of sand.—W. M. Deans.

Legumes

4276

Petronici, C. Contributo alla conoscenza del metabolismo azotato nelle piante: variazioni degli aminoacidi liberi e totali nella fava (*Vicia faba major*) durante il ciclo vegetativo. [**Nitrogen metabolism of plants: variations in free and total amino acids in the bean (*Vicia faba major*) during the cycle of growth.**] *Ann. Sper. agrar.*, 1956, **10,** 841–855. [Ist. Chim. Agrar., Univ. Palermo.] English summary.

The composition of bean plants was studied at 7 stages of growth, from plants 10 cm. tall to the stage of ripe seeds. Dry matter, total and soluble N, free amino acids and total amino acids after hydrolysis were studied.

The free amino acids found were aspartic acid, glutamic acid, alanine, asparagine, phenylalanine, leucine, lysine, proline, serine, tyrosine, threonine, valine and probably γ-aminobutyric acid. After hydrolysis glycine, cystine or cysteine and an unidentified amino acid were found also.

The variations with growth of the plant are shown in tables and in graphs for individual amino acids.—D. Duncan.

4277

Learmonth, E. M. **Soya in the field of nutrition. A review of existing knowledge.** *Chem. and Indust.*, 1956, No. 18, 360–367. [British Soya Products, Ltd., London, E.C.3.]

4278

Gutiérrez Rojas, D. Contenido de aceite y proteina y respuesta al abonamiento de ocho variedades de soya. [**Oil and protein content and relation to fertilisers of eight varieties of soya.**] *Acta agronom., Columbia*, 1955, **5,** 211–221. English summary.

The yield and composition of the 8 varieties of soya bean tested were not significantly affected by fertilising with urea, dicalcium phosphate or KCl separately or in combination. The yields ranged from 568 kg. per plaza (6400 sq.m.) of the variety Hawkeye to 1809 kg. of Aksarben. The oil content ranged from 18·72 per cent. in Aksarben to 24·19 in Mammoth yellow; the latter gave the highest yield of oil, 423 kg. per plaza. The protein content ranged from 37·45 per cent. in Acadian 36 to 44·12 per cent. in Acadian 292; the protein yield per plaza is not given for Acadian 292, but for Aksarben, with 41·77 per cent. protein, the yield per plaza was 756 kg. Oil contents were more variable than protein contents, so total protein yield was closely related to total grain yield, but total oil yield was not.—D. Duncan.

4279

KROBER, O. A. **Methionine content of soybeans as influenced by location and season.** *J. Agric. Food Chem.*, 1956, **4**, 254–257. [Field Crops Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Urbana, Ill.]

Samples of 14 varieties of soya bean grown in from 12 to 18 localities in the United States in 1950, 1951 and 1952 were combined by variety and by locality and methionine was estimated in the protein by an adaptation of the chemical method of Horn *et al.* (Abst. 41, Vol. 17). The results were analysed statistically.

Seasonal differences were slight except in late-maturing varieties. Three-year averages ranged from 1·31 to 1·58 per cent. of the protein. Location differences were significant only among intermediate-maturing varieties, though there was a tendency for the methionine content to be higher in crops grown further south. Varietal differences were more important than either. Dunfield and related strains, and Clark, a Lincoln × Richland cross, were consistently good ; since the last surpassed its parents, it should be possible to improve the methionine content of soya beans by breeding.

Values for some varieties agreed closely with those found microbiologically by Alderks (*J. Amer. Oil Chem. Soc.*, 1949, **24**, 126).—W. M. Deans.

Fruits

4280

SERINI, G. Correlazione tra tenore in 2–3 butilenglicole ed in acetilmetilcarbinolo e stato di maturazione dei prodotti frutticoli. 2. *Pirus communis, Citrus nobilis, C. sinensis, C. limonia, Musa sapientum, Prunus persica.* [**Relation between 2 : 3-butylene glycol and acetylmethylcarbinol content and stage of ripeness of fruits. 2. *Pyrus communis, Citrus nobilis, C. sinensis, C. limonia, Musa sapientum, Prunus persica.***] *Ann. Sper. agrar.*, 1956, **10**, 857–863. [Staz. Sper. Freddo, Milan.] English summary.

For part 1 see Title 2889, Vol. 26.

2. The amounts of acetylmethylcarbinol and 2 : 3-butylene glycol in different varieties and species of fruits are not consistently related to their ripeness. The values are given in a table.

D. Duncan.

4281

CASARES LOPEZ, R. and LOPEZ HERRERA, C. Estudio bromatológico de los dátiles desecados españoles. [**Bromatological study of dried Spanish dates.**] *An. Bromatol.*, 1955, **7**, 81–88. [Dept. Invest. Bromatol., C.S.I.C., Madrid.]

Two samples of commercial dried dates, from Alicante and Madrid, were analysed. They had the following average composition : stones 10·01, edible material 89·99 per cent., in which there was dry matter 76, total sugars 64·36, fibre 1·66, ash 1·44, crude protein 1·88 per cent. The energy value of 100 g. edible portion was 272 Cal. and there were 122 dates in 1 kg.—T. D. Bell.

4282

BHATIA, B. S., SIDDAPPA, G. S. and LAL, G. **Composition and nutritive value of jack fruit.** *Indian J. Agric. Sci.*, 1955, **25**, 303–306. [Central Food Technol. Res. Inst., Mysore.]

The edible portion of jack fruit (*Artocarpus integrifolia*) contained, in per cent. of moisture-free material, ash 6·49, ether extract 7·45, protein 10·51, crude fibre 27·64, reducing sugar 1·07, total sugar 1·11, starch 18·74 and carbohydrates other than sugars and starch 26·79 ; Ca 881·4, P 219·5 and Fe 15·62 mg. per cent.—J. S. Thomson.

4283

DAVID, J. J., LUH, B. S. and MARSH, G. L. **Organic acids in peaches.** *Food Res.*, 1956, **21**, 184–194. [Dept. Food Technol., Univ. California, Davis.]

Citric, malic and quinic acids were the principal acids found in 2 varieties of peach. Acetic, aspartic and mucic or galacturonic acids were also possibly present. The total titratable acidity and the concentrations of malic and citric acids increased to a maximum during growth and decreased during maturation.—A. Hepburn.

4284

CERBULIS, J. **Carbohydrates in Hazel (*Corylus sp.*) 1. Major sugar component in Turkish hazelnut kernel.** *J. Amer. Chem. Soc.*, 1955, **77**, 6054–6056. [Stephen F. Whitman and Son, Inc., Philadelphia, Pa.]

The major sugar components of Turkish hazelnut kernels were fructose, glucose, sucrose, raffinose and stachyose. Melibiose, manninotriose and several unidentified sugars were present in traces.

A. Hepburn.

See also Absts. 4028, 5044, 5419.

Other Types

4285

GOUNELLE, H. Le sucre roux : engouement sans preuves. [**Brown sugar : a craze without foundation.**] *Presse méd.*, 1956, **64**, 665. [Centre Recherches Foch, Paris.]

Minerals, vitamins of the B complex and vitamin C were estimated in 2 samples of brown sugar. The tabulated results gave no support to the popular assumption that brown sugar is a good source of minerals and vitamins.—F. C. Aitken.

4286

CHARRO, M. P. Estudio bromatológico de la sopa de hierbas. [**Bromatological study of vegetable soup.**] *An. Bromatol.*, 1956, **8**, 73–107. [Inst. Bromatol. Galicia, Fac. Farm., Santiago.] English summary.

4287

SMITH, D. G. and YOUNG, E. G. **The combined amino acids in several species of marine algae.** *J. Biol. Chem.*, 1955, **217**, 845–853. [Maritime Reg. Lab., Nat. Res. Counc., Halifax, Canada.]

Seaweeds were air-dried and ground and extracted with 75 per cent. ethanol. N and amino acids were estimated, the latter by paper chromatography of acid hydrolysates. Values are tabulated for *Fucus vesiculosus*, *Ascophyllum nodosum*, *Chondrus crispus*, *Rhodymenia palmata* and *Ulva lactuca*. In the first 4 species the N estimated in protein, free amino acids, peptides, organic bases, purines and pyrimidines accounted for 90 to 96 per cent. of the total N, but in *Ulva* only 80 to 86 per cent. of the total N was accounted for, and some peculiar form of N may be present. Amino acid N made up from 79 to 89 per cent. of the total N in the hydrolysate. Citrulline and ornithine were identified in the hydrolysate from *Chondrus*, but not in the other species. *Chondrus* was rich also in arginine. The composition of *Rhodymenia* and *Ulva* was similar, but differed from that of the brown algae.—D. Duncan.

4288

VILLANUA, L., NUÑEZ SAMPER, M., PORTOLES, A. and FERNANDEZ PIZARRO, M. J. Análisis de condimentos. [**Analysis of condiments.**] *An. Bromatol.*, 1954, **6**, 399–421. [Dept. Invest. Bromatol., Madrid.]

Morphological, chemical and microscopic details, laws on standards of quality in Spain, and common impurities encountered in commercial samples of 12 spices and flavourings are described: green aniseed (*Pimpinella anisum*), saffron (*Crocus sativus*), cinnamon (*Cinnamomum ceylanicum* and *C. aromaticum*), clove (*Caryophyllus aromaticus*), cumin (*Cuminum cyminum*), bay leaf (*Laurus nobilis*), mustard (*Sinapis nigra* and *S. alba*), red pepper (*Capsicum annum*) black pepper (*Piper nigrum*), thyme (*Thymus vulgaris*), nutmeg (*Myristica moschata*) and vanilla (*Vanilla planifolia*).

T. D. Bell.

See also Absts. 4205, 4886.

Pasture, Hay and Silage

4289

HEINRICHS, D. H. and CARSON, R. B. **Chemical composition of nine grasses at six stages of development.** *Canad. J. Agric. Sci.*, 1956, **36**, 95–106. [Canada Dept. Agric., Ottawa.]

The grasses studied were smooth bromegrass (*Bromus inermis*), Russian wild ryegrass (*Elymus juncans*), Mandan wild ryegrass (*E. canadensis*), Fairway crested wheatgrass (*Agropyron cristatum*), Summit crested wheatgrass (*A. desertorum*), intermediate wheatgrass (*A. intermedium*), tall wheatgrass (*A. elongatum*), streambank wheatgrass (*A. inparium*) and green stipagrass (*Stipa viridula*). The grasses were analysed at 6 stages of growth: early leaf, shot blade, flower, mature seed, late autumn and the following spring, in the years 1951–52 and 1952–53. Crude protein, N-free extract, ether extract, ash, crude fibre, lignin, Ca and P were estimated.

Between species and between stages of growth there were significant differences in protein, N-free extract, ether extract, ash, crude fibre and lignin. There was also a difference between years. Protein in all was lower in 1952 than in 1951. Russian wild ryegrass was the best in both seasons, and maintained its protein content in the last cut better than the other grasses. Streambank wheatgrass also maintained its protein content well, but its initial value was lowest.

N-free extract was higher in 1952 than in 1951 in all and varied inversely with protein: bromegrass was exceptional, being high in both. The 2 grasses which maintained protein content were correspondingly lower in N-free extract at the later stages of cutting.

Ether extract was higher in 1951, and was higher in streambank wheatgrass than in the others at all stages.

Crude fibre was higher in 1952 than in 1951, but only in the early stages: this was related to the different growth induced by different weather in the 2 years. Bromegrass and Russian wild ryegrass were low in fibre at the later stages. Lignin, estimated in 1951 only, was related to the habit of growth; grasses which formed few stems and more basal leaves had a low lignin content.

Up to the mature seed stage the Ca : P ratio was good. After this stage the ratio was too wide, the best being in Russian wild ryegrass, tall and streambank wheatgrasses and green stipagrass, which had ratios of 5 or 6 : 1.—T. D. Bell.

4290

SULLIVAN, J. T., PHILLIPS, T. G., LOUGHLIN, M. E. and SPRAGUE, V. G. **Chemical composition of forage grasses. 2. Successive cuttings during the growing season.** *Agronom. J.*, 1956, **48**, 11–14. [U.S. Reg. Pasture Res. Lab., State Coll., Pa.]

2. The results of plot experiments in 1950 and 1952 with Alta fescue, bromegrass, Kentucky bluegrass, orchardgrass, reed canarygrass, redtop,

timothy and tall oatgrass, systematically treated with N and cut at grazing height from 4 to 8 times during the season, are tabulated or shown graphically. Methods of analysis were as before (Title 4748, Vol. 25).

Alta fescue, Kentucky bluegrass, orchardgrass, reed canarygrass and tall oatgrass had crude protein contents ranging from 17·72 for Alta fescue to 18·58 for reed canarygrass and were significantly richer in protein than the 3 other species. Reed canarygrass and tall oatgrass were low in crude fibre, cellulose and lignin; orchardgrass was high in these and in ether extract and minerals. Kentucky bluegrass was low in ether extract, minerals and moisture and high in lignin. Correlations between constituents were not high, except that between crude fibre and cellulose, + 0·974; the regression equation, from 329 samples, was

$$y = 1{\cdot}694 + 0{\cdot}9318\,x,$$

where y = crude fibre, x = cellulose. Orchardgrass gave the highest annual yield of dry matter. Yields of dry matter decreased at successive cuttings. Crude protein remained steady until autumn, when it rose. Ether extract also rose in autumn. Cellulose, crude fibre and lignin were highest at the second cutting, at a time of long daylight; the first two decreased steadily thereafter, but lignin not till autumn. All the changes with time of year were small.—W. M. Deans.

4291

HARBERTS, C. L., IMMINK, H. J. and DEIJS, W. B. Het chlorophylgehalte van gras in de loop van het weide-seizoen. [**Chlorophyll content of grass in the course of the pasture season.**] *Centraal Inst. Landbouwk. Onderzoek, Overdruk* 277, 1954 (1955), 228–230. English summary.

Chlorophyll is broken down, during digestion, to phaeophytin, which forms highly stable complexes with Cu; this might explain why Cu may be retained during stall feeding and lost at pasture. Chlorophyll a and chlorophyll b and phaeophytin were estimated by the method of Arnon modified as described in *Versl. Centraal Inst. Landbouwk. Onderzoek*, 1953, p. 168 and that of Joslyn and Mackinney (*J. Amer. Chem. Soc.*, 1938, **60,** 1132).

The first samples of grass taken in early May had less chlorophyll, 11·2 and 10·1 mg. per g. dry matter, in proportion to crude protein, 28·6 and 27·1 per cent., than later samples. The correlation coefficient between chlorophyll and crude protein contents for the 35 later samples was 0·88 ± 0·04. There was no seasonal change in that relation, except for the first samples, and none in the ratio of chlorophyll a to chlorophyll b, which varied between 3·3 to 2·8. Free phaeophytin varied between 0·5 and 1·1 mg. per g. dry matter without relation to season.—I. Leitch.

4292

DEIJS, W. B. Enkele gegevens over het nitraatgehalte van ruwvoedermiddelen. [**Some data on the nitrate content of roughages.**] *Centraal Inst. Landbouwk. Onderzoek, Overdruk* 212, 1953 (1954), 153–154. English summary.

Data are reported for samples from ordinary farms and a farm intensively fertilised with N as follows, in that order and per cent. of dry matter: fresh grass 63 and 40 samples, crude protein 20·2 and 22·5, nitrate as KNO_3 0·40 and 0·95; hay 11 and 30 samples, crude protein 14·7 and 20·8, KNO_3 0·29 and 1·02; grass silage 4 and 10 samples, crude protein 15·0 and 17·4, KNO_3 0·19 and 0·56; artificially dried grass, 11 and 3 samples, crude protein 18·0 and 21·1, KNO_3 0·47 and 1·52. I. Leitch.

4293

SOLBERG, P. Forsøk med luserne, kløver og grasvekster. [**Experiments with lucerne, clover and grass.**] *Forskning og Forsøk Landbruket*, 1956, **7,** 129 – 182. [Statens Forsøksgard Løken.] English summary.

A study of strains and the effect of fertilisers at two stations with some data on composition.

4294

GERI, G. Contributo alla conoscenza della composizione chimica e del valore nutritivo dei foraggi maremmani. [**Chemical composition and nutritive value of forages from the Maremma.**] *Ann. Sper. agrar.*, 1956, **10,** 577–618. [Lab. Zootec., Univ. Florence.] English summary.

Lucerne, sainfoin, bird's foot trefoil and cocksfoot pastures and natural pastures were analysed at different stages of growth. Natural pastures were better than leys as sources of fodder. The digestible protein content decreased and crude fibre content increased with advancing maturity. Ether extract and ash contents were not affected by the age of the plant. The P content of the plant was directly related to the available P_2O_5 in the soil.

Maturity affected the digestible protein content more than the nutritive value and hence the nutritive ratio was wider. As a whole the Maremma pastures investigated compared favourably with similar crops reported in the literature. The procedures are reported in detail, and results are tabulated.—T. D. Bell.

4295

WALKER, T. W., ADAMS, A. F. R. and ORCHISTON, H. D. **The effect of levels of calcium sulphate on the yield and composition of a grass and clover pasture.** *Plant and Soil*, 1956, **7,** 290–300. [Canterbury Agric. Coll., N.Z.]

Calcium sulphate as gypsum was applied to plots of sandy loam soil which had received also triple superphosphate at 100 lb. per acre. The gypsum was applied at 25, 50, 100 and 200 lb. per acre and the area was sown with a mixture of legumes. Plant and soil analyses were made 6 months later.

In comparison with the plot given no gypsum, large and significant increases were found in yield of clovers and of grasses. Total N was increased from 12 to 52 lb. per acre, and most of the increase was obtained with 50 lb. gypsum. The increase of N percentage in clover was twice that in grass. P was not much affected, but Ca was slightly increased by gypsum. Inorganic S remained low, but total S increased appreciably. More S was taken up by grass than by clover. It is concluded that the value of the gypsum was in the S content and that in South Island there are large areas where application of S is needed to promote fixation of N by legumes.—D. Duncan.

4296

LAZAR, V. A. and BEESON, K. C. **Mineral nutrients in native vegetation on Atlantic Coastal Plain soil types.** *J. Agric. Food Chem.*, 1956, **4,** 439–444. [U.S. Plant, Soil and Nutrit. Lab., Agric. Res. Serv., Ithaca, N.Y.]

Co, Cu, Mn, Ca and P were estimated in samples, mostly leaves, taken at different times in 1952 and 1953 from 5 browse or forage plants growing on six ½-acre plots of differing soil type on cut-over forest land, and in samples of the soil, at different places in North and South Carolina (at one place the forage was known to be too low in Co and Cu for cattle to survive). For methods, see Beeson, *J. Assoc. Off. Agric. Chem.*, 1953, **36,** 405 and Absts. 1883, Vol. 13 and 4515, Vol. 21. The results were analysed statistically and are shown for all plots in tables and for the plot known to be deficient also in graphs, and are discussed at length.

Swamp blackgum (*Nyssa sylvatica* var. *biflora* (Walt.)) and pepperbush (*Clethra alnifolia*, L.) were high in Co compared with the other 3 plants; about ½ lb. dry leaves of either from a Co-deficient area, along with the other browse and forage, would supply the minimum daily requirement of cattle. Cu did not vary much; blackgum and sweetbay (*Magnolia virginiana*, L.) were highest. Pepperbush was high in Mn; next came blackgum. No plant contained much P. Pepperbush was high in Ca. In most plants Co and Ca increased with maturity and Cu and P decreased. It was considered that blackgum leaves could serve as an indicator of the mineral content of forage as typified by broomsedge (*Andropogon glomeratus*, Walt.) except for Ca; 2 leaves per plot would suffice for Co and Cu, 5 for P and Mn. Although the Co content of the soil bore some relation to that of the plants, the relation was not close enough for the former to be used as a test of the adequacy of forage.—W. M. Deans.

4297

PATON, D. F. **Investigations on trace element deficiencies of pastures in Tasmania.** *J. Austral. Inst. Agric. Sci.*, 1956, **22,** 33–36. [Tasmanian Dept. Agric.]

4298

MILLS, C. F. **Studies of the copper compounds in aqueous extracts of herbage.** *Biochem. J.*, 1956, **63,** 187–190. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Electrodialysis of aqueous extracts of freeze-dried herbage in a 4-compartment cell showed that although some Cu was present as the free ion or as positively charged complexes, most of it was present as neutral or anionic complexes. On the addition of radio-active $^{64}Cu(NO_3)_2$ the readiness of the water-soluble components of herbage to form complexes with Cu^{2+} was demonstrated. After incubation of the herbage extract with pepsin the Cu complexes were stable in the presence of a cation-exchange resin at *p*H above 2·5, but decomposed appreciably below *p*H 2·0.

A. Hepburn.

4299

MILLS, C. F. and MURRAY, G. **Avidity of the water-soluble components of herbage for added cupric ions.** *Nature*, 1956, **177,** 793–794. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Autoradiography of a water extract of herbage to which $^{64}Cu(NO_3)_2$ was added showed that the cupric ions had formed stable complexes with an R_F value different from that of the cupric ion itself.—A. Hepburn.

4300

BRZAC, T. Ekonomsko značenje primorske zajednice *Carex humilis-Centaurea rupestris*. [**Economic importance of the littoral association of *Carex humilis* with *Centaurea rupestris***.] *Vet. Arhiv*, 1956, **26,** 63–78. English and German summaries.

Typical hays from the natural forage investigated had dry matter 90·94 to 91·56, crude protein 7·27 to 8·86, N-free extract 47·64 to 53·78, ash 5·64 to 6·42, ether extract 3·04 to 3·44 and fibre 21·29 to 26·10 per cent. There were over 30 species in the association, some of them poisonous to stock. Only 6 species individually represented more than 5 per cent. of the total weight, and together those species represented 65 per cent. of the total. Analyses of the separate species, their

relative value as cover, and persistence are presented in tables. By virtue of its feeding value, and dominance due to covering capacity and persistence, *Carex humilis* is the most important species. There are other good species, from the feeding point of view. Improvement of the hay can be achieved only by sowing seeds of these species so that they will overcome the undesirable species. (From English summary.)—T. D. Bell.

4301

FRENCH, M. H. **The nutritive value of East African hay.** *Empire J. Exp. Agric.*, 1956, **24,** 53–60. [Joint Animal Indust. Div., E.A.A.F.R.O.]

Crude protein of 10 hays studied ranged from 3·7 to 9·2 per cent. of the dry matter, with a wide variation in digestibility from 30 to 60 per cent., which was related to species but not to stage of maturity. N-free extract ranged from 40 to 45 per cent., with digestibility 44 to 70 per cent., and crude fibre from 32·5 to 43·5 per cent., digestibility 52 to 65 per cent. In the more mature herbage digestibility of crude fibre was greater than that of N-free extract.

The more stemmy species were inferior to the others in both digestible crude protein and N-free extract. Of the others, the starch equivalent was comparable to that of temperate European hays, but the digestible crude protein content was lower. T. D. Bell.

See also Absts. 4174, 4177, 4208, 4209, 4211, 5125, 5132.

MISCELLANEOUS

4302

SACCHI, R. Mieli umbri e analisi rifrattometrica dell'umidità. [**Umbrian honeys and refractometric estimation of their moisture content.**] *Ann. Sper. agrar.*, 1956, **10,** 1029–1042. [Ist. Zoocolt., Univ. Perugia.] English summary.

4303

RANDOIN, L. and BILLAUD, S. La bière. [**Beer.**] *Bull. Soc. sci. Hyg. aliment.*, 1956, **44,** 3–28.

A review dealing with composition, nutritive value and physiological value.

4304

BILLAUD, S. Le thé et le café. [**Tea and coffee.**] *Bull. Soc. sci. Hyg. aliment.*, 1956, **44,** 29–54.

A review on composition, physiological properties and results of excessive consumption.

4305

HADORN, H. and SUTER, H. Über die Analyse und Zusammensetzung von Rohkaffee verschiedener Provenienzen. [**Analysis and composition of raw coffee of differing origin.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1956, **47,** 33–51. [Lab. VSK, Basle.] French and English summaries.

Raw coffee beans from 4 regions were ground in a ball mill and analysed exhaustively by methods similar in principle to those of Slotta and Neisser (*Ber. Deutsch. Chem. Gesellsch.*, 1939, **72,** 126). Full details are given. The results are tabulated. Percentage ranges were for water 6·15 to 8·15, total lipids 10·95 to 16·40, total protein (minus trigonellin and caffeine) 10·11 to 11·29, water-soluble protein 5·23 to 5·65, caffeine 0·99 to 1·99, trigonellin 0·74 to 1·03, chlorogenic acid 4·58 to 5·74, sucrose 5·30 to 8·15, total ash 4 14 to 5·02, water-soluble minerals 0·89 to 1·93. An error was found in the balance drawn up by Slotta and Neisser: owing to incomplete extraction they underestimated the substances soluble in water. The present authors failed to account for about 10 per cent. of these, which may consist of organic acids and their salts and perhaps higher carbohydrates and tannins.—W. M. Deans.

4306

CERUTTI, G., CERUTTI, L. and TAMBORINI, A. Sul contenuto in ferro, bromo e piombo dei vini italiani. 1. [**Iron, bromine and lead in Italian wines. 1.**] *Ann. Sper. agrar.*, 1956, **10,** 451–454. [Inst. Indust. Agrar., Univ. Milan.]

1. The Fe, Pb and Br contents of 40 samples of wine known to be pure were estimated by methods described. The highest value for inorganic Br was 0·5 mg. per litre: no organic Br was detected. Up to 0·9 mg. Pb per litre was found, but most samples contained none. The Fe content ranged from 1 to 23 mg. per litre.—T. D. Bell.

4307

VITAGLIANO, M. I costituenti minerali del vino. [**The mineral constituents of wine.**] 2. Il ferro. [**2. Iron.**] 3. Lo zolfo. [**3. Sulphur.**] *Ann. Sper. agrar.*, 1956, **10,** 659–668; 711–719. [Ist. Indust. Agrar., Univ. Naples, Portici.] English summary.

2. Samples of wine and of the must from which it was fermented were analysed. The Fe content of the musts did not exceed 12 mg. per litre when only moderate pressure was used; when continuous and excessive pressure was applied values as high as 22 mg. per litre were obtained. The Fe content of the wines ranged from 2 to 114 mg. per litre. In ideal conditions of production, where pressure was not excessive and wooden vats were used for fermentation and maturing, there was little increase in Fe contents of must and wine. The great increases were caused by contamination from the equipment used, the worst being vats of cement.

An Fe content of more than 22 mg. per litre of wine gave a product that became cloudy on exposure to air. It is advocated that equipment in

the wine industry should be overhauled and renewed to eliminate the sources of contamination with Fe.

3. Inorganic and organic S were estimated in musts and wines. Inorganic S values, expressed as K_2SO_4, ranged from 0·12 to 0·43 g. per litre must in 25 samples analysed. Organic S ranged from 14 to 30 mg. per litre, slightly higher in black than in golden grapes. In 49 wines the inorganic S, as K_2SO_4, showed great variation, from 0·26 to 2·92 g. per litre, and 10 per cent. of the samples exceeded the legal limit of 1·5 g. per litre. The high S content was due to excessive use of SO_2 in the process of wine-making. Only a small portion of the organic S was present as methionine, and investigations on the form in which it is embodied are in progress.—T. D. Bell.

See also Abst. 4182.

3. VITAMINS

GENERAL

4308

PLACIDI, L. and LARRE, J. Affection du poulet simulant la variole dans un élevage industriel (déficience alimentaire). [**Disease of poultry resembling fowlpox in a commercial breeding farm: a nutritional deficiency.**] *Rec. Méd. vét.*, 1955, **131,** 1108–1110.

On a large commercial chicken farm, 7022 chickens aged from 3 to 8 weeks died in 8 months. Those that survived remained in poor condition. The disease appeared in chicks a week old. The lesions were on the head and beak, and resembled those of fowlpox (*epithelioma contagiosum*). An epidemic of infectious disease was presumed, but after exhaustive investigation the idea had to be abandoned. An experiment was then made in which, at the same time, 80 of the chicks received the diet customary on the farm and 120 received a poultry food known to be highly satisfactory. The result was unequivocal. The second group remained well; the first group sickened but recovered when transferred to the good diet. The deficiency was considered to be multiple, but no further effort was made to find out its exact nature.

E. M. Hume.

4309

GARRETT, E. R. **Prediction of stability in pharmaceutical preparations. 2. Vitamin stability in liquid multivitamin preparations.** *J. Amer. Pharm. Assoc.*, 1956, **45,** 171–178. [Res. Div., Upjohn Co., Kalamazoo, Mich.]

From studies of deterioration at high temperature of multivitamin preparations containing ascorbic acid, vitamin B_{12}, folic acid, vitamin A, *d*-pantothenyl alcohol and vitamin B_1 hydrochloride, rates of deterioration at shelf temperature were predicted. The results confirmed other studies of destruction at shelf temperature. Preparations in which the initial concentrations had been increased by amounts recommended were found to have the required concentrations after 12 months of shelf life.—K. H. Coward.

4310

INTENGAN, C. L., ALEJO, L. G., CORPUS, V. A., SALUD, R. D., DEL ROSARIO, I., GOMEZ, R., HENSON, J. and CONCEPCION, I. **Composition of Philippine foods. 3.** *Philippine J. Sci.*, 1955, **84,** 263–273. [Foods and Nutrit. Biochem. Lab., Inst. Nutrit., Manila.]

Parts 1 and 2 (Absts. 1794, Vol. 25; 1574, Vol. 26) dealt with the composition of vegetable products. Part 3 tabulates the values for 77 muscle cuts and 69 organ meats of livestock, poultry and game. The components studied were moisture, N, ether extract, ash, Ca, P, Fe, carotene, vitamin B_1, riboflavin, nicotinic acid and ascorbic acid. It is proposed to publish values for vitamin A separately. Especially rich sources of nutrients were pig meat for vitamin B_1, goat meat for riboflavin, and rabbit and venison for nicotinic acid.

E. M. Hume.

4311

BURGER, M., HEIN, L. W., TEPLY, L. J., DERSE, P. H. and KRIEGER, C. H. **Vitamin, mineral, and proximate composition of frozen fruits, juices and vegetables.** *J. Agric. Food Chem.*, 1956, **4,** 418–425. [Wisconsin Alumni Res. Found., Madison 5.]

Eight vitamins, 6 minerals and 5 proximate constituents were estimated, and energy values calculated, for 14 frozen fruits, 7 frozen juices and 30 frozen vegetables produced by more than 150 freezing plants in the United States and Hawaii, and the results are tabulated. There were 796 sets of samples and 27,562 individual packages from 2 consecutive seasons. The packages were taken at statistically predetermined intervals to ensure representative sampling with regard to such variables as weather, variety, harvesting, processing, packing and grade. Citrus juices, almost all fruits and most vegetable products contained good quantities of ascorbic acid. Many products contained little sodium.—A. Hepburn.

See also Absts. 4256, 4285, 4765, 4899, 4920, 4966, 4977, 5040, 5101, 5419.

VITAMIN A

4312

AMES, S. R. and HARRIS, P. L. **Slope-ratio liver storage bioassay for vitamin A.** *Anal. Chem.*, 1956, **28,** 874–878. [Res. Labs., Distillation Products Industries, Div. Eastman Kodak Co., Rochester, N.Y.]

Practical details are given of an improved and standardised modification of the liver-storage type of biological test.

Male rats were depleted of vitamin A, but not so far that disease was produced, and were divided into 5 groups of 10. One group was given in 3 days a standard preparation of vitamin A providing 1000 I.U.; another group was given a total of 2000 I.U. over the 3 days. Two groups were given the test material, in amounts estimated spectrophotometrically to provide about 1000 and 2000 I.U. per head. One group, the negative control, was given no vitamin A. Forty-eight hr. after the last dose the rats were killed, and the livers were kept frozen till analysed. Each liver was analysed separately. It was ground with anhydrous sodium sulphate, and vitamin A was extracted at room temperature with 100 ml. ether and estimated with the Carr Price reagent. The negative control group provided a common base line for testing the linearity of the responses. If the responses were linear within statistically accepted limits, the slopes of the response curves for the test material and standard were compared by a method that is explained. An example is worked out in detail.

When several compounds of vitamin A were tested by the storage method and by a standard growth method, the agreement was good. A value for the within-group precision of the storage method was calculated from the pooled results with 16 groups of rats. The mean standard error so calculated was 2·9 per cent. and is discussed. The method is much more rapid than the growth method and does not demand complete depletion of the rats. The response, in terms of the amount of vitamin A found in the liver in relation to that given, was linear over a dose range of from 500 to 10,000 I.U. The mean of 67 per cent. so recovered is higher than that usually recorded in the literature. The possible significance of such a high response is discussed.—V. H. Booth.

4313

LAGONI, H. and WORTMANN, A. Eine einfache quantitative Methode zur Bestimmung von Vitamin A and β-Carotin in Fetten und Ölen. **[Simple quantitative method for estimating vitamin A and β-carotene in fats and oils.]** *Milchwissenschaft*, 1956, **11,** 206–208. [Physik. Inst., Bundesforschungsanst. Milchwirtsch., Kiel.] English, Spanish and French summaries.

The method, developed from a qualitative one previously described (*Milchwissenschaft*, 1955, **10,** 360), was based on plate chromatography. Aluminium oxide, 5 to 7 g., was distributed uniformly over a glass plate 15 cm. square, and a drop of the sample or a dilution of it in groundnut oil was placed on the plate. The chromatogram was developed with light petroleum. β-Carotene formed an orange-yellow ring. The process was repeated with successive known dilutions as long as the characteristic ring could be seen. In the conditions used by the authors, this amount corresponded with 0·05 μg. carotene. Vitamin A could be estimated at the same time unless carotene was present in excess, by exposing the chromatogram to the light from a mercury vapour quartz lamp or, more sensitively, by spraying with the Carr Price reagent; the limiting amount of vitamin A was 0·06 μg. in oily solution. Annatto (bixin) and similar pigments did not interfere; if dimethylaminoazobenzene (butter yellow) was present, the plate had to be treated first with H_2SO_4 (45 per cent.). The method is claimed to be suitable for recording variations in the vitamin A content of butter with the feeding of the cows or during storage, and for controlling the carotene and vitamin A content of margarine.

W. M. Deans.

4314

GADE, E. T. and KADLEC, J. D. **Rapid estimation of vitamin A using a surface active agent.** *J. Agric. Food Chem.*, 1956, **4,** 426–427. [The Borden Co., Special Products Div., Elgin, Ill.]

The method of estimating vitamin A has been used for the analysis of chicken livers and of powdered preparations for infant feeding. Samples with a surface-active agent, which was a mixture of Triton X-100 and sodium tripolyphosphate dissolved in aqueous methanol, were extracted in one step with a mixture of light petroleum and ether, the extracts were purified chromatographically and the vitamin was estimated with the $SbCl_3$ reagent and an Evelyn photo-electric colorimeter. Extraction took 25 min. and several samples could be run simultaneously. Feed supplements containing *N*, *N'*-diphenyl-*p*-phenylenediamine and fortified with vitamin A embedded in a matrix were washed with ether. With 6 replicate samples of an infant food fortified with vitamin A palmitate, there was recovery of between 92 and 100 per cent. Comparison with methods that involve saponification showed good agreement of the results for each of the materials examined.—I. M. Sharman.

4315

DI CELSO, P. M. Illustrazione di un metodo rapido per la determinazione del carotene nei foraggi e nei mangimi. [**Rapid method for estimating carotene in fodders and foods.**] *Ann. Sper. agrar.*, 1956, **10,** No. 2, *Suppl.*, li-lv. [Ist. Sper. Zootec., Rome.] English summary.

Samples not exceeding 2 g. of fresh grass or 1 g. of dry forage or other material were triturated with quartz powder and extracted with methanol and benzene. The solvents were separated and the benzene fraction was saponified with alcoholic KOH in 90 per cent. ethanol. The benzene layer was again separated and washed first several times with methanol and then with 90 per cent. ethanol. The carotene was separated from the benzene extract by column chromatography and estimated in a Beckman spectrophotometer. Estimations by the method took only half an hour.

D. Duncan.

4316

OGDEN, R. L. **Effect of added fats and oils on carotene stability in dehydrated alfalfa meal during storage.** *J. Agric. Food Chem.*, 1956, **4,** 428–431. [Dept. Biochem. Nutrit., Univ. Nebraska, Lincoln.]

Animal fats and vegetable oils of several types were added to dehydrated alfalfa meal, which was then stored at 40° C. When only 40 per cent. of the carotene remained in untreated samples, carotene was estimated in the treated samples. The percentage remaining was called the carotene retention index. A value above 40 was evidence that the fat had protected the carotene.

The retention index of linseed, walnut, olive and some other vegetable oils was below 40. Cocoa butter, soya bean oil and refined maize oil had values slightly above 40. Beef tallow, pork lard, and mutton tallow had values at or near 60. Several other oils had little effect. In general, animal fats improved retention, but vegetable oils gave less protection or none or were harmful. Free fatty acids were estimated in each fat and oil. In general those with a high index had low free fatty acid values, and those with an index below 40 had high values. Retention was improved by treating oils with alkali to remove free fatty acids. Retention of carotene was improved by increasing the amount of animal fat added to the meal up to about 5 per cent., but with more than that there was little further effect. Oils or fats are applied to meal to reduce its dustiness, and, for that purpose also, proportions greater than 5 per cent. do not produce much further improvement. Five per cent., therefore, is about the highest proportion that is economically advantageous. The response to a given fat or oil was quantitatively different for different alfalfa meals, for which a possible explanation is discussed.—V. H. Booth.

4317

BÄCK, K. **Effect of some metal ions on the stability of natural vitamin A.** *Acta chem. scand.*, 1956, **10,** 334–335. [Royal Inst. Technol., Stockholm.]

After metal ions had been removed from fish liver oil concentrates containing about 100,000 I.U. vitamin A per g., by percolation of a solution in propanol through a cation exchanger, solutions of metal chlorides in absolute ethanol were added to the samples to give final concentrations of 2 per cent. ethanol and 1, 10 and 100 p.p.m. of metal ion. Samples were stored in vials at 34·5° C. for different times, after which vitamin A was estimated spectrophotometrically. Typical curves are presented to show destruction of the vitamin relative to time of storage in the presence of aluminium ions. Ratios of the times for destruction of 50 per cent. of the vitamin A in oil containing 100 p.p.m. of metal ions, to those for the same loss from oil containing no metal ion were 0·5 for Al, 0·5 for Cu, 0·2 for Fe, 0·4 for Ni, 0·7 for Sn and 0·8 for Zn.—I. M. Sharman.

4318

MATZKO, S. N. and ZHMEIDO, A. T. Periodichnost vvedeniya kak faktor, vliyayushchii na potrebnost v vitamine A. [**Vitamin A requirement as influenced by periodicity of administration.**] *Dokl. Akad. Nauk SSSR*, 1956, **106,** 367–369. [Nauch.-Issled. Inst. Vitaminol., Minist. Zdravookhran. SSSR.]

Male rats, one month old, in groups of 20 or 21 were kept, first on diets containing sufficient vitamin A to prevent signs of deficiency but allowing no storage and during the experiment on stock diet without vitamin A.

Groups 1 to 4 were given vitamin A daily, 1·3, 2·6, 5·1 or 10·3 μg., respectively; group 5 at weekly and group 6 at fortnightly intervals were given the equivalent of 5·1 μg. vitamin A daily.

In the first 4 groups increase of weight rose with the amount of vitamin A given.

In group 5, given vitamin A at weekly intervals, weight gain was as good as that in group 3; group 6, given vitamin A at 2-week intervals, put on less weight than group 3, but more than group 2.

In another series rats were given 1·3, 2·6, 5·1, 10·3 and 21 μg. vitamin A daily. Weight gain increased with increasing amount of vitamin A up to 10·3 μg.; the group given 21 μg. showed no further improvement. It is therefore concluded that a dose of 10 μg. fully covered the requirement and that the minimum physiological daily requirement is between 5 and 10 μg.

The general conclusion is that administration of vitamin A at weekly intervals did not affect the requirement, but that administration at intervals

of 2 weeks increased the requirement by half. That administration of vitamin A at intervals did not cause a spectacular increase of requirement is explained by the ability of the organisms to store large quantities of vitamin A in the liver.—F. Billewicz.

4319

SHELDON, H. and ZETTERQVIST, H. **Experimentally induced changes in mitochondrial morphology: vitamin A deficiency.** *Exp. Cell. Res.*, 1956, **10,** 225–228. [Dept. Anat., Karolinska Inst., Stockholm.]

Specimens of corneal epithelium were taken at intervals from mice maintained for 250 days on a diet deficient in vitamin A. Light and electron microscopy of the corneal epithelium of 15 clinically ill animals showed keratinisation of superficial layers as histological evidence of vitamin A deficiency. The electron microscope showed that the basal cells of the epithelium contained many large mitochondria of normal appearance, and the cells of the most superficial layers contained few mitochondria. The cells in the intermediate layers of the keratinising epithelium showed many mitochondria with distorted internal structure and having dense areas within the matrix. It is suggested that vitamin A deficiency changes the metabolic pattern of the mitochondria so that there is accumulation of the dense substance which has hitherto been referred to as "keratohyaline", but whether the keratohyaline granules "actually stem from interference with normal mitochondrial metabolism" may require other methods to determine.—M. H. Pierce.

4320

SHELDON, H. and ZETTERQVIST, H. **An electron microscope study of the corneal epithelium in the vitamin A deficient mouse.** *Bull. Johns Hopkins Hosp.*, 1956, **98,** 372–405. [Dept. Anat., Karolinska Inst., Stockholm.]

Studies were made with the light and electron microscope of the corneal epithelium of mice deprived of vitamin A. The light microscope revealed keratinisation of the epithelium, with cornification and loosening of the outer layers. Keratohyaline granules were present in the cells of the intermediate and superficial regions, but the basal cells were apparently normal. Electron micrographs showed that in the basal cells the mitochondria were often arranged around the nucleus, which was frequently invaginated on the circumference and variegated in appearance. Granules were seen in the intermediate and superficial regions. Free and phagocytised bacteria were found occasionally in the loosened outer layers of the keratinised epithelium.—T. Moore.

4321

SRÉTER, F. Adatok a karotinháztartás és az ásványi anyagforgalom összefüggéséhez. [**Relation of carotene to mineral metabolism.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1,** No. 10, 3–15. [Inst. Physiol., Univ. Agric. Sci., Budapest.] Russian, German and English summaries.

In 10 Hungarian spotted cows studied in 1954, about 1 g. carotene, given in the form of carrots, caused a transient rise of serum Ca, but there was no change when $CaCO_3$ was given. On another farm there was no rise in serum Ca after carotene, and in another test with Brown Swiss cows the rise occurred after 60 hr. In horses, also, carotene raised both serum Ca and inorganic P after 24 hr. (From English summary.)—D. Duncan.

4322

NERURKAR, M. K. and SAHASRABUDHE, M. B. **Metabolism of calcium, phosphorus and nitrogen in hypervitaminosis A in young rats.** *Biochem. J.*, 1956, **63,** 344–349. [Biol. Div., Dept. Atomic Energy, Govt. India, Indian Cancer Res. Centre, Parel, Bombay 12.]

Male rats from 6 to 7 weeks old were fed on a synthetic diet deficient in vitamin A and all received vitamin supplements including 100 I.U. vitamin A. After 10 days the amount of vitamin A was increased to 40,000 I.U. daily for 10 days, followed by a curative period of 14 days during which the intake of vitamin A was reduced to that given during the preliminary period. Metabolism experiments showed that the net retention of calcium during the preliminary period was about 65 per cent. of the intake; it fell rapidly during the period of high dosage to a negative value of 21 per cent. on the 8th day. During the curative period retention rose steadily to 53 per cent. Phosphorus metabolism gave a similar picture, with about 60 per cent. retained during the preliminary period, a fall to — 82·2 per cent. on the eighth day of high dosage and a rise to 57·2 per cent. at the end of the curative period. For nitrogen the net retention was about 80 per cent. during the preliminary period, — 51·7 per cent. on the 8th day of high dosage and 72·1 per cent. at the end of the curative period. Excess of vitamin A reduced food intake, and there was loss of weight with skeletal fractures and haemorrhages in the young rats. The concentration of Ca and inorganic P in the blood showed no change. Changes in composition of the bones were small, so that the loss of Ca and P was probably by thinning of the bones. Estimation of vitamin A in the liver showed absorption to be poor when the amount given was far in excess of the normal requirement.—I. M. Sharman.

4323

MOURIQUAND, G., ROLLET, J., EDEL, V. and CHIGHIZOLA, R. Avitaminose et hypervitaminose A du pigeon. Identité de leur séméiologie oculaire. [**Lack and excess of vitamin A in the pigeon. Identity of their eye signs.**] *C.R. Acad. Sci.*, 1955, **241,** 348–350.

For earlier work see Absts. 4219, Vol. 18 ; 328, Vol. 24.

When pigeons were given vitamin A, 5000 I.U. daily, no eye change was seen and bodyweight and flight were unaffected ; index of chronaxie rose in the period from the 19th to 29th day and then returned to normal. When a larger amount of vitamin A, 25,000 I.U., was given the index fell to a very low value and between the 50th and 60th days there appeared in the eye signs of vitamin A excess which were similar to those produced by vitamin A deficiency. The view is held that deficiency or excess of the vitamin gives rise to the same pathological state.—D. Harvey.

4324

MOURIQUAND, G., ROLLET, J., EDEL, V. and CHIGHIZOLA, R. Sur la phase inapparente de l'hypervitaminose A. [**The concealed phase of vitamin A excess.**] *C.R. Soc. Biol.*, 1955, **149,** 1989–1991.

When pigeons were given daily doses of 25,000 I.U. vitamin A, vestibular chronaxie was slightly increased and later returned to normal. With 50,000 I.U. the index of chronaxie fell to very low values. The change preceded the appearance of the ocular signs of vitamin A excess which have already been described as resembling those of xerophthalmia (see preceding Abst.).—T. Moore.

4325

MAYFIELD, H. L. and ROEHM, R. R. **The influence of ascorbic acid and the source of B vitamins on the utilization of carotene.** *J. Nutrition*, 1956, **58,** 203–217. [Dept. Home Econ. Res., Montana State Coll. Agric. Exp. Stat., Bozeman.]

Young rats in 20 groups with 4 males and 4 females in each were given a diet deficient in vitamin A until they showed signs of deficiency. One group was killed at that stage and vitamin A was estimated in the liver and kidneys. Groups 1 to 4 inclusive were given 30 μg. carotene, groups 5 to 10, 60 μg. and groups 11 to 19, 120 μg., daily for 14 days. Rats in the 3 sets of groups were given 0, 25, 50 or 75 mg. ascorbic acid daily, and those in groups 8, 9, 10, 14, 15 and 16 received B vitamins from a test diet in which 5 per cent. of a synthetic vitamin mixture was substituted for 8 per cent. of brewer's yeast. After 14 days of supplementary feeding the animals were killed and vitamin A was estimated in the liver and kidneys.

With 30 μg. carotene the average amount of vitamin A in the liver and kidneys of the females was 46·5 μg. for those receiving no ascorbic acid, 64·9 μg. for those receiving 35 mg. and 46·2 μg. for those receiving 50 mg. Corresponding values for the males were 52·0, 38·0 and 34·6.

The liver and kidneys of the females receiving 60 μg. carotene and 0, 25 or 50 mg. ascorbic acid had an average content of 90·8, 111·0 and 79·8 μg. vitamin A ; the values for the males were 102·3, 76·1 and 74·4 μg. When B vitamins were given instead of yeast the values for the females were 121·6, 144·3 and 117·3 μg. and for the males 113·4, 106·5 and 103·0 μg.

When 120 μg. was the carotene supplement with 0, 25 or 50 mg. ascorbic acid, the average vitamin A content of the liver and kidneys of the rats receiving yeast was 161·2, 175·1 and 185·3 μg. for the females and 131·8, 134·1 and 154·7 μg. for the males. The corresponding values for the animals receiving the synthetic vitamin mixture was 201·1, 200·0 and 225·0 μg. for the females and 178·9, 182·0 and 195·5 μg. for the males.

When 0, 50 or 75 mg. ascorbic acid was given with the supplement of 120 μg. carotene and yeast from a different source, vitamin A in the liver and kidneys of the females amounted to 194·2, 225·5 and 209·9 μg. and of the males to 185·7, 202·7 and 182·0 μg.—R. J. Ward.

4326

MAYFIELD, H. L. and ROEHM, R. R. **Carotene utilization as influenced by the addition of vitamin B_{12} to diets containing yeast or a synthetic vitamin mixture.** *J. Nutrition*, 1956, **58,** 483–493. [Dept. Home Econ. Res., Montana State Coll. Agric. Exp. Stat., Bozeman.]

A previous study (see preceding Abst.) had suggested that diets containing a mixture of synthetic vitamins allowed better utilisation of carotene than diets containing yeast. Rats were depleted of vitamin A and then given 60 μg. carotene daily with diets containing one of 4 different yeasts with or without vitamin B_{12}, or a mixture of synthetic vitamins. The vitamin B_{12} content of the yeasts estimated by microbiological methods varied considerably. The effect of carotene on growth and on storage of vitamin A in the liver was least with the yeast of lowest vitamin B_{12} content. Storage of vitamin A by rats given synthetic vitamins but no vitamin B_{12} was like that of rats given yeasts of moderate vitamin B_{12} content. Vitamin B_{12} added to the diet with a yeast of low vitamin B_{12} content improved growth and storage of vitamin A. No improvement occurred when vitamin B_{12} was added to the synthetic vitamin mixture, and more nicotinic acid added to the synthetic mixture did not

affect storage of vitamin A. There appeared to be substances in yeast, other than vitamin B_{12}, which were concerned in the utilisation of carotene by the rat.—A. M. Copping.

4327

McGillivray, W. A., Thompson, S. Y. and Worker, N. A. **Further studies on the metabolism by rats of intravenously administered aqueous dispersions of carotenoid pigments.** *Brit. J. Nutrition*, 1956, **10**, 126–134. [Dept. Biochem., Massey Agric. Coll. (Univ. New Zealand), Palmerston North.]

For earlier work see Abst. 312, Vol. 26.

Rats deficient in vitamin A were given intravenously 250 or 35 μg. carotene in Tween 40, and 2 hr. later the values for vitamin A alcohol in the plasma in μg. per 100 mg., and for total vitamin A in the liver in μg., had increased to 66 and 3·7 or 36 and 3·2 compared with values in untreated rats of 21 and 1·6. After injection of 25 μg. into younger rats with lower reserves the corresponding values were 32 and 1·4 compared with 11 and 0·5 in untreated rats. In rats with greater reserves of vitamin A and injected with 250 or 35 μg. carotene, values in the plasma were 33 or 22 and for untreated animals 21.

Lycopene, xanthophyll, zeaxanthin and cryptoxanthin in amounts from 175 to 250 μg. had no effect on the vitamin A content of the plasma and liver of rats partly deficient in vitamin A, but a larger dose of cryptoxanthin given by mouth raised the values in plasma and liver. When 300 μg. α- or β-carotene was injected the amounts of vitamin A alcohol 24 hr. later in the plasma were 20 or 29 and in the liver 15·8 or 25·8 ; in untreated rats corresponding values were 15 and 1·0. Retinene was rapidly utilised, since half an hour after injection of 400 μg. the value for vitamin A in the plasma had risen to 27 and in the liver to 109. After 24 hr. the value in the plasma was 17 and in the liver 161. Groups of thyroidectomised, hyperthyroid and untreated rats, all partly deficient in vitamin A, had similar values in the blood and for liver storage of vitamin A 24 hr. after injection of carotene. Animals rendered hypothyroid by treatment with thiouracil showed an increase in liver storage from 12·3 to 18·7, 24 hr. after injection. When 400 μg. carotene was injected intravenously into rats deficient in vitamin A from which the liver had been removed, the value for vitamin A in the plasma rose from 10 to 57 after 5 min. and was 50 after 30 min.—R. J. Ward.

4328

Worker, N. A. **The effect of complete hepatectomy on the utilization by rats and rabbits of intravenously administered aqueous dispersions of carotene.** *Brit. J. Nutrition*, 1956, **10**, 169–175. [Dept. Biochem., Massey Agric. Coll. (Univ. New Zealand), Palmerston North.]

Thirty minutes after 320 μg. carotene in Tween had been injected intravenously into rats partly deprived of vitamin A, the average vitamin A alcohol content of the plasma in μg. per 100 ml. rose from 13 to 42. After a similar injection, plasma vitamin A alcohol in rats from which the liver had been removed rose from 10 to 49 after 10 min. and was 29 after 15 min. and 45 after 30 min. In rats given the injection of carotene after removal of the liver and viscera, the plasma value for vitamin A alcohol rose from 10 to 40 after 15 min. In rabbits from which the liver had been removed vitamin A alcohol in the blood plasma fell by a maximum of 27 μg. per 100 ml. after injection of distilled water or Tween ; it rose by about 10 μg. per 100 ml., 2 hr. after injection of 920 μg. carotene into such rabbits.—R. J. Ward.

4329

Potter, L. M., Bunnell, R. H., Matterson, L. D. and Singsen, E. P. **The effect of antioxidants and a vitamin B_{12} concentrate on the utilization of carotenoid pigments by the chicks.** *Poultry Sci.*, 1956, **35**, 452–456. [Dept. Poultry Sci., Storrs Agric. Exp. Stat., Conn.]

For 4 weeks chicks were given a semi-purified diet low in vitamin A, supplemented with carotene in alfalfa meal to give the equivalent of 300 or 1200 U.S.P.U. vitamin A per lb. ration, and with or without 0·0125 per cent. N,N′-diphenyl-*p*-phenylenediamine (DPPD) or 2 : 6 di-*tert.*-butyl-4-methylphenol (BHT). With both amounts of carotene DPPD considerably increased the concentration of vitamin A and carotenoids in the plasma and liver ; BHT gave smaller increases. In a second experiment lasting 9 weeks, 12 mg. vitamin B_{12} per ton, in a practical diet containing 5 per cent. alfalfa meal, did not consistently increase vitamin A and carotenoids in the plasma and liver, but did greatly increase carotenoids in the skin. DPPD added to that diet increased only slightly the storage of vitamin A and carotenoids but DPPD and vitamin B_{12} together increased storage substantially.—E. M. Cruickshank.

4330

Massonet, R. Activité antixéropthalmique des chromatoprotéides de crustacés administrés au rat blanc carencé en vitamine A. [**Antixerophthalmic activity of chromoproteins of crustacea given to white rats deficient in vitamin A.**] *C.R. Soc. Biol.*, 1955, **149**, 1971–1976. [Lab. Chim. Biol., Fac. Méd., Algiers.]

Solutions in physiological serum of chromoproteins from crustacea were injected by the

intraperitoneal route into albino rats deprived of vitamin A and showing xerophthalmia. Those treated with an extract prepared from the eggs of *Pandalus* or of *Scyllarus* lost weight, but were cured of xerophthalmia after 13 days. An extract prepared from the eggs of *Aristeus* also caused loss of weight, but the animals were cured of xerophthalmia after 6 days. Another extract prepared from the "conjonctif péristomacal" of *Aristeus* cured in 11 days and also caused a loss of bodyweight. Animals given injections of human serum alone gained weight, but xeropthalmia remained the same or became worse. The anti-xerophthalmia activity of the extracts, which was similar to that of oily solutions of the esters of astaxanthine given orally, could not be accounted for by the very small amounts of vitamin A, approximately 0·2 I.U., estimated to be present.—I. M. Sharman.

4331

MASSONET, R. Recherches sur l'activité vitaminique A des huiles de Pénéidés. [**Vitamin A activity of the oils of Penaeidae.**] *C.R. Soc. Biol.*, 1956, **150,** 170–173.

Three male rats, each of which received 3 I.U. vitamin A daily, were mated 100 days after weaning with 3 females which had been given 90 mg. daily of oil from the hepatopancreas of the crustacean *Aristeus antennatus*. The females aborted their young, and when killed at 5 months had no vitamin A in their liver. The males had only traces of vitamin A in their liver. In a second experiment the vitamin A was given to the females and the oil to the males. They produced no young and when killed the males had no vitamin A in their liver, and the females had 20 μg. vitamin A per g. liver. In a third experiment with groups each of 3 males and 3 females, all were given 1 mg. α-tocopherol daily. In one group both sexes received 90 mg. daily of the hepatopancreatic oil; they produced no young and had no vitamin A in liver. In another the males received 15 μg. vitamin A daily and the females oil from the "conjonctif péristomacal" (see above abst.) equal in activity to the oil from hepatopancreas. Their young were aborted and the females had no vitamin A in the liver; the males had 250 μg. per g. In a third group the oil was given to the males and vitamin A to the females. They produced no young and at death the males had no vitamin A in the liver and the females had 250 μg. per g. Animals in a fourth group received 5 I.U. vitamin A daily and those in a fifth group 15 I.U. daily, Females of both groups gave birth to normal litters. The livers of the animals of group 4 had an average of 20 μg. vitamin A per g. and of group 5 an average of 210 μg. per g.

R. J. Ward.

4332

HARMS, R. H., CAMP, A. A., REID, B. L., GRANT, E. L., CREECH, B. G. and COUCH, J. R. **Evidence for a substance in fish solubles which enhances vitamin A storage in chick livers.** *Poultry Sci.*, 1956, **35,** 285–291. [Dept. Poultry Husb., Texas Agric. and Mech. Coll. System, College Station.]

Chicks from hens receiving an adequate diet were given a basal ration of ground milo, soya bean meal, minerals and vitamins. Vitamin A, 2000 or 4000 I.U. per lb. feed, was supplied as fish oil concentrate or stabilised vitamin A. The diet was given alone or supplemented with 3 per cent. condensed fish solubles, or a water extract of them, or the residue remaining after the water extraction. The addition of fish solubles to the diet which contained 2000 I.U. vitamin A from either source increased storage of the vitamin in the liver four-fold in chicks 10 weeks old. Substantial increases in vitamin A were found also in the livers of chicks 3, 4 and 9 weeks old, when the diet contained 4000 I.U. vitamin A from either source. The substance in fish solubles which favoured storage of the vitamin was present in the water-soluble fraction. The residue contained an appreciable amount of vitamin A, estimated chemically, but its biological value was low compared with that of a corresponding amount of vitamin A from fish oil. It is therefore presumed that the vitamin A in fish solubles is not readily available or that its chemical estimation is inaccurate because of the presence of other substances.

E. M. Cruickshank.

4333

SQUIBB, R. L., BRAHAM, J. E. and SCRIMSHAW, N. S. **Absorption of vitamin A in aqueous and oil solutions by depleted New Hampshire chicks.** *Poultry Sci.*, 1956, **35,** 73–76. [Inst. Agropecuario Nac., Guatemala.]

Groups of from 8 to 15 chicks, depleted of vitamin A, were given vitamin A in aqueous or oily medium by mouth or by injection. The rate of absorption was gauged by estimating the vitamin A content of the serum without, and at intervals of up to 11 days after, administration of the vitamin. Absorption was poor in chicks injected subcutaneously with 1800 I.U. vitamin A in oil; the maximum response of 5 μg. vitamin A per 100 ml. serum occurred only after 4 days. When 7500 I.U. was given by subcutaneous or intramuscular injection in oil, the maximum responses were 33 and 29 μg., respectively, after 7 days. When 7500 I.U. in aqueous medium was given by intramuscular injection the maximum response of 66 μg. was attained after 24 hr. After oral administration of 7500 I.U. in aqueous or oily medium, the maximum of 50 to 51 μg. was found

within 24 hr. Death from vitamin deficiency was not prevented by parenteral injection of the vitamin in oil, probably owing to its slow absorption, but no death occurred when maximum absorption was attained within 24 hr.

E. M. Cruickshank.

4334

HIGH, E. G. and WILSON, S. S. **Studies on vitamin A ester : alcohol partition between the liver, kidneys and plasma of rats.** *Arch. Biochem. Biophys.*, 1956, **62,** 163–172. [Dept. Biochem., Meharry Med. Coll., Nashville, Tenn.]

Albino rats maintained on a diet deficient in vitamin A were given 13 μg. vitamin A ester daily for the first 3 weeks ; they were killed at intervals up to 49 days after withdrawal of vitamin A. Vitamin A ester and alcohol, separated chromatographically, were estimated in the kidneys, liver and blood plasma. In the kidneys, the proportions of vitamin A ester and alcohol were about the same, but in the liver the ester form always predominated, constituting from 68 to 91 per cent. of the total vitamin A present. The proportion of ester in the blood plasma declined from 41·6 per cent. initially to 3·8 per cent. after 49 days. Other rats deprived of vitamin A were given daily, for up to 19 days, vitamin A ester in cottonseed oil in amounts ranging from 49 to 180,000 μg. In their kidneys there was relatively more of the ester form, from 52 to 77 per cent. of the total present. In the liver the ester form again predominated with values between 91 and 98 per cent. of the total. The total amount of the vitamin present in the liver varied widely ; the concentration in the plasma remained nearly constant. The results support the view that the concentration of vitamin A alcohol in the plasma is independent of the total concentration of the vitamin in the liver or kidneys.

I. M. Sharman.

4335

LIU, C. H., FRAPE, D. L., ASHTON, G. C. and CATRON, D. V. **Vitamin A content of the livers of suckling pigs.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 571–572. [Iowa Agric. Exp. Stat., Ames.]

Fat and vitamin A were estimated in the liver of 35 piglets aged from 1 to 42 days. Average concentrations of vitamin A, in μg. per g. liver, were 15·1 at 1 day of age, 30·6 at 7 days, 26·4 at 14, 24·4 at 21, 21·7 at 28, 19·3 at 35 and 17·4 at 42. The mean total amount of vitamin A in the liver rose from 570 μg. at 1 day old to 2281 at 7 days, after which it continued to rise, though less rapidly than during the first week. At 14 days of age the average total content was 2689 μg., at 21, 3184, at 28, 3889, and at 35, 4539.

I. M. Sharman.

4336

SIBBALD, I. R., BOWLAND, J. P. and BERG, R. T. **The relationship between the blood plasma vitamin A levels of sows and of their suckling pigs.** *J. Animal Sci.*, 1956, **15,** 400–406. [Dept. Animal Sci., Univ. Alberta, Edmonton.]

Yorkshire sows with one male and one female pig from each litter were taken at random, grouped according to the season in which they farrowed, and given a ration with 15 per cent. protein based on oats and barley in a 2 : 1 ratio. Vitamin A, which was included in the ration during lactation at the rate of 1,250,000 I.U. per ton, was estimated in blood at weekly intervals.

The mean values, in μg. per 100 ml., for sows farrowing in January were 35·2, 22·2 and 22·5 on the 7th, 28th and 49th days, respectively. The mean values for the young pigs on the same days were 22·1, 15·6 and 16·8. For those that farrowed in February and March the corresponding values were, for the sows, 28·6, 37·2 and 39·8, and for the young pigs 24·9, 32·5 and 28·1 ; in July, 49·2, 33·9 and 41·0 for the sows, and 46·5, 28·2 and 27·4 for the young pigs ; and in September 49·8, 40·9 and 36·3 for the sows, and 35·9, 30·3 and 28·0 for the young pigs. Values for some groups are given at 14, 21, 35 and 42 days of age as well. From regression equations for the results the vitamin A content of the plasma of the sucking pigs could be predicted from that of the plasma of their dams. Predictions were most accurate when the sucking pigs were 28 days old, at which age the equation was $Y = 0{\cdot}473\,X + 10{\cdot}8$, where Y and X were the respective values for the young pigs and their dams.—R. J. Ward.

4337

ÓCSAG, I. and SRÉTER, F. Időszaki változások lovaink szérumának karotinoid és A-vitamin koncentrációjában és ennek gazdasági jelentősége. [**Seasonal variations in the concentration of carotenoids and vitamin A in the serum of horses, and their economic significance.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1,** No. 2, 3–27. [Inst. Animal Breeding, Univ. Agric. Sci., Budapest.] Russian, French, English and German summaries.

Carotenoids and vitamin A were estimated in the serum of horses and foals at different seasons and under different conditions of feeding. The carotenoid content of the fodder was low except during late spring and summer, and the difference was reflected in the serum carotenoid values. Abortions were especially common in mares with serum carotenoid values below 15 μg. per cent., and fertility was highest on farms where the value was kept up to 15 or 20 μg. per cent. during the

winter. Where values were low in winter, fertility improved when green feed became available in spring. Wider use of good hay, carrots and silage is recommended, especially for foals. In the serum the values for vitamin A tended to vary inversely with those for carotenoids, but towards the end of winter both were often low. The values for carotenoids were higher and for vitamin A lower in foals than in mares. (From English summary.)—D. Duncan.

4338

Ócsag, I., Sréter, F. and Monostori, I. Az újszülött és a szopóscsikó karotinoid és A-vitamin ellátottsága különös tekintettel a kancák tejelési időszakára és takarmányozására. [**The supply of carotenoids and vitamin A to newborn and sucking foals in relation to the period of lactation and the diet of the mares.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1**, No. 8, 23–37. [Inst. Animal Breeding, Univ. Agric. Sci., Budapest.] Russian, German and English summaries.

Some of the mares studied previously (preceding Abst.) and their foals were investigated further, Carotenoids and vitamin A were estimated in the blood of the mares before and at intervals after foaling.

The carotenoid content of the blood was higher after foaling than a week before and it continued to rise for about 6 days. The vitamin A content did not always rise immediately, but was always higher by the sixth day after foaling.

In foals at birth the serum carotenoid value was always, and the vitamin A value almost always, below that of the mother. The carotenoid content rose steeply. Colostrum contained up to 20 times as much vitamin A as later milk, but by about the third day the content was like that of milk. The carotenoid content of the colostrum was little, if at all, higher than that of later milk. Green fodder increased the vitamin A content of the milk more than the carotenoid content. It is suggested that foals which do not get colostrum should be given eggs for the first few days of life. (From English summary.)—D. Duncan.

4339

Hennaux, L. and Antoine, A. L'importance de la vitamine A en élevage bovin. [**Importance of vitamin A in cattle rearing.**] *Bull. Inst. agronom. Gembloux*, 1956, **24**, 40–53.

Records were kept of the amounts of colostrum and milk taken by a calf during the first 6 weeks of life. The daily vitamin A intake during successive weeks was then calculated according to the average values found by the authors for the vitamin A content of colostrum and milk, and also according to their lowest recorded values. By the first method of calculation the calf received nearly 4 times its reputed requirement of vitamin A during the first week of life, after which intake only slightly exceeded requirement. By the second method the requirement was again exceeded during the first week, but afterwards was not satisfied. Intake was lowest in the fifth week, which appeared to be a time of danger, since the vitamin A content of the milk was falling and was not yet balanced by the hay eaten.—T. Moore.

4340

Plotnikov, K. I. Gipovitaminoz telyat i ego profilaktika. [**Vitamin deficiency in calves and its prevention.**] *Veterinariya*, 1956, **33**, No. 3, 70–72. [New Siberia nivos.]

Low values for vitamin A and carotene in the blood and colostrum of cows caused losses of calves. A meal from pine needles, given at the rate of 200 to 300 g. daily, improved the health of calves and sheep. Chopped pine needles mixed with hay in the proportion 1 : 3, salt 30 g. daily per animal and bran 1 kg., were soaked in vats for 3 days in warm water at the rate of 1 litre to 1·5 or 2 kg. cut pine needles, and given to cows at the rate of 2·5 or 3 kg. per head.—H. Scherbatoff.

4341

Davis, C. L., Elliott, R. F. and Lassiter, C. A. **The effect of lecithin, choline, and methionine on the vitamin A and carotene plasma levels and liver stores of young dairy calves.** *J. Dairy Sci.*, 1956, **39**, 440–447. [Dairy Sect., Univ. Kentucky, Lexington.]

In an experiment repeated in 3 separate years, male Jersey calves were sorted at random into 9 groups, each of 2 animals. All had a basal ration low in carotene, group 1 without supplement, group 2 with 25,000 I.U. vitamin A daily, groups 3, 4 and 5 with the same amount of vitamin A and daily 3 g. DL-methionine or 2 g. choline chloride or 10 g. vegetable lecithin, groups 6 to 9 with 25,000 I.U. carotene daily alone or with one of the lipotropic substances. Blood samples were taken weekly, and liver and kidneys were taken at slaughter on the 42nd day for estimation of vitamin A and carotene.

In the experiment with vitamin A, the mean value for vitamin A in the plasma in groups 1 to 5 was 9·6, 17·6, 15·0, 16·1 and 20·1 μg. per 100 ml. The vitamin A content of the plasma of the animals receiving vitamin A and lecithin was significantly higher, at a 5 per cent. level, than that in the groups given the other lipotropic substances but not significantly higher than that in the group given vitamin A

alone. The average carotene contents of the plasma were 18·0, 19·2, 17·9, 18·0 and 27·0 μg. per 100 ml. The average vitamin A contents of the livers were 12·6, 102·2, 123·7, 132·9 and 113·2 μg. per g. There was no significant difference between any of the 4 groups given vitamin A. In the experiment with carotene the carotene content of the plasma in groups 1, 6, 7, 8 and 9 was 18·0, 83·5, 137·4, 124·0 and 90·8 μg. per 100 ml. There was superiority, significant at a 1 per cent. level, in the absorption of carotene given with methionine over carotene given alone or with lecithin, and superiority, significant at a 5 per cent. level, in the absorption of carotene given with choline over carotene given alone or with lecithin. The lipotropic agents had no effect on storage of carotene in the liver. The vitamin A content of the liver in groups 1, 6, 7, 8 and 9 was 12·6, 11·6, 19·2, 10·3 and 14·8 μg. per g.—R. J. Ward.

4342

BONDI, A., VOLCANI, R., NEUMARK, C. and DAVIDSON, J. **On vitamin A and carotene levels in blood of Israel cattle.** *Refuah Vet.*, 1955, **12**, 17–27 in Hebrew; 127–122 in English. [Agric. Res. Stat., Rehovot.]

During the years 1951 and 1952 the quality of roughage was poor and much ill health was attributed to deficiency of vitamin A. The present survey dealt with blood and liver of cows and calves, and colostrum from herds where feeding had been improved and where it was still bad. Blood from healthy cows had values for carotene and vitamin A above the lower values accepted as normal but never up to the highest reported elsewhere. Where there was acute ill health, blood contained less than the normal amounts of carotene and vitamin A; samples of liver from such a herd had 0 and 28 I.U. vitamin A per g., and those from other herds were from 34 to 625. Calf liver had less, up to 72 I.U. per g.; 4 out of 8 samples had none and they were from a herd where cow liver gave from 205 to 475 I.U. per g. Colostrum on the first and second day had, per 100 ml., from 90 to 600 I.U. vitamin A and from 84 to 260 μg. carotene.

When more carotene was supplied to cattle suffering from deficiency, plasma carotene rose at once but vitamin A rose slowly. It is suggested that the deficient diet impaired the power to convert carotene to vitamin A and that recovery of the power to do so was slow.—I. M. Sharman.

4343

NARAYANAN, K. M., ANANTAKRISHNAN, C. P. and SEN, K. C. **Co-vitamin studies. 1. Variations in tocopherol, carotene and vitamin A contents in milk and butterfat of cows and buffaloes.** *Indian J. Dairy Sci.*, 1956, **9**, 44–51. [Southern Reg. Stat., Nat. Dairy Res. Inst., Bangalore.]

Specimens of milk fat from 40 Red Sindhi cows, 20 Gir cows, 50 crossbred cows and 8 Murrah buffaloes were examined twice a month from February 1954 to January 1955. The animals were given a mixture of, per cent., oats 25, gram 20, groundnut cake 20, wheat bran 20 and gram husk 15, and fodder consisting partly of green grass and partly of silage and *ragi* straw or *ragi* straw alone. For all the cows taken together the ranges and average values, per g. of fat, were for tocopherol 26·6 to 42·7 and 34·8 μg., for carotene 3·2 to 7·4 and 4·8 μg., and for vitamin A 19·4 to 33·9 and 25·9 I.U. There was no difference between the breeds for any of the three components. For the buffaloes corresponding values were for tocopherol 18·0 to 36·7 and 25·9 and for vitamin A 17·2 to 38·4 and 25·9. Differences between the values for cows and buffaloes were significant for tocopherol but not for vitamin A.

In terms of milk the amounts of tocopherol and vitamin A were for cows 837 μg. and 620 I.U. per lb. and for buffaloes 896 μg. and 906 I.U. per lb.

Significantly more tocopherol, carotene and vitamin A were found in milk fat and milk during the monsoon season from June to November than in the hot or the cold season.—I. M. Sharman.

4344

BORRELL, S. Método de compensar la deficiencia de vitamina A en la ración alimenticia. [**Means of compensating for deficiency of vitamin A in the normal diet.**] *An. Bromatol.*, 1956, **8**, 19–37. [Dept. Invest. Bromatol., C.S.I.C., Univ. Madrid.] English summary.

Carotene was estimated by a modification of Booth's method (Abst. 2149, Vol. 15). The ranges and mean values for carotene and vitamin A are tabulated for a number of green foods, vegetables and fresh and preserved fruits, and the vitamin A content of several kinds of fish is given also. Selection of the better sources of vitamin A would eliminate the need for therapeutic administration of the pure vitamin for incipient deficiency.

D. Duncan.

See also Absts. 4129, 4263, 4275, 4474, 5132.

VITAMIN D

4345

LAUGHLAND, D. H. and PHILLIPS, W. E. J. **Quantitative estimation of vitamins D_2 and D_3 in pure solution.** *Anal. Chem.*, 1956, **28,** 817–819. [Div. Chem., Sci. Serv., Dept. Agric., Ottawa.]

The basis of the method is the formation of coloured complexes between the D vitamins and a mixture of furfural and sulphuric acid. The spectral absorption of the reaction product was greatly affected by concentration of acid, temperature and duration of reaction, so that conditions are strictly laid down. Within the temperature range from 10° to 20° C., maximum absorption for vitamin D_2 was at 565 mμ. and the extinction coefficient was 950; the corresponding values for vitamin D_3 were 490 mμ. and 1060. The smallest amount of vitamin D that could be estimated was 15 μg.—E. M. Hume.

4346

SCHUBERT, K. Über die partielle Hydrierung des Vitamins D_2. Ein Verfahren zur Herstellung von kristallisiertem Dihydrovitamin D_2II. [**Partial hydrogenation of vitamin D_2. A procedure for the preparation of crystalline dihydrovitamin D_2II.**] *Biochem. Ztschr.*, 1956, **327,** 507–514. [Inst. Mikrobiol., Jena.]

For previous work see Abst. 3437, Vol. 25.

For the maintenance of the side chain and to secure that only one of the 3 conjugated double bonds in vitamin D_2 was hydrogenated, Raney nickel was preferred to platinum or palladium, with methanol as solvent. The characteristic ultraviolet spectrum of the dihydrovitamin D_2II thus obtained was modified by raising the temperature or changing the *p*H in either direction.

Dihydrovitamin D_2II was produced during the preparation of dihydrotachysterol. Its structure is discussed.—E. M. Hume.

4347

HAAVALDSEN, R. and NICOLAYSEN, R. **Studies in calcium metabolism in rats. 1. A long term study in rats given an optimal diet with and without vitamin D.**

HAAVALDSEN, R., EGNUND, K. M. and NICOLAYSEN, R. **2. The interaction of vitamin D and the endogenous factor.**

NICOLAYSEN, R. **3. The adaption to low Ca intakes of old rats.** *Acta physiol. scand.*, 1956, **36,** 102–107; 108–113; 114–118. [Johan Throne Holst's Nutrit. Res. Inst., Univ. Oslo.]

1. Young male rats weighing from 50 to 60 g., 150 in all, were given a diet of, per cent., acid-precipitated casein 10, dried egg albumin 3, dried brewer's yeast 3, arachis oil 5, wheat flour 76, vitamin B_{12} mixture (20 mg. in 1 kg. rice starch) 0·5, KH_2PO_4 0·8, and $CaCO_3$ to give 0·5 per cent. Ca in the diet. The percentage of P was 0·5. Some of the rats received 70 I.U. vitamin D weekly. [It is stated further that all rats received also 140 I.U. vitamin D weekly, but it seems more probable that this should be 140 I.U. vitamin A.] Rats were killed at intervals of 5 or 6 weeks up to the age of 81 weeks. Ca and ash were estimated in the bones, and Ca balance experiments were made for periods of from 3 to 6 weeks.

In the rats given vitamin D weight gain was somewhat superior, and absorption of Ca was definitely superior, for the first 15 weeks but not later; the deficit of Ca incurred by those without vitamin D was never subsequently made up. Both groups excreted very little Ca in the urine; those given vitamin D excreted somewhat the larger amount. The bones of those given vitamin D contained more ash.

2. In one experiment, rats were given a diet of, per cent., whole wheat 84, acid-precipitated casein 10, dried brewer's yeast 3, NaCl 1, KH_2PO_4 0·8 and vitamin B_{12} mixture, as in the preceding Abst., 0·5. In the other experiments, rats were given the same diet as in the preceding Abst., except for variations in the Ca content and the introduction of Na oxalate to increase the negative Ca balance in 2 experiments.

In the first experiment, 18 rats were maintained on the first diet for about 30 weeks from 6 weeks old. For the last 6 weeks 6 of them were given 70 I.U. vitamin D a week. Ca absorption was measured throughout. The mean amount absorbed increased up to about the 14th week of age and then, when weight increase was slackening, declined to less than half the initial value unless vitamin D was given, when there was a great increase followed by a moderate decline but not to as little as the initial value.

The same decrease in the absorption of Ca, followed by increase when vitamin D was given, was shown by rats having had the diet described in the preceding Abst., and containing, per cent., Ca 0·5 and P 0·5 for 35 or 69 weeks. Adult rats which had lost several hundred mg. Ca during about 20 weeks showed greatly increased absorption when 10 I.U. vitamin D were given daily.

Female rats more than 2 years old were given vitamin D for about 20 weeks. A strongly negative Ca balance was induced at intervals by giving Na oxalate. Each such period was followed by an absorption of Ca much greater than in the period before oxalate was given, although vitamin D was then being given.

It is concluded that " The absorption of calcium is throughout life subject to a regulation by vitamin D and an endogenous factor of unknown nature. Vitamin D appears to be the primary regulating factor without which the endogenous factor cannot develop its action. "

3. In 3 experiments, 33 rats in all were given the same diet as in Part 1. They had been used for many months previously for balance experiments in which vitamin D was given, and were in positive Ca balance on a diet containing 0·25 per cent. Ca. In the first experiment rats aged from 21 to 28 months, and in the second experiment rats aged from 26 to 32 months, having a diet with 0·04 per cent. Ca and given vitamin D, were almost always in positive balance with an intake of 6 mg. daily.

In the third experiment rats aged 28 months were in positive balance on a diet with 0·25 per cent. Ca and an intake of about 40 mg. After a month the percentage of Ca was reduced to 0·04 with an intake of 6 or 7 mg., and all the rats were in negative balance. Change after another month to a diet with 0·098 per cent. Ca and an intake of from 13 to 15 mg. reduced the negative balance but rendered it positive only in one rat. The surviving rats were by this time more than 30 months old. The amount of Ca in the urine was increased, which, it was considered, might be evidence of a very slight increase in bone catabolism in such old rats.—E. M. Hume.

4348

JOSHI, J. G. and DIKSHIT, P. K. **Effect of vitamin D on the phosphorus content of rachitic rat cartilage.** *Nature*, 1956, **177**, 625. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

Rats 4 weeks old, in 6 groups of 10 and 1 of 20, were given a rachitogenic diet. After 21 days one group was killed and the epiphyseal cartilage from the tibia was removed and dried at 90° C. At the same time all the rest were given a single dose of 4000 I.U. vitamin D and groups of rats were killed at intervals of 24 hr. afterwards, up to 144 hr., and the tibial cartilages were removed in the same way. The cartilages were wet-ashed and P was estimated in them colorimetrically. The mean value, in μg. P per mg. dry cartilage, was 9·78 before vitamin D was given, and 11·00 after 24 hr., increasing to 20·94 after 96 hr. The value then began to decline again, and was 17·21 after 120 hr. and 12·21 after 144 hr. The reason for the decline after 96 hr. was not clear, but it is pointed out that that is the time when maximum increase in calcifying capacity after administration of vitamin D is shown by cartilage *in vitro*, and when calcification begins *in vivo*.

E. M. Hume.

4349

HANSSLER, H. Über den Einfluss der Nebennierenrinde auf das Knochenwachstum Vitamin-D-frei ernährter Ratten. [**Influence of the adrenal cortex on the growth of bone in rats deprived of vitamin D.**] *Klin. Wochenschr.*, 1956, **34**, 646–647. [Kinderklin., Univ. Tübingen.]

Young rats 4 weeks old, 208 in all, were maintained on the low-P rachitogenic diet, Steenbock No. 2965. For from 10 to 14 days groups of from 18 to 33 were given daily 0·5 or 1·25 or 2·5 mg. cortisone or 1 I.U. vitamin D_3 or both cortisone and vitamin D_3. Two groups of 18 rats had the adrenal glands removed and during 7 or 8 days were given 2000 or 1 I.U. vitamin D_3. At the end of the experiment an X-ray picture was taken, Ca and P in the blood serum were estimated and histological examinations were made.

In intact rats cortisone lowered serum inorganic P but did not affect Ca. It reduced the weight of the thymus gland and spleen, and promoted their involution, and it induced skeletal changes resembling the beginning of healing in rickets. Given with vitamin D_3 it reinforced the vitamin's effect. In adrenalectomised rats the antirachitic effect of 1 I.U. vitamin D_3 was less than in intact rats.

With a rachitogenic diet low in Ca, cortisone had a well marked antirachitic effect.

E. M. Hume.

4350

KANDUTSCH, A. A., MURPHY, E. D. and DREISBACH, M. E. **Provitamin D in certain sebaceous tissues of the mouse and guinea pig.** *Arch. Biochem. Biophys.*, 1956, **61**, 450–455. [Roscoe B. Jackson Mem. Lab., Bar Harbor, Maine.]

Preputial glands from 220 Swiss mice 22 months old, anal glands from 10 male guineapigs weighing from 490 to 795 g., and material of a transplantable preputial gland tumour 7 weeks after being implanted into mice, were extracted with acetone and saponified with alcoholic KOH after evaporation of the acetone. The sterols were obtained by precipitation with digitonin. They were purified in different ways and recrystallised repeatedly. The spectral absorption between 230 and 320 mμ. and that of the product of reaction with the Liebermann Burchard reagent were measured, and compared with values for standard specimens of sterols. 7-Dehydrocholesterol constituted from 35·3 to 66·3 per cent. of the sterol mixture. Cholesterol and a substance reacting rapidly with the Liebermann Burchard reagent, tentatively identified as Δ^7-cholesterol, were present also. The concentrations of 7-dehydrocholesterol in the different tissues were several times greater than any reported for other organs or tissues.—E. M. Hume.

4351

RAINES, T. V. and WINKEL, F. H. **Avian rickets in Wisconsin.** *J. Amer. Vet. Med. Assoc.*, 1956, **128,** 414–415. [Poultry Dis. Diagnostic Sect., Animal Dis. Diagnostic Lab., Wisconsin Dept. Agric., Madison.]

Rickets was reported in 5-week-old chickens from 3 flocks. The clinical signs and post-mortem findings justifying the diagnosis are described. In 2 of the flocks coccidiosis also was diagnosed. The flocks were all having the same commercial feed, which apparently did not provide the preventive doses of vitamin D_3 and drugs declared to be present. In trials with rats the suspected feed was found to have no vitamin D.—T. D. Bell.

4352

CHITRE, R. G. and DAMLE, V. M. **Effect of high doses of vitamin-D on nitrogen excretion in albino rats.** *J. Postgrad. Med., Bombay*, 1956, **2,** 106–116. [Sect. Biochem., Dept. Physiol., Seth G.S. Med. Coll., Bombay 12.]

Total N, urea, ammonia, uric acid, creatinine N, Ca and P were estimated in the 24 hr. urine of 4 male rats, from 110 to 120 days old, maintained on a stock diet. The intakes of N, Ca and P were measured. The study lasted for 5 preliminary periods of 3 days each, then for 10 periods during which 2 of the rats were injected with 10,000 I.U. vitamin D_2 daily, and then with 20,000 I.U. daily; they died after from 63 to 75 days in all. In the rats given vitamin D the output of all forms of N, but especially urea, increased when 20,000 I.U. daily was given and N balance became negative. Signs of toxicity then became severe, with loss of weight, increased output of Ca and P, and reduced food intake. It was concluded that there was no damage to the liver in vitamin D excess and that it was exogenous protein metabolism that was primarily affected.

To test the conclusion the experiment was repeated with 4 rats given a protein-free diet. In those given vitamin D death occurred sooner than in the first experiment but no increase in the urinary excretion of N in any form took place.

E. M. Hume.

4353

HERZFELD, E., LOUDON, M. and ZWEYMÜLLER, E. Beitrag zur experimentellen Vitamin D-Vergiftung beim Hund. 2. Das Verhalten der maximalen tubulären Rückresorption von Phosphat (Tm_{PO_4}) bei infolge subakuten Vitamin D-Vergiftung verringerter Glomerulusfiltrationsgrösse. [**Experimental vitamin D intoxication in the dog. 2. The effect on maximum tubular re-absorption of phosphate (Tm_{PO_4}) of diminished glomerular filtration due to sub-acute vitamin D intoxication.**] *Ztschr. ges. exp. Med.*, 1956, **127,** 272–280. [Inst. Pharmakol., Univ. Vienna.]

For part 1 see Abst. 335, Vol. 26.

2. With the method described in part 1, 84 clearance tests were made on 11 female dogs, weighing between 10 and 24 kg., before and after administration of from 1 to 4 mg. vitamin D_2 per kg. bodyweight. The tests after administration of vitamin D were started when the weight had begun to fall and residual N in the blood had begun to rise. Serum inorganic P was estimated. Degrees of vitamin D intoxication were produced, classified as transitory, moderate and fatal. The degree of intoxication suffered by the different dogs in response to the same amount of vitamin D varied widely. With the onset of signs of intoxication the rate of glomerular filtration was slowed and so to a smaller extent was the rate of plasma flow through the kidneys. As the intoxication became more severe, those defects increased, and maximum tubular re-absorption of phosphate began to fail, but the failure was not related in degree to the extent of the failure of glomerular filtration and was not secondary to it.

E. M. Hume.

4354

BÄHRECKE, G. Über die Haltbarkeit von Vitamin D-Zusätzen in Futterkalk bzw. dessen Komponenten. [**Stability of vitamin D additions to feeding chalk or its components.**] *Arch. Tierernährung*, 1956, **6,** 110–128. [Anst. Vitaminforsch., Potsdam-Rehbrücke.]

The materials were tested prophylactically on groups of 10 rats given McCollum's rachitogenic diet 3143 modified. Four groups received every other day graded doses of a preparation of vitamin D_2 as standard, one group received no addition, and the remaining groups had appropriate amounts of the test substance. Solid preparations were given as pills. After 15 days an X-ray picture was taken of the left knee joint; 5 degrees of rickets were recognised. In all, 4000 rats were used. Certain commercial preparations were tested, and laboratory mixtures were made of vitamin D_2 and sometimes of vitamin D_3 with Ca phosphates or Ca carbonate, alone or with different proportions of other salts or salt mixtures. The materials were tested as soon as prepared and at intervals up to 12 months afterwards. They were stored in the dark. When the amount of P in the material was sufficient to have an antirachitic effect, the effect remained constant and did not affect measurement of the loss of vitamin D activity during storage.

The stability of vitamin D in the different mixtures varied greatly. The best result was obtained when the vitamin was added in alcoholic solution to $CaCO_3$, but if it was in oil solution the

stability was poor. Stability with phosphates of Ca was not good, and many other salts were destructive.—E. M. Hume.

4355

MELYUKOV, A. N. Opyt bor'by s D-vitaminnoi i mineral'noi nedostatochnost'yu y zhivotnykh. [**Experiments on the correction of vitamin D and mineral deficiencies in animals.**] *Veterinariya*, 1956, **33,** No. 3, 77–79. [All-Union Inst. Mechanisation of Agric.]

Treatment with preparations of vitamin D and with ultraviolet light was effective with both cows and pigs.—H. Scherbatoff.

4356

TEŠIĆ, D. Rendgenološka slika eksperimentalnog rahitisa prasadi. [**The X-ray picture of experimental rickets in baby pigs.**] *Acta vet., Belgrade*, 1955, 5, No. 4, 59–74. [Inst. Rendgenol. Fiz. Terap., Vet. Fak., Univ. Belgrade.] German summary.

The article is the author's abstract of his thesis. Thirty young pigs of different ages were given a rachitogenic diet and 10 others had a normal diet. X-ray photographs were made of the distal ends of the radius and ulna, usually every 5 to 8 days, to study the development of rickets especially in its early stages. A pre-rachitic stage, characterised by loss of density in the diaphysis and metaphyseal spongiosa, a pre-clinical stage in which the disorder could readily be recognised radiographically, and early and late clinical rickets are described and illustrated with 21 X-ray photographs. The findings of other workers, who have claimed that diagnosis is possible only when the clinical stage is reached, are criticised.—D. Duncan.

4357

MELYUKOV, A. N. Primenenie preparata vitamina D v molochnom zhivotnovodstve. [**The use of vitamin D preparations in dairy husbandry.**] *Zhivotnovodstvo*, 1955, No. 11, 97.

Cows given vitamin D as an emulsion with the concentrate part of their ration gave more milk than a group not given vitamin D and their calves gained weight more rapidly.—H. Scherbatoff.

See also Absts. 4474, 4733.

VITAMIN E

4358

MARKEES, S. Über den Stand der Erforschung des Vitamin E. [**Position of research on vitamin E.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 976–977. [Dinkelsbergstr. 7, Riehen, Basle.]

A review.

4359

NAIR, P. P. and MAGAR, N. G. **Determination of vitamin E in blood.** *J. Biol. Chem.*, 1956, **220,** 157–159. [Dept. Biochem., Inst. Sci., Bombay.]

Blood, oxalated or clotted, was centrifuged for 20 min. at 2000 r.p.m. and from 1 to 2 ml. of plasma or serum was shaken with 0·5 ml. of 5 per cent. NaOH. The mixture was allowed to stand for 6 hr. after which it was diluted with 10 ml. distilled water and extracted twice with 5 ml. light petroleum. The washed extract was evaporated to dryness and the dry residue was dissolved in 1 ml. of a 0·394 per cent. solution of phosphomolybdic acid in glacial acetic acid. Exactly 5 min. after addition of the phosphomolybdic acid, the solution was diluted with 3 ml. purified ethanol and the colour density was read on a spectrophotometer at 725 mμ. A curve of reference was constructed with pure α-tocopherol. In 25 samples of human blood serum the vitamin E content ranged from 0·36 to 0·41 mg. per 100 ml. When tocopherol was added to rat blood serum recovery averaged 98 per cent. It is claimed that interference from reducing substances other than tocopherol can be ignored, and that the procedure is free from interference by vitamin A, calciferol, cholesterol and carotenoids.—R. J. Ward.

4360

DELMAS, L. Dosage de l'α-tocophérol du sang humain par chromatographie sur papier. [**Estimation of α-tocopherol in human blood by paper chromatography.**] *C.R. Acad. Sci.*, 1956, **242,** 2595–2598.

Serum in amounts from 0·05 to 0·1 ml. was saponified in the presence of pyrogallol and nitrogen. The unsaponifiable residue was extracted with light petroleum, washed until free from alkali, dried with acetone and dissolved in a known amount of light petroleum or acetone. Paper chromatograms were prepared by immersing strips of paper in a 2·6 per cent. solution of spermaceti in petroleum to which had been added 4 per cent. of ferric undecylate. The aqueous phase was 25 per cent. aqueous acetone, which ran about 8 cm. in 1 hr. at 22° C. After development, the spots of α-tocopherol were detected by spraying with a solution of potassium ferricyanide and were compared with standard spots of α-tocopherol. The most accurate estimations were made on from 0·4 to 0·9 μg. α-tocopherol, but 0·05 μg. was detectable. A difference of 0·02 μg. between 2 spots

was easily detected provided there was no difference in the shape of the spot. Separation of α-tocopherol, $R_F = 0{\cdot}45$, was possible from vitamin A alcohol, $R_F = 1{\cdot}0$, carotenoids, $R_F = 0{\cdot}1$, 0·36 and 0·70 and γ-tocopherol, $R_F = 0{\cdot}50$. A recovery of 94 per cent. was obtained when α-tocopherol was added to serum. Several samples of human serum were investigated by the method and the values ranged from 0·55 to 1·16 mg. per 100 ml.—R. J. Ward.

4361

SCARDI, V. and BOERI, E. Alcune proprietà dell' α-tocoferilfosfato e dell'α-tocoferolo. [**Some properties of α-tocopheryl phosphate and of α-tocopherol.**] *Acta vitaminol.*, 1956, **10,** 57–63. [Ist. Fisiol. Umana, Univ. Naples.] French, English, German and Spanish summaries.

The reduction of ferric to ferrous cytochrome *c* and the behaviour of α-tocopheryl phosphate were followed spectrophotometrically with a Beckman apparatus. α-Tocopheryl phosphate showed some dissociation in alkaline medium. It was confirmed that reduction of ferric to ferrous cytochrome *c* by ascorbic acid was completely inhibited by α-tocopheryl phosphate even at low concentrations (see Jacobi *et al.*, Abst. 3365, Vol. 20). The inhibition was not affected by *p*H, so it did not depend on dissociation of α-tocopheryl phosphate. Reduction of ferric cytochrome *c* by cytochrome b_2 and lactate was inhibited by α-tocopheryl phosphate, but α-tocopherol had no power to activate or inhibit the reaction.—E. M. Hume.

4362

NAKAGAWA, T. and MORI, Y. **Synthesis of a water-soluble vitamin E derivatives.** *J. Pharm. Soc. Japan.*, 1955, **75,** 1322–1328. [Res. Lab., Shionogi and Co., Ltd., Hyogo-ken.]

4363

BERG, B. N. **Muscular dystrophy in aging rats.** *J. Gerontol.*, 1956, **11,** 134–139. [Dept. Pathol., Coll. Phys. Surg., Columbia Univ., New York.]

Carcases of 417 male and 151 female rats of Sprague Dawley strain, ranging in age from 500 to 1186 days, were examined; some muscles were studied and the brain and spinal cord of individuals with severe muscular degeneration were examined. The rats had been weaned at 4 weeks of age and had been given Rockland "D free" pellets containing about 3·2 mg. α-tocopherol per 100 g. diet., the average daily intake of α-tocopherol by an adult rat being about 0·7 mg. Conditions of temperature, humidity and lighting were good.

Muscular dystrophy appeared after 2 years of age and its incidence increased with advancing age. The condition appeared earlier and with greater frequency in males. Histological changes in the muscles resembled those found in experimental deficiency of vitamin E.—G. F. Garton.

4364

WEINSTOCK, I. M., GOLDRICH, A. D. and MILHORAT, A. T. **Enzyme studies in muscular dystrophy. 2. Muscle dipeptidase activity and vitamin E-deficiency.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 302–305. [Dept. Psychiat., Cornell Univ. Med. Coll., New York.]

Rabbits maintained on a diet deficient in vitamin E were killed when signs of muscular dystrophy appeared, and portions of muscle from the legs, thighs and back were homogenised with 2 vol. of water or a 2 per cent. solution of KCl; extracts of muscle were prepared also. Other rabbits given vitamin E were similarly examined. With aqueous muscle extracts and glycyl-*l*-leucine as substrate, specific activity of dipeptidase rose from an average value of 155 for the non-deprived animals to 540 for the deprived. With glycylglycine as substrate the corresponding figures were 125 and 405, measured in the presence of Co^{++} ions as activator. With the muscle homogenates and glycyl-*l*-leucine, specific activity increased from 34 for the non-deprived animals to 310 for the deprived and with glycylglycine from 15 to 110, again in the presence of Co^{++} ions.

I. M. Sharman.

4365

FINK, H. and SCHLIE, I. Verbesserung des Champignon-Eiweisses für das Wachstum junger Ratten durch Zusätze von Cystin, Methionin und Tocopherol. Ein Beitrag zur alimentären Lebernekrose der Ratte. [**Improvement of the protein of fungi for the growth of young rats by adding cystine, methionine and tocopherol. Dietary liver necrosis in the rat.**] *Naturwissenschaften*, 1956, **43,** 134–135. [Inst. Gärungswiss., Univ. Cologne.]

In a previous paper liver necrosis was described in rats fed on the fungus *Psalliota lispora* (Abst. 2073, Vol. 24). In the present experiment young albino rats were fed on a diet of the fungi alone or supplemented with cystine or methionine or vitamin E or cystine and methionine. Average weight curves were plotted for 90 or 120 days. Rats given the unsupplemented diet lost weight and failed to regain their initial weight. Those given cystine alone at first lost weight, then regained their initial weight in 15 days and continued to grow for the rest of the experiment. Those given methionine grew somewhat at first but later lost weight. In those given vitamin E weight did not change. Those given cystine and methionine grew well and at the end

of 120 days had gained about 71 g.; liver necrosis was least in this group. Methionine alone gave some protection against liver necrosis, as judged by survival time, but less than cystine alone. Vitamin E reduced necrosis in 60 per cent. of the animals. Possible modes of action of the substances are discussed.—I. M. Sharman.

4366

FERGUSON, T. M., RIGDON, R. H. and COUCH, J. R. **Cataracts in vitamin E deficiency: an experimental study in the turkey embryo.** *Arch. Ophthalmol.*, 1956, **55,** 346–355. [Dept. Biochem., Agric. and Mech. Coll. Texas, College Station.]

Of 16 mature turkey hens given a diet without vitamin E but with supplements of other vitamins, 8 had in addition 20 mg. *d*-α-tocopheryl acetate per lb. diet for 9½ weeks and 40 mg. for 5½ weeks. The hens were artificially inseminated at weekly intervals for the 15 weeks and their eggs were collected daily and incubated. One or both eyes from 109 embryos, 55 from the non-deprived group and 54 from the deprived, varying in age from 5 to 28 days, were examined. Embryos in the deprived group showed a keratoconus-like change when 19 or more days old. There were lens opacities in one or both eyes of 21 embryos from the deprived group and in 2 embryos from the non-deprived group. The most conspicuous change in the lens was liquefaction of the protein which might start anywhere and, where liquefaction was advanced, degeneration and proliferation occurred in cells of the lens epithelium. There were corneal opacities in 6 deprived and 1 non-deprived embryo. It is suggested that the lens protein probably forms and then subsequently liquefies as the result of a chemical change. (See also Absts. 1889, 4833, Vol. 25.)—I .M. Sharman.

4367

BLACKMORE, J. C. and WILLIAMS, P. C. **Tocopherol deficiency in rats and mice fed on pelleted diets.** *J. Animal Tech. Assoc.*, 1955–1956, **6,** 71–73. [Imp. Cancer Res. Fund, London, N.W.7.]

Mice fed on a cubed diet prepared according to formula No. 86 of the Rowett Research Institute bred at a subnormal rate during the winter of 1954–55. Of the 4 strains, C_{57}BL, A, Simpson and C_3H, only the last was seriously affected. In a 19 weeks' experiment mice of the C_3H strain in 2 groups were given 10 mg. α-tocopheryl acetate thrice weekly during weeks 9 to 15 or during weeks 1 to 4. The tocopherol supplement did not increase the number of litters born, but significantly increased the size of the litter. The percentage of young weaned in the first 4 weeks was 1 and 32, respectively, in weeks 5 to 8, 0 and 38, in weeks 9 to 16, 35 and 18; neither group weaned any in the ensuring 4 weeks. The increase in litter size was maintained after treatment ceased. It is recommended that vitamin E supplements should be given as a routine to breeding colonies of mice.

Rats were not adversely affected to the same extent as the mice during the winter of 1954–55 and continued to breed but at a subnormal rate.

R. J. Ward.

4368

CHRISTENSEN, F. and DAM, H. **Reproduction capacity of rats in relation to diet. 3. Influence of diets containing no added fat with and without vitamin E and certain artificial antioxidants.**

CHRISTENSEN, F., DAM, H. and GORTNER, R. A. **4. Influence of diets containing no fat, lard freed from tocopherol, and of vitamin E and methylene blue.**

CHRISTENSEN, F. and DAM, H. **5. Absence of influence of high casein and addition of vitamin B_{12} on vitamin E deficient diets.** *Acta physiol. scand.*, 1956, **36,** 82–86; 87–96; 97–101. [Dept. Biochem., Polytech. Inst., Copenhagen.]

3. Seven groups of 12 female rats were given a basal diet without vitamin E or added fat. Groups 1 and 2 had vitamins A and D in peanut oil and group 2 had 0·02 per cent. α-tocopheryl acetate in the food. Groups 3 to 7 inclusive received vitamins A and D in aqueous colloidal solution and group 4 had also 0·126 per cent. methylene blue, group 5 had 0·025 per cent. tetraethylthiuram disulphide, group 6 had 0·5 per cent. nordihydroguaiaretic acid and group 7 had 0·02 per cent. α-tocopheryl acetate. After 70 days on the diets the survivors were mated with normal males of the same age. By the tenth week 4 rats had died in group 4, 12 in group 6 and 1 in group 7. Methylene blue appeared to prevent the tails becoming scaly. Rats of groups 1, 3, 5 and 6 gave birth to no young. All rats of group 2 which had vitamins A and D in oil and vitamin E produced litters, all of which died within 6 days. Of the 8 survivors in group 4 receiving methylene blue, 2 had litters which did not survive, and 5 of the 11 rats of group 7 which received the aqueous emulsion of vitamins A and D and α-tocopheryl acetate had litters which did not survive beyond 6 days.

4. Female rats were divided into 15 groups of 8 rats and were given a basal diet without tocopherol and fat for 62 days, after which 3 groups were given the basal diet alone, or with 0·02 per cent. α-tocopheryl acetate, or with 0·126 per cent. methylene blue; 3 groups had the same diet in which 20 per cent. sugar was replaced by 20

per cent. lard, alone, or with tocopherol, or with methylene blue ; 3 groups had diets like the last 3 but with lard in which the tocopherol content had been reduced by adsorption chromatography from 7·8 μg. per g. to 0·6 ; 3 groups had the basal diet with 2 per cent. lard, alone, or with tocopherol or methylene blue and 3 groups had diets like the last, but with 2 per cent. purified lard. After 21 days on the second diet they were mated with normal males. Lard in the diet prevented kyphosis and, except in the groups receiving 2 per cent. of the purified lard, prevented abnormal accumulation of cerumen. Teeth were not depigmented in groups on the fat-free diet or the diet containing 2 per cent. lard. In groups receiving the diet with 20 per cent. lard, tocopherol and methylene blue prevented depigmentation, but it was not prevented by methylene blue in groups receiving purified lard. No litter was born to rats given the basal diet with or without fat. Methylene blue was effective only in the group receiving the diet with 20 per cent. untreated lard, where 6 of the animals produced litters. Vitamin E was effective in all animals receiving lard, treated or untreated, but only 2 out of 5 rats had litters in the group receiving the fat-free diet and vitamin E.

5. Young female rats were divided into 6 groups of 10 and were given a diet without vitamin E and containing 4 per cent. lard. Groups numbered 8, 9, 11 and 12 had 20 per cent. casein in the diet and groups 10 and 13, 40 per cent. of casein with a corresponding reduction of sucrose. In addition groups 8, 9 and 10 received 0·02 per cent. α-tocopheryl acetate and groups 9 and 12, 1·5 μg. vitamin B_{12} in the diet. The rats were mated twice, the first time after 84 days and the second after 139 days on the diet. Neither vitamin B_{12} nor extra casein improved reproductive capacity and no litter was born to any group on the deficient diet, but the differences in the diet did not affect the normal reproduction of rats receiving added vitamin E.—R. J. Ward.

4369

AMES, S. R. **Role of vitamin E (α-tocopherol) in poultry nutrition and disease.** *Poultry Sci.*, 1956, **35,** 145–159. [Res. Labs., Distillation Products Indust., Div. Eastman Kodak Co., Rochester, N.Y.]

A review including a table of the vitamin E content of feedingstuffs.

4370

JENSEN, L. S., CARVER, J. S. and MCGINNIS, J. **Effects of vitamin E, N, N¹-diphenyl-paraphenylene diamine, and fish liver oil on reproduction in turkeys.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 386–388. [Dept. Poultry Sci., State Coll., Washington, Pullman.]

There were 12 pens with 11 turkey hens in each. Pairs of hens were given a ration deficient in vitamin E with no supplement, or 20 mg. α-tocopheryl acetate per lb. diet, or 2 per cent. pollack liver oil, or 2 per cent. pollack liver oil and 20 mg. α-tocopheryl acetate per lb. diet, or 2 per cent. pollack liver oil and 0·025 per cent. N, N′-diphenyl-*p*-phenylenediamine, or pollack liver oil, α-tocopheryl acetate and N, N′-diphenyl-*p*-phenylenediamine in the same amounts. During the last 12 weeks of the 21-week experiment one male was placed in each pen and the males were moved round each week. Eggs were incubated every 2 weeks and were candled on the 7th and the 24th day. During the latter part of the experiment tocopherol was estimated in a sample of 6 eggs from each pen.

The average percentage fertility of the six groups in the order given above was 66·5, 81·8, 58·6, 77·9, 73·2 and 69·2, and the average percentage mortality of the embryo after from 25 to 28 days was 13·4, 7·9, 41·2, 8·2, 13·5 and 7·2. The average percentage of fertile eggs per hatch was 66·0, 77·1, 38·6, 76·5, 74·0 and 79·5, and the average total tocopherol content of the egg yolks was 31·8, 72·7, 17·4, 23·0, 18·0 and 24·3 μg. per g.

R. J. Ward.

4371

BUNNELL, R. H., MATTERSON, L. D., SINGSEN, E. P. and EATON, H. D. **Studies on encephalomalacia in the chick. 5. The effect of fish oil and diphenyl-p-phenylenediamine on the vitamin E metabolism of the chick.** *Poultry Sci.*, 1956, **35,** 436–451. [Dept. Poultry Sci., Storrs Agric. Exp. Stat., Conn.]

For previous parts see Absts. 4361, Vol. 24 ; 4830, Vol. 25 ; 1687, Vol. 26.

5. A factorially designed experiment to test the effect of fish oil and the anti-oxidant diphenyl-*p*-phenylenediamine on vitamin E metabolism was made with chicks from hens fed on a normal diet or a diet low in vitamin E. The tocopherol content of the blood and liver was estimated at the start of the experiment, and subsequently at intervals up to 25 days. The initial stores of tocopherol in the livers of the non-deprived chicks were up to ten times as great as those of deprived chicks, but after 10 days on a vitamin-E-deficient diet the stores were about the same. The high initial value for the non-deprived chicks obscured the effect of the different treatments during the early part of the experiment, so the results obtained at first and up to 5 days of age were omitted from the statistical analysis. When the diet was supplemented, per lb., with 8 I.U. vitamin E, the tocopherol content of the plasma and liver increased in both deprived and non-deprived chicks, but there was no significant effect on bodyweight

or on the lipid content of the liver. Inclusion in the diet of 2 per cent. fish oil decreased the tocopherol content of the plasma and liver, depressed growth, particularly in the deprived chicks, and decreased the lipid content of the liver. Inclusion of the anti-oxidant slightly increased the tocopherol content of the liver in deprived but not in non-deprived chicks. It stimulated growth, particularly in the deprived chicks, increased liver lipid and partly counteracted the depression of growth produced by fish oil.

The possible mechanism by which the anti-oxidant exerted a protective action against encephalomalacia is discussed.—E. M. Cruickshank.

4372

De Cicco, A. Manifestazioni di avitaminosi E nel pollo prodotte da somministrazione di o-cresolo. [**Signs of deficiency of vitamin E in the hen produced by administration of o-cresol.**] *Quad. Nutrizione*, 1954, **14**, 143–152. [Ist. Fisiol. Gen., Univ. Rome.] Summaries, French p. 191, English p. 193, German p. 195.

Three groups of 5 White Leghorn hens 10 months old and weighing from 1500 to 1700 g. were fed on a standard Italian ration including 70 g. daily of a laying mixture which contained, per kg., vitamin A 7000 I.U., vitamin D_3 1000 I.U., vitamin E 2 mg., vitamin B_1 5 mg., riboflavin 5 mg., nicotinamide 40 mg., pyridoxine 4 mg., pantothenic acid 12 mg. and vitamin B_{12} 8 μg. One group received no treatment, and 2 groups had weekly intramuscular injections of 500 mg. *o*-cresol succinate in olive oil, with and without 100 mg. α-tocopherol weekly. Treatment continued for 12 weeks. There was a cockerel with each group and all the eggs were incubated and the chickens were reared.

The general health of all the hens was good and their weight was constant. The number of eggs laid weekly was less from the second week of treatment in the group given *o*-cresol alone ; the effect was prevented by α-tocopherol. The eggs did not differ in fertility ; the percentage hatched, mortality and growth of the chick were similar for all 3 groups.

Serum tocopherol after 53 days, in μg. per 100 ml., was 270 in untreated birds, 30 in birds given *o*-cresol alone and 287 in birds given *o*-cresol and tocopherol. The estimation was made on 10 ml. plasma, and an earlier test with 5 ml. failed to reveal any tocopherol at all in samples from the second group.

After 10 weeks 2 untreated birds and 2 given *o*-cresol alone were killed. No pathological change was found, but the ovaries of the treated birds were smaller and had fewer maturing eggs. The 3 remaining birds of the treated group were given 1 g. α-tocopherol in 2 injections 5 days apart. Their serum tocopherol value was normal in 10 days, but egg production was normal only after 4 weeks.—D. Duncan.

4373

Salvi, F. and Mentasti, P. Azione protettiva della vitamina E sulle lesioni da Marcumar. [**Protective effect of vitamin E on lesions produced by Marcumar.**] *Acta vitaminol.*, 1956, **10**, 17–26. [Scuola Ostet., Vercelli.] French, English, German and Spanish summaries.

Three groups of 6 rabbits were given daily, per kg. bodyweight, 5 mg. Marcumar, an anticoagulant derivative of dicoumarol, alone or with 20 mg. α-tocopherol, or 20 mg. tocopherol alone for 24 days and then with Marcumar. The rabbits survived on the average for 9, 14 and 18 days. α-Tocopherol had little effect on prothrombin activity. The hyaluronidase-like effect of the anticoagulant on the intracellular and intrafibrillar substance of the mesenchyme was apparently strongly inhibited by α-tocopherol, and in the third group when α-tocopherol was given alone there was also less intradermal diffusion. α-Tocopherol inhibited the degenerate changes in the liver caused by Marcumar. The antihyaluronidase effect of α-tocopherol appeared to account for its protective effect against the anticoagulant.—A. M. Copping.

4374

Ames, S. R., Kujawski, W. F., Ludwig, M. I. and Harris, P. L. **Annotated bibliography of vitamin E in swine nutrition, 1927 to 1954.** Distillation Products Industries, Division of Eastman Kodak Company, Rochester 3, N.Y., 1954, pp. iv + 15.

See also Absts. 4205, 4880.

VITAMIN K

4375

Schulz, A. R. and Goss, H. ***In vivo* inhibition of phosphorylation by menadione.** *Biochim. biophys. Acta*, 1956, **20**, 443–444. [Dept. Animal Husb., Univ. California, Davis.]

The effect of menadione, 2-methyl-1 : 4-naphthohydroquinone, given by intraperitoneal injection to rats was to reduce the incorporation of radio-active orthophosphate into labile nucleotide phosphate in liver and heart tissue. Storage of

glycogen in the liver was reduced at the same time. The results suggested that the toxic effects of menadione might be due at least in part to the loss of phosphorylating capacity induced by it in the organism.—A. M. Copping.

4376

MARTIUS, C. Über die intracelluläre Verteilung des Vitamin K in verschiedenen Organen des Huhnes. [**Intracellular distribution of vitamin K in different organs of the fowl.**] *Biochem. Ztschr.*, 1956, **327**, 407–409. [Physiol. Chem. Inst., Univ. Würzburg.]

The distribution of vitamin K was investigated in nuclear, mitochondria, microsome and cytoplasm fractions of heart, liver and kidney tissue from chickens deprived of vitamin K for about 2 weeks and then given radio-active synthetic vitamin K_3 for several weeks. Measurement of radio-activity in extracts of cell fractions showed that almost all the vitamin K present was in the nucleus and mitochondria with negligible amounts in the other fractions. The vitamin K content of the cells was related to the nitrogen content; it was highest in heart tissue. Solvent distribution of the vitamin K of heart mitochondria between 95 per cent. methanol and *n*-heptane gave a distribution coefficient similar to that obtained with synthetic vitamin K_1, which was considered to be evidence that vitamin K_3 can be converted into vitamin K_1 in the animal body.—A. M. Copping.

4377

PHILLIPS, A. F. and CATER, D. B. **Protection by cysteine against the acute toxicity of a chemical radio-sensitizer ("Synkavit").** *Brit. J. Pharmacol.*, 1956, **11**, 128–131. [Dept. Radiotherap., Univ. Cambridge.]

Intravenous injection into adult rats of 1 m*M* per kg. bodyweight of tetrasodium 2-methyl-1 : 4-naphthohydroquinone diphosphate, Synkavit, caused death within 45 min. Cysteine and glutathione injected before or at the same time as the Synkavit protected. Synkavit caused convulsions without hypoglycaemia. A fall of oxidation-reduction potential in the brain after Synkavit suggested that its action was on the central nervous system.
A. M. Copping.

See also Abst. 4872.

VITAMIN B COMPLEX: GENERAL

4378

OHNESORGE, W. E. and ROGERS, L. B. **Fluorometric determination of thiamine and riboflavin in mixtures.** *Anal. Chem.*, 1956, **28**, 1017–1021. [Dept. Chem., Massachusetts Inst. Technol., Cambridge 39.]

With two Beckman DU monochromators, one for the exciting light and the other for the fluorescence, it was possible to obtain curves of the fluorescence spectra of vitamin B_1 and riboflavin in mixed solutions containing from 0·5 to 4·0 p.p.m. Calibration curves for each vitamin were made with reference to the concentration of the other and in terms of fluorescence emitted by a standard solution of quinine sulphate. Standard deviations of $\pm$ 5 per cent. were attained under controlled conditions.—A. M. Copping.

4379

HAENEL, H. and MÜLLER-BEUTHOW, W. Zur Vitaminsynthese von Standortvarianten von Escherichia coli. [**Synthesis of vitamins by variants of different origin of *Bact. coli*.**] *Klin. Wochenschr.*, 1956, **34**, 643–644. [Anst. Vitaminforsch., Potsdam-Rehbrücke.]

Variants of *Bact. coli* obtained from faeces of man, horse, cow, pig, sheep, rat and hen were grown in a vitamin-free medium, and 9 vitamins of the B complex were estimated by microbiological methods in the cell-free filtrate from the cultures. Vitamin B_1 or inositol was never found but small amounts of riboflavin, nicotinic acid, pantothenic acid, pyridoxine, folic acid, biotin and vitamin B_{12} were present.—A. M. Copping.

4380

GIACALONE, O. and BARDINO, M. Comportamento del glicogeno epatico in seguito a somministrazione di vitamina B_{12} o di vitamina B_1, nei ratti alimentati con dieta iperglicidica-ipoproticica. [**Behaviour of liver glycogen after administration of vitamin B_{12} or vitamin B_1 in rats fed on a high-carbohydrate, low-protein diet.**] *Quad. Nutrizione*, 1954, **14**, 153–158. [Ist. Fisiol. Umana, Univ. Palermo.] Summaries, French p. 191, English p. 193, German, p. 195.

For previous work see Giacalone, *Quad. Nutrizione*, 1953, **13**, 424.

Thirty male rats 8 to 9 weeks old and reared on milk, meat, bread and greenstuff to appetite were divided into 5 groups of 6. One group continued to receive the same diet, the others had a diet containing, per cent., sucrose 84, casein 10, salts 4, and cellulose 2; 1 group had in addition 5 mg. vitamin B_1 per head by mouth on alternate days, another had 8 μg. vitamin B_{12} on alternate days and the last had both vitamins. The experiment

lasted 21 days, and the rats were then fasted for 16 hr. and decapitated, and glycogen was estimated in the livers.

Liver glycogen, in g. per 100 g. fresh tissue, in the group on stock diet, the group given the high-carbohydrate, low-protein diet alone, and the 3 groups given vitamins as above, was 0·283 ± 0·01, 0·277 ± 0·009, 0·248 ± 0·012, 0·280 ± 0·022 and 0·243 ± 0·013, respectively. The values in the groups having vitamin B_1, with or without vitamin B_{12}, were probably not significantly different. Liver fat in the experimental groups, expressed as a percentage of that in the group having stock diet, was 134·8, 220·7, 268·1 and 284·9. Thus the presence of much fat did not affect the amount of glycogen in the liver.—D. Duncan.

4381

FREI, J. and RYSER, H. Relations entre oxydation phosphorylante et structure des mitochondries hépatiques de rats carencés en vitamines B_1 et B_2. [**Relations between oxidative phosphorylation and structure of liver mitochondria in rats deprived of vitamin B_1 and riboflavin.**] *Experientia*, 1956, **12,** 105–107. [Med. Clin., Univ. Lausanne.] English summary.

In rats deprived of vitamin B_1 a decrease in phosphorylation by liver homogenates was accompanied by a decrease in optical density of suspensions of liver mitochondria, caused by swelling of the mitochondria, but there was no significant change in the amount of protein nitrogen in the mitochondria.

In riboflavin deficiency there was no decrease in phosphorylation or optical density of mitochondria suspensions, but there was a significant fall in the amount of protein N in the mitochondria.

A. M. Copping.

4382

NELSON, M. M. and EVANS, H. M. **Failure of ovarian hormones to maintain pregnancy in rats deficient in pantothenic or pteroylglutamic acid.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 614–617. [Inst. Exp. Biol., Univ. California, Berkeley.]

Death and resorption of foetuses in rats deprived of pantothenic acid or pteroylglutamic acid was not prevented by injection of oestrone, or progesterone, separately or together, in amounts which had maintained pregnancy in rats deprived of vitamin B_1 or vitamin B_6 (Absts. 3503, Vol. 25; 3443, Vol. 21).—A. M. Copping.

4383

EAGLE, H. **Relative growth-promoting activity in tissue culture of co-factors and the parent vitamins.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 358–361. [Sect. Exp. Therap., Lab. Infect. Dis., Nat. Inst. Allergy Infect. Dis., Nat. Insts. Health, Bethesda, Md.]

For previous work see Abst. 1625, Vol. 26.

In media without vitamin B_1, pyridoxine, nicotinic acid, riboflavin, pantothenic acid or folic acid, the growth responses of mouse fibroblasts (strain L) to addition of the vitamins or of derived cofactors were studied. Cocarboxylase, flavin adenine mononucleotide and diphosphopyridine had, respectively, the same activity as vitamin B_1, riboflavin and nicotinamide. Pyridoxal phosphate, flavin adenine dinucleotide, triphosphopyridine and coenzyme A were, respectively, less active than pyridoxine, riboflavin, nicotinamide and pantothenic acid. Citrovorum factor was more active than folic acid, but *p*-aminobenzoic acid could not replace folic acid. The experiments did not explain the differences in activity, which might have been caused by variations in cell permeability or by partial blocks to utilisation.

A. M. Copping.

4384

BOROS, E., PÁLYI, A., KÓS, T. and PAJZS, ZS. Nahrungswahl von Ratten in Verbindung mit der Ausbildung bedingter Reflexe. [**Choice of food by rats in connection with the establishment of conditioned reflexes.**] *Acta physiol. hung.*, 1955, **7,** 251–264. [2. Klin. Inn. Med., Med. Univ., Budapest.] Russian summary.

Male white rats weighing from 150 to 180 g., housed individually in wire-floored cages, after fasting for 20½ hr. were placed on a board and were expected to climb up a 2-m. rope to another board, on which were set the food containers, differing in size and shape but throughout the experiment always the same for the same food and in the same position. Ten rats were used in each experiment, and 10 other rats were used which were offered the same choice of foods for 3½ hr. daily in their cages. The average amounts eaten were ascertained daily in a preliminary period of from 12 to 17 days and there was an experimental period of from 2 to 3 weeks during which the conditioned reflex was established. The results are tabulated and there are 2 graphs. The foods used were: normal, consisting of, per cent., yeast 3, meatmeal 5, casein 9, fat 10, cod liver oil 1, salt mixture of Sós (*Kiserl. Orvostud.*, 1951, **3,** 67) 4, starch 68; high-protein, no meatmeal, casein 37, starch 45, other items as before; low-protein, no meatmeal or casein, starch 82; high in saturated fats, beef suet 25, starch 53; high in unsaturated fats, oil 25; low in B vitamins, no yeast, meatmeal and casein extracted with dilute acid by the method of Sure (Abst. 254, Vol. 3); vitamin-enriched, normal with, per 100 g., vitamin A 1·5 mg., or vitamin B_1 1 mg., or riboflavin 1 mg., or vitamin B_6 1 mg., or vitamin "N" 50 mg., or vitamin B_1 0·5, riboflavin 0·5, vitamin B_6 0·5 and vitamin

"N" 18 mg. The vitamins were mixed with the foods, which were made up daily with 40 per cent. spring water.

In experiment 1 the choice of foods offered was between normal, high-protein, low in B vitamins and high in B vitamins. During establishment of the conditioned reflex, as shown by the animal's reaction time, consumption of the food rich in B vitamins rose significantly compared with that of the rats fed in their cages; it tended to fall once the reflex was established. The same was found in experiment 2, in which the choice of foods was between normal, high in B vitamins, high in vitamin A, high in saturated fats and high in unsaturated fats; with nutrients other than B vitamins, no trend was found. In experiment 3, in which normal food was offered with and without added vitamin B_1, riboflavin, vitamin B_6 or vitamin "N", no significant difference was found between the two groups of rats or between vitamins, either because the rats could not distinguish between them or because the amounts added, 6 times the normal requirement, were too large. In experiment 4 the rats were given the food low in B vitamins throughout, without choice, and establishment of the conditioned reflex was much slower than in any of the previous tests and the reaction times were longer.

The results are discussed in conjunction with those of an earlier experiment (Abst. 1933, Vol. 25). It is suggested that stress on the central nervous system increases the requirement for B vitamins. Further experiments are planned.—W. M. Deans.

4385

ARNRICH, L., HURLEY, L. S., FORKER, B. R. and MORGAN, A. F. **Response to stress by riboflavin-deficient and pantothenic acid-deficient dogs.** *Amer. J. Physiol.*, 1956, **184,** 515–520. [Dept. Home Econ., Univ. California, Berkeley.]

Young dogs were given a purified diet complete or without riboflavin or pantothenic acid for 2 weeks, and their blood sugar values were measured before, immediately after, and 1 and 2 hr. after, swimming in a tank at 25° C. for 25 min. The swimming test was repeated at intervals of 2 weeks until the deprived dogs died or were killed. The rise of blood sugar in response to stress was greatest in riboflavin-deficient dogs, and an abnormal fall occurred 2 hr. after exercise in dogs deprived of riboflavin or pantothenic acid. Restriction of food intake in dogs on the complete diet did not produce the effects produced by deprivation of riboflavin or pantothenic acid. Adrenal cortical extract had a compensatory effect and tended to counteract the rise in blood sugar after swimming in normal dogs and in dogs deprived of pantothenic acid but not in those deprived of riboflavin. In normal dogs given adrenaline, blood sugar and lactic acid rose as they were found to do after swimming stress. Of the dogs that collapsed in hypoglycaemic coma during deprivation, those deprived of pantothenic acid could be restored by adrenal cortical extract, but those deprived of riboflavin could not. Differences in the mechanism by which failure of the adrenal and pituitary cycle occurred in the two types of vitamin deficiency are discussed.—A. M. Copping.

4386

FRIEND, W. G. and PATTON, R. L. **Studies on vitamin requirements of larvae of the onion maggot, *Hylemya antiqua* (Mg.), under aseptic conditions.** *Canad. J. Zool.*, 1956, **34,** 152–162. [Veg. Insect Sect., Entomol. Lab., Ottawa.]

The basal medium contained, in mg. per ml., agar 20, ribonucleic acid 1, inosine 0·03, thymine 0·004, cholesterol 0·1, dextrose 15, mineral mixture U.S.P. XIII, No. 2, 2 and amino acid mixture 24·21, and vitamin mixture 77·96 μg. per ml. The amino acid mixture provided 19 amino acids.

Eggs of the onion fly from adults fed on honey and brewer's yeast were disinfected in formalin and added to tubes of the medium, unmodified or with single vitamins omitted. Development of the larvae was studied. Biotin, pantothenic acid, choline, folic acid, pyridoxine, riboflavin, nicotinic acid and vitamin B_1 were essential for normal growth and development. Vitamin B_{12}, thioctic acid and coenzyme A each gave a greater number of pupae and a better ratio of male to female flies, but were not indispensable. The effects of omitting different vitamins became apparent at different stages of development. From all the 1016 eggs used in the experiment only 52 adults were obtained, and when they were caged together and fed on honey and brewer's yeast only 4 eggs were laid.—D. Duncan.

4387

MORGAREIDGE, K. **The effect of light on vitamin retention in enriched white bread.** *Cereal Chem.*, 1956, **33,** 213–220. [Food Res. Labs., Inc., 48–14 Thirty-Third St., Long Island City 1, N.Y.]

Bread wrapped in plain or printed cellophane or waxed paper did not show any loss of vitamin B_1, riboflavin or nicotinic acid within 5 days when displayed as is usual in retail stores and exposed to intermittent general illumination of up to 100 foot-candles.—F. C. Aitken.

4388

KNAUT, T. Zawartość tiaminy i ryboflawiny w mleku surowym i gotowanym. [**The vitamin B_1 and riboflavin content of raw and boiled**

milk.] *Rocz. Nauk rol.* [*B*], 1955, **70,** 197–205. [Zakł. Technol. Mleczarstwa SGGW, Warsaw.] Russian and English summaries.

In raw milk the average content, in mg. per cent., was of vitamin B_1 0·0417, range 0·038 to 0·045, and of riboflavin 0·192, range 0·169 to 0·209. After boiling for 2 min. the average content of vitamin B_1 was 0·0386 and of riboflavin 0·187. The percentage lost through boiling was of vitamin B_1 7·43 and of riboflavin 2·6. The values found agreed well with those quoted in the literature. (From English summary.)—T. D. Bell.

4389

COVER, S. and SMITH, W. H. (Jr.) **Effect of moist and dry heat cooking on vitamin retention in meat from beef animals of different levels of fleshing.** *Food Res.*, 1956, **21,** 209–216. [Texas Agric. Exp. Stat., College Station.]

Vitamin B_1 and nicotinic acid were estimated, before and after cooking, in thin and thick cuts of beef from animals killed off pasture and out of the feedlot. There was no consistent difference in content or retention of the vitamins between pasture and feedlot animals. Broiled steaks retained higher percentages of vitamin B_1 and nicotinic acid than braised steaks. Oven roasts retained less vitamin B_1 and more nicotinic acid than pot roasts. It was not possible to generalise about the relation between vitamin B_1 retention and cooking temperature, cooking time or moisture content of cooked meat.—F. C. Aitken.

4390

GREGORY, B. R., WILDER, O. H. M. and OSTBY, P. C. **Studies on the amino acid and vitamin composition of feather meal.** *Poultry Sci.*, 1956, **35,** 234–235. [Div. Animal Feeds, Amer. Meat Inst. Found., Chicago, Ill.]

Thirteen amino acids and 4 vitamins were estimated in 5 samples of feather meal prepared by processing under steam pressure and containing about 87 per cent. protein. The amino acid appeared to be relatively stable to processing, with the exception of arginine, phenylalanine, *iso*leucine and cystine, but only cystine showed considerable loss. The average content, in mg. per lb., of riboflavin, nicotinic acid and pantothenic acid was 0·88, 7·85 and 3·68, respectively. Vitamin B_{12} activity, estimated with *Lactobacillus leichmannii*, was 32·2 μg. per lb.—E. M. Cruickshank.

See also Absts. 4198, 4205, 4271, 4275, 4325, 4956.

VITAMIN B_1 (ANEURIN, THIAMINE)

4391

WATANABE, A. and ASAHI, Y. **Physico-chemical studies of vitamin B_1 and related compounds. 3. Quantitative studies on the behaviour of thiol-type thiamine in aqueous solution (1). (2).** *J. Pharm. Soc. Japan.*, 1955, **75,** 1046–1049; 1050–1053. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

4392

HIRANO, H. **Studies on vitamin B_1 and related compounds. 71. Dehydration of N-substituted 4-hydroxy - thiazolidine - 2 - thione derivatives.**

HIRANO, H. and YONEMOTO, H. **72 and 73. Synthesis of pyrimidine derivatives. Manich reaction of pyrimidine derivatives.**

HIRANO, H., YONEMOTA, H. and KAMIO, H. **74. Synthesis of pyrimidine derivatives. Infrared spectra of pyrimidine derivatives.** *J. Pharm. Soc. Japan.*, 1955, **75,** 1184–1187; 1956, **76,** 230–233; 234–239; 239–245. [Res. Lab. Takeda Pharmaceutical Industries, Ltd., Osaka.]

4393

ISHIZUKA, W. **Studies on the allied compounds of vitamin B_1. 19. Studies on N-substituted thiazolidine-2-thione derivatives.** *J. Pharm. Soc. Japan.*, 1955, **75,** 1392–1395. [Takamine Res. Lab., Sankyo Co., Ltd., Tokyo.]

4394

FUJIWARA, M., YOSHIMURA, M. and TSUNO, S. **"Allithiamine", a newly found derivative of vitamin B_1. 3. On the allicin homologues in the plants of the *Allium* species.** *J. Biochem., Tokyo*, 1955, **42,** 591–601. [Dept. Hyg., Fac. Med., Univ. Kyoto.]

For parts 1 and 2 see Abst. 411, Vol. 25.

4395

TAKEUCHI, Y., OKUDA, K., HAYAKAWA, S. and MIZUHARA, S. **The active center of thiamine.** *J. Biochem., Tokyo*, 1955, **42,** 93–97. [Dept. Biochem., Med. Sch., Okayama Univ.]

The sulphydryl compounds cysteine, thioglycollic acid, thioglycollic acid-pyruvic acid addition compound, thiophenol, thiophenol-pyruvic acid addition compound, and O,S-diacetylthiamine did not catalyse formation of acetoin from pyruvate and acetaldehyde in experimental conditions in which vitamin B_1 had previously been shown to be active. Sodium cyanide did catalyse acetoin formation but was less active than vitamin B_1.—M. H. Pierce.

4396

KIESSLING, K. H. **Studies on thiamine triphosphate.** *Biochim. biophys. Acta*, 1956, **20**, 293–298. [Inst. Zoophysiol., Upsala.]

Analysis by chromatography on paper of the phosphates of vitamin B_1 formed when baker's yeast was incubated with vitamin B_1, thiamine and pyrophosphate showed the presence of a substance whose behaviour on the chromatogram corresponded with that of synthetic vitamin B_1 triphosphate; vitamin B_1 diphosphate and monophosphate were present also. Vitamin B_1 triphosphate was hydrolysed by potato apyrase in the same way as adenosine triphosphate, which suggested that the arrangement of the phosphate groups in the two compounds was similar. The triphosphate did not replace cocarboxylase in a purified pyruvate decarboxylating system unless it had previously been incubated with apyrase to remove one phosphate group.—A. M. Copping.

4397

FREI, J. Oxydation phosphorylante et carences en vitamines du groupe B. 1. Carence en aneurine. [**Phosphorylating oxidation and deficiencies of B group vitamins. 1. Vitamin B_1 deficiency.**] *Helv. physiol. pharm. Acta*, 1956, **14**, 59–69. [Méd. Clin., Univ. Lausanne.] English summary.

1. Oxidative phosphorylation was measured with ^{32}P according to methods developed by Krebs and his colleagues (*Biochem. J.*, 1953, **54**, 107) in tissues from normal rats and rats deprived of vitamin B_1. The decrease in phosphorylation in the liver from deprived rats was greater than could be accounted for by the small increase which occurred in adenine triphosphatase. There was no difference in the nitrogen content of the liver from normal and deprived rats. In homogenates of liver of deprived rats, the rate of phosphorylation was not affected by addition of vitamin B_1 or cocarboxylase, but the activity was found to have been recovered when deprived rats had been given vitamin B_1 for 2 or 3 days. The bearing is discussed of the observations on the view that the fundamental lesion of the liver in vitamin B_1 deficiency is a defect of the mitochondria.—A. M. Copping.

4398

ARGYRIS, T. S. **Loss of sebaceous glands in skin of thiamine-deficient mice.** *Science*, 1956, **123**, 634–635. [Dept. Anat., Harvard Med. Sch., Boston, Mass.]

Mice were given purified diets with or without vitamin B_1 21 days after the plucking of club hairs, ready to be shed, had initiated a new wave of hair growth. Biopsies of specimens of skin were taken 7, 14 and 21 days after the dietary change. No difference was detected after 7 days but after 14 days atrophy of skin follicles, resulting from decrease in the size of the panniculus adiposus, was seen in the mice deprived of vitamin B_1. The sebaceous glands were normal at that stage, but at later stages atrophic changes increased in the skin and sebaceous glands, and lipids could not be demonstrated in the remnants of the glands. Pair-fed mice given vitamin B_1 showed loss of the panniculus adiposus, and decrease in the thickness of the epidermis and size of the follicles, but no loss of the sebaceous glands.—A. M. Copping.

4399

TERROINE, T. Sur le rôle vicariant de l'acide ascorbique en carence B_1. [**Substitutive role of ascorbic acid in vitamin B_1 deficiency.**] *C.R. Acad. Sci.*, 1956, **242**, 2767–2769.

Rats receiving a massive supplement of 3 per cent. of ascorbic acid in a diet without vitamin B_1 continued to grow and survived without sign of polyneuritis for longer than rats with no supplement. The vitamin B_1 content of the liver fell rapidly whether ascorbic acid was given or not. Food consumption was much greater in animals given ascorbic acid, and prolongation of life was thought to be due to the maintenance of a satisfactory intake of food.—A. M. Copping.

4400

BOROS, É. and SZAMOSI, A. Aneurinbedarf von Ratten bei Ausbau bedingter Reflexe. [**Vitamin B_1 requirement of rats during establishment of conditioned reflexes.**] *Acta physiol. hung.*, 1956, **9**, *Suppl.*, 50–51. [2. Med. Klin., Med. Univ., Budapest.]

4401

HÄNDEL, M., BOROS, É., HERMANN, GY. and WEISZ, P. Wirkung von Aneurin auf die experimentelle neurogene Hypertonie von Ratten. [**Effect of vitamin B_1 on experimental neurogenic hypertension in rats.**] *Acta physiol. hung.*, 1956, **9**, 253–260. [Pathophysiol. Inst., Med. Univ., Budapest.] Russian summary.

The rise of blood pressure induced in rats by light, noise and electrical stimuli (Abst. 1933, Vol. 25) was less when 0·2 mg. vitamin B_1 per 100 g. bodyweight was injected; 1·5 mg. had no greater effect. In rats deprived of vitamin B_1 experimental hypertension was induced by the same means as readily as in normal animals. When hypertension had been induced, injection of 2 mg. vitamin B_1 per 100 g. weight reduced blood pressure, which was at its lowest after 2 hr.; it had regained the former high value after 5 hr. In rats with normal blood pressure injection of vitamin B_1 had no effect.—A. M. Copping.

4402

GUILHON, J., OBRY, J. and QUEINNEC, G. Reproduction expérimentale du syndrome hémorragique des jeunes bovidés bretons par ingestion de fougère aigle de la région parisienne. [**Experimental production of the haemorrhagic syndrome of young Breton cattle by the consumption of bracken fern from the neighbourhood of Paris.**] *Bull. Acad. vét. France*, 1955, **28,** 457–462 (with discussion 463).

Three young calves were brought from different parts of Brittany to Alfort at about 6 weeks of age and given a controlled diet of mixed hay, barley, and mineral supplement for a month before bracken fern was added to the feed, as 1 kg. daily of green bracken which was brought in fresh each week. All the animals were normal before bracken was eaten but within a month rise of temperature, haemorrhages on mucous surfaces and agranulocytosis were recorded. The animals died in from 6 to 9 weeks with general signs closely resembling those reported in animals suffering from bracken poisoning in Brittany.

The toxicity of bracken is discussed with reference to the possible effects of tannins, potassium and thiaminase.—A. M. Copping.

4403

SUOMALAINEN, H. and AXELSON, E. **Effect of thiamine on the rate of fermentation of zymohexoses and of maltose by baker's yeast.** *Biochim. biophys. Acta*, 1956, **20,** 315–318. [Res. Labs., State Alcohol Monopoly, Helsinki.]

Vitamin B_1 added to a synthetic medium stimulated production of CO_2 from glucose, fructose, mannose and maltose by commercial baker's yeast, but did not abolish the induction period which characterises the fermentation of maltose by yeast.

A. M. Copping.

4404

SUZUOKI-ZIRO. **Thiamine uptake by yeast cells.** *J. Biochem., Tokyo*, 1955, **42,** 27–39. [Pharmacol. Sect., Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

Cells of *Saccharomyces cerevisiae* were incubated at 27° C. and vitamin B_1 was estimated by the thiochrome method with cyanogen bromide and a Klett fluorimeter. Uptake of O_2 and production of CO_2 were measured in a Warburg apparatus. Decrease in the concentration of vitamin B_1 in the incubation medium was established as being a measure of the vitamin B_1 taken up by the cells.

In presence of glucose, the cells took up vitamin B_1 after a lag period of from 10 to 15 min. in aerobic and anaerobic conditions. The uptake depended on the concentration of glucose, but in presence of excess glucose the rate was not influenced by the initial concentration of vitamin B_1. The reaction was accelerated by K ions. The rate of uptake of vitamin B_1 by cells previously incubated with glucose bore a linear relation to lapse of time, and there was no lag.

The optimum *p*H for uptake of vitamin B_1 was from 4·5 to 5·0. The effect of several inhibitors tested showed that uptake of vitamin B_1 was closely related to the metabolism of carbohydrate and phosphate. Derivatives of vitamin B_1 of the thiol type were not taken up by yeast cells.

M. H. Pierce.

See also Abst. 4188.

RIBOFLAVIN

4405

YAGI, K. and MATSUOKA, Y. **Separatory determination of riboflavin nucleotides by paper electrophoresis.** *J. Biochem., Tokyo*, 1955, **42,** 757–762. [Dept. Biochem., Sch. Med., Univ. Nagoya.]

Riboflavin, flavin mononucleotide and flavin dinucleotide were separated by electrophoresis in the dark on paper buffered at *p*H 8·0. The substances were located by their fluorescence in ultraviolet light. The strips of paper were separated, and the substances were eluted with water and estimated with a Beckman spectrophotometer by their absorption at 450 mμ.—E. M. Hume.

4406

PLAUT, G. W. E. and BROBERG, P. L. **Biosynthesis of riboflavin. 3. Incorporation of C^{14}-labeled compounds into the ribityl side chain.** *J. Biol. Chem.*, 1956, **219,** 131–138. [Inst. Enzyme Res., Univ. Wisconsin, Madison.]

For parts 1 and 2 see Absts. 423, 1940, Vol. 25.

Ashbya gossypii was grown in a medium to which was added glucose-1-^{14}C, glucose-2-^{14}C, glucose-6-^{14}C or acetate-1-^{14}C or acetate-2-^{14}C. The riboflavin formed was measured and examined to find the amounts of ^{14}C from acetate or glucose incorporated into the ribityl side chain. It appeared that the hexose monophosphate pathway was not the only one ; transketolase and aldolase pathways were used also.—A. M. Copping.

4407

SYMEONIDIS, A. and MULAY, A. S. **Histopathology of the adrenal glands of rats fed a low-protein, low-riboflavine diet alone, or with *p*-dimethylaminoazobenzene.** *J. Nat. Cancer Inst.*, 1956,

16, 1163–1179. [Nat. Cancer Inst., Bethesda, Md.]

A histological study was made of the adrenal glands of rats receiving a semi-synthetic diet of low-protein and low-riboflavin content with or without addition of the carcinogen *p*-dimethylaminoazobenzene. If deoxycorticosterone acetate was given or the adrenal glands were removed, neoplastic lesions did not develop in the liver when the carcinogen was given. The semi-synthetic diet by itself induced changes in the adrenal glands, which included increase in the width of the glomerulosa, fasciculata and transitional zones by proliferation and enlargement of the cells, increase of lipoid material in the cells and degeneration in the reticularis zone ; the changes were more pronounced when the carcinogen was added. The adrenal cortex was atrophic and almost free of lipoid material in rats given deoxycorticosterone as well as the carcinogen.—A. M. Copping.

4408

WASE, A. W. **The biological half-life of riboflavin-C^{14} in the liver of normal rats and rats fed 2-acetylaminofluorene.** *Arch. Biochem. Biophys.*, 1956, **61,** 174–178. [Div. Biol. Chem., Hahnemann Med. Coll., Philadelphia, Pa.]

Daily injections of riboflavin labelled with ^{14}C were given for 28 days to 30 adult rats, fed on a semi-synthetic diet containing 0·266 mg. riboflavin per 100 g. dry weight. Six were then killed and the radio-activity of the liver riboflavin was estimated. Acetylaminofluorene, 0·03 per cent. in the diet, was given to 12, and 12 others received the basal diet alone. Animals were killed after 1, 2, 4 and 5 days and the specific activity of the liver riboflavin was measured. In rats on the basal diet alone the biological half-life of riboflavin-^{14}C was 6·53 days. Acetylaminofluorene reduced the biological half-life to 1·09 day. Acetylaminofluorine in the diet appeared to increase the metabolic turnover of riboflavin and might thus cause deficiency unless more riboflavin was given.

A. M. Copping.

4409

SIBBALD, I. R. and BOWLAND, J. P. **Supplemental riboflavin and a feed flavour in creep feed rations for swine.** *Canad. J. Agric. Sci.*, 1956, **36,** 19–26. [Dept. Animal Sci., Univ. Alberta, Edmonton.]

Extra riboflavin or a flavouring agent composed of anise and molasses added to a ration composed of wheat, oats, meatmeal, soya bean oilmeal, sugar and vitamins had no significant effect on the amount of feed eaten or the growth rate of sucking pigs receiving it as creep feed from the age of 2 weeks. There were considerable seasonal variations in the amount of creep feed eaten and in the weaning weight of sucking pigs. The riboflavin content of the basal creep feed was 1·5 g. per ton or 0·75 mg. per lb., which appeared to be sufficient.—A. M. Copping.

See also Abst. 4188.

NICOTINIC ACID (NIACIN)

4410

MARKUZE, Z. Chemiczna metoda oznaczania kwasu nikotynowego w produktach spożywczych. [**Chemical method for estimating nicotinic acid in food products.**] *Rocz. Państwowego Zakł. Hig.*, 1956, **7,** 21–34. Russian and English summaries.

After an acid hydrolysate had been clarified with $Pb(OH)_2$ or $Zn(OH)_2$, nicotinic acid was estimated colorimetrically by the method of Melnick and Field (Abst. 1482, Vol. 10). The method was simple and rapid. (From English summary.)

A. Hepburn.

4411

ORUNESU, M. and FORNAINI, G. Sul meccanismo della glicogenolisi epatica da forti dosi di nicotinamide. [**The mechanism of glycogenolysis in the liver caused by large doses of nicotinamide.**] 1. Comportamento della " glucoso-6-fosfato-fosfatasi ". [**1. Behaviour of glucose-6-phosphate phosphatase.**]

FORNAINI, G. and ORUNESU, M. 2. Comportamento della " glucoso-6-fosfato-deidrogenasi ". [**2. Behaviour of glucose-6-phosphate dehydrogenase.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 985–986 ; 986–987. [Ist. Chim. Biol., Univ. Sienna.]

1. Glycogen in the liver and the amount of inorganic phosphate liberated from β-glycerophosphate at *p*H 6·8 by liver homogenates were estimated for 15 pairs of rats of which 1 in each pair was given 100 mg. nicotinamide per kg. bodyweight 4, 8 or 12 hr. before being killed. The large decrease in liver glycogen occurred as usual after nicotinamide (see Abst. 3522, Vol. 25), but there was no difference in the amount of inorganic P liberated, showing that there was no increase in the activity of glucose-6-phosphate phosphatase.

2. With the same technique and 5 pairs of rats not given and given nicotinamide 8 hr. previously, glucose-6-phosphate dehydrogenase in homogenates of the liver was measured by their capacity to reduce triphenyltetrazolium chloride on incubation with and without glucose-6-phosphate. The mean

value for 10 tests in mg. triphenyltetrazolium chloride per 100 mg. tissue incubated at 37° C. for 25 min. was 0·38 for those given nicotinamide and 0·25 for those not given it.—E. M. Hume.

4412

SUNDARAM, T. K., MOUDGAL, N. R. and SARMA, P. S. **Influence of thyroid hormone on nicotinamide metabolism in the rat.** *Biochim. biophys. Acta*, 1956, **20**, 413–414. [Biochem. Lab., Univ. Madras.]

Groups of 4 adult rats were given methylthiouracil or desiccated thyroid or no addition for from 5 to 7 weeks. At the end of that time excretion of N^1-methylnicotinamide in response to an injection of nicotinamide was raised in hypothyroid and reduced in hyperthyroid animals. The results are discussed with reference to the role of thyroid hormone in methylating processes.—A. M. Copping.

4413

KAVANAU, J. L. and BÁNHIDI, Z. G. **Studies of the metabolism of B-vitamins and related compounds in embryonic sea urchin development. 2. The niacin group of factors.** *Exp. Cell. Res.*, 1956, **10**, 415–423. [Wenner-Gren Inst. Exp. Biol., Univ. Stockholm.]

Lactobacillus arabinosus was used to measure the free nicotinic acid components in extracts made with acetone and HCl from eggs and embryos of the sea urchin; very considerable amounts were found. The changes in activity of the nicotinic acid group of compounds during development were related to changes in the insoluble protein fraction of the embryo but the amounts of nicotinic acid derivatives present were greater than would be expected if their sole function was that of precursor for pyridine nucleotide coenzymes.

A. M. Copping.

VITAMIN B_6 (PYRIDOXINE, ADERMIN)

4414

SAKURAGI, T. and KUMMEROW, F. A. **The biological utilization of various fat-soluble esters of pyridoxine and 4-desoxypyridoxine by rats.** *J. Nutrition*, 1956, **58**, 557–568. [Dept. Food Technol., Univ. Illinois, Urbana.]

In tests with rats receiving optimum and suboptimum amounts of pyridoxine as the hydrochloride, tri-acetate, tripalmitate and trilinoleate the different esters were as active as the hydrochloride. The esters were tested also as antidotes to deoxypyridoxine and its esters. They appeared to be less rapidly absorbed than free pyridoxine and were retained in the body for a longer time.

Pyridoxine tribenzoate, tri-*p*-nitrobenzoate and tri-*m*-nitrobenzoate showed biological activity, but that of the nitrobenzoates was small, probably because of their high melting-points.

A. M. Copping.

4415

PUSZTAI, A. **Enzymatic synthesis of pyridoxalphosphate.** *Acta physiol. hung.*, 1956, **9**, 381–391. [Inst. Biochem., Hungarian Acad. Sci., Budapest.] Russian summary.

The synthesis by *Streptococcus faecalis* of pyridoxal phosphate from pyridoxal ethylacetal hydrochloride and adenosine triphosphate was studied by paper chromatography. The active enzyme synthesised by *S. faecalis* was found to be identical with chemically synthesised pyridoxal-5-phosphate. It was calculated from measurements of tyrosine decarboxylase activity that about 5 per cent. of the added pyridoxal was converted to the phosphate in the conditions of the experiment.

A. M. Copping.

4416

BRAUNSHTEIN, A. E. and BUKIN, YU. V. O fermentativnom okislenii piridoksina v tkanyakh zhivotnogo organizma. [**Enzymic oxidation of pyridoxine in animal tissues.**] *Dokl. Akad. Nauk SSSR*, 1956, **106**, 95–98. [Inst. Biol. Med. Khim., Akad. Med. Nauk SSSR.]

The amount of pyridoxine hydrochloride oxidised to 4-pyridoxic acid during incubation with homogenates of different rat tissues in phosphate buffer was very small. The most active tissues, in decreasing order, were kidney, liver and small intestine, spleen, lung and retina. Other tissues, heart, brain and skin, were almost inactive.

F. Billewicz.

4417

ROSS, M. L. and PIKE, R. L. **The relationship of vitamin B_6 to protein metabolism during pregnancy in the rat.** *J. Nutrition*, 1956, **58**, 251–268. [Dept. Foods Nutrit., Pennsylvania State Univ., University Park.]

Rats maintained before and during pregnancy on diets adequately supplemented with pyridoxine gained over 100 g. in weight; those depleted of vitamin B_6 before mating gained less weight during pregnancy even with an adequate intake of pyridoxine, still less if pyridoxine was restricted or withheld, and least if they were given deoxypyridoxine. Food intake during pregnancy was related to pyridoxine intake and less nitrogen was retained by depleted than by non-depleted rats. Rats given deoxypyridoxine showed poor N retention.

The weight and N content of the liver relative to bodyweight were greater in rats receiving

deoxypyridoxine than in those given adequate amounts of pyridoxine. Pyridoxine given to depleted animals reduced the protein content of the liver but not to the values found in non-depleted animals.

Young from rats depleted of vitamin B_6 before mating were of low birthweight even when pyridoxine was given during pregnancy.

A. M. Copping.

4418

LICHSTEIN, H. C. **Vitamin B_6 and protein synthesis.** *J. Biol. Chem.*, 1956, **219**, 27–29. [Dept. Bacteriol. Immunol., Univ. Minnesota, Minneapolis.]

The synthesis of the enzyme tryptophanase by washed cells of *Bacterium coli* in a medium containing hydrolysed casein was shown to depend on the presence of vitamin B_6.—A. M. Copping.

4419

KOTAKE, YAHITO and NOGAMI, K. **Research on xanthurenic acid. 14. Effect of 5-hydroxyanthranilic acid on the formation and conjugating reaction of xanthurenic acid in albino rat.**

KOTAKE, YAHITO, INADA, T., MATSUMURA, Y., INOUYE, K. and TAKAMORI, F. **15. Adrenalectomised albino rats and their tryptophan metabolism.** *Proc. Japan Acad.*, 1955, **31**, 582–586; 587–591. [Biochem. Dept., Wakayama Med. Coll.]

For part 13 see Abst. 3037, Vol. 26.

14. Rats weighing about 200 g. were given a diet of, per cent., casein 22, salt mixture 6, agar 3, yeast 2, butter 10, sugar 5 and starch 52. They were given in addition 0·4 g. Na butyrate and 0·1 g. tryptophan by mouth; at the same time some were given an injection of 0·2 mg. 5-hydroxyanthranilic acid per kg. bodyweight, and a second injection on the next day but one.

In the 24-hr. urine the average amount of xanthurenic acid was 8·29 mg. (5 tests) for the rats not given hydroxyanthranilic acid, and 2·07 mg. (10 tests) for those given it. The administration of hydroxyanthranilic acid prevented the hyperglycaemia and glycosuria caused by giving tryptophan and Na butyrate. Paper chromatography showed that there was much less 3-hydroxykynurenine and its conjugated compounds and xanthurenic acid in the urine of the rats given hydroxyanthranilic acid than in the urine of those not given it, which contained conjugated compounds of xanthurenic acid such as anthranilic acid glycuronide and N^{α}-acetylkynurenine. Estimation of kynurenic acid showed the amount in the urine of the rats given hydroxyanthranilic acid to be about double that in the urine of those not given it.

Similar rats having the same diet were given a hypodermic injection of 10 mg. xanthurenic acid in ammoniacal solution, and one group was given 0·4 g. Na butyrate by mouth. The average amount of ethereal sulphate of xanthurenic acid in the 24-hr. urine of those given Na butyrate was about half that in the urine of those not given it. With the same technique, 2 injections of 10 mg. methionine or 100 μg. 5-hydroxyanthranilic acid counteracted the effect of Na butyrate in inhibiting the conjugation of xanthurenic acid.

15. In similar rats having the same diet, xanthurenic acid in the 24-hr. urine after administration of 10 g. tryptophan was reduced to less than half when the pituitary or adrenal glands had been removed, and paper chromatography showed the presence of N′-formylkynurenine and 3-hydroxykynurenine, not found in the urine of intact rats.

Liver homogenates were prepared from normal rats and rats from which the adrenal glands had been removed 5 days earlier; some of the latter had received injections of 3 mg. cortisone daily for the 5 days. Supernatant fluid from the homogenates, suitably buffered, was incubated with tryptophan for 3 hr., and kynurenine, anthranilic acid and xanthurenic acid were estimated in the preparations. All 3 substances were much less than the normal in the adrenalectomised rats but were much greater than the normal in the adrenalectomised rats given cortisone.

It is therefore concluded that the adrenal and pituitary glands are indispensable for the formation of kynurenic acid and xanthurenic acid, respectively, through the mechanism of transaminase.—E. M. Hume.

4420

KOTAKE, Y. (Jr.), INADA, T. and MATSUMURA, Y. **Studies on xanthurenic acid. 11. Research on the mechanism of initial hyperglycaemia caused by xanthurenic acid.** *J. Biochem., Tokyo*, 1955, **42**, 63–68. [Biochem. Dept., Wakayama Med. Coll.]

See Abst. 3529, Vol. 25.

4421

KOTAKE, Y. (Jr.) and NAKAGAWA, I. **Studies on xanthurenic acid. 12. Effect of xanthurenic acid on phosphate metabolism.** *J. Biochem., Tokyo*, 1955, **42**, 503–512. [Biochem. Dept., Wakayama Med. Coll.]

See Abst. 3037, Vol. 26.

4422

UMEBACHI, Y. and TSUCHITANI, K. **The presence of xanthurenic acid in the fruit-fly, *Drosophila melanogaster*.** *J. Biochem., Tokyo*, 1955, **42**, 817–824. [Dept. Biol., Fac. Sci., Univ. Kanazawa.]

Fruit flies of the wild type and of 11 strains of eye-colour mutants were reared on a liquid medium. The heads of 300 flies of the wild type of both sexes were analysed together, but the bodies of the sexes were kept separate. The ethanol extract of the heads, on paper electrophoresis, yielded 2 spots giving a positive diazo reaction. One of the spots corresponded with 3-hydroxykynurenine and the other represented an unidentified substance which was investigated. In its R_F value, colour reaction, behaviour on paper electrophoresis and ultraviolet absorption spectrum it resembled xanthurenic acid. No sex difference with regard to it was found. The substance was absent from 7 of the mutant strains from which 3-hydroxykynurenine also was absent, but was present in 2 strains which were without 3-hydroxykynurenine. Three strains were without kynurenine as well. Xanthurenic acid when present was more abundant in the head than in the body.—E. M. Hume.

4423

SZÖRÉNYI, E., ELÖDI, P., SZÖRÉNYI, B. and PUSZTAI, A. Zitrulliniminase, ein neues kristallinisches Pyridoxalproteid. Vorläufige Mitteilung. [**Citrulliniminase, a new crystalline pyridoxal protein. Preliminary note.**] *Acta physiol. hung.*, 1955, **7**, 163–165. [Inst. Biochem., Hungarian Acad. Sci., Budapest.]

A crystalline preparation of citrulliniminase obtained from two kinds of crab, *Potambius astacus* and *P. leptodactylus*, was shown to require pyridoxal-5-phosphate or other codecarboxylase preparation as coenzyme for conversion of citrullin to arginine. The relation between citrulliniminase and pyridoxal protein complex will be discussed at length in a further publication.—A. M. Copping.

4424

HOLTZ, P., STOCK, K. and WESTERMANN, E. Über den Einfluss des Thyroxins und des Hungerns auf die Aktivität der Monoaminoxydase und Dopadecarboxylase der Leber. [**Effect of thyroxine and starvation on the activity of monoaminooxidase and dopa decarboxylase in the liver.**] *Arch. exp. Pathol. Pharmakol.*, 1956, **228**, 322–330. [Pharmakol. Inst., Univ. Frankfurt a.M.] English summary.

Guineapigs, rabbits and rats were treated with thyroxine or triiodothyronine for from 4 to 22 days; there was considerable loss of weight from both body and liver. The monoaminooxidase activity of liver extracts from the animals was increased or not significantly altered compared with the activity of extracts from the livers of untreated animals, whether activity was expressed per g. wet or dry weight or per mg. total N. Similar results were obtained with starved guineapigs. In contrast, the dihydroxyphenylalanine (dopa) decarboxylase activity of the same liver extracts was significantly reduced compared with that of extracts from normal animals. Pyridoxal phosphate (coenzyme) added to the extracts increased the dopa decarboxylase activity of extracts from the liver of normal rats and gave a still greater rise in activity of extracts from the livers of starved rats, but almost no increase in the activity of extracts from animals treated with thyroid. Similar results were obtained with guineapigs.—L. Wills.

4425

HOLDEN, J. T. **Inhibition of phenylalanine and tyrosine synthesis in *Streptococcus faecalis* and *Lactobacillus arabinosus* by α-keto acids.** *Arch. Biochem. Biophys.*, 1956, **61**, 128–136. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

The growth responses of *Streptococcus faecalis* and *Lactobacillus arabinus* in media deficient in tyrosine or phenylalanine were studied when pyridoxamine and amino and α-keto acids were added. In the absence of tyrosine or phenylalanine, pyridoxamine was a powerful growth stimulant. In the absence of tyrosine, *p*-hydroxyphenylpyruvic acid stimulated, and phenylpyruvic acid inhibited, growth even with added pyridoxamine. In the absence of phenylalanine the roles of *p*-hydroxyphenylpyruvic acid and phenylpyruvic acid were reversed. The results are discussed with reference to the importance of pyridoxamine in transamination reactions with α-keto acids.—A. M. Copping.

4426

GAFFURI, P. and CREMA, A. Esperienze sull'interferenza tra vitamina B_6 e idrazide dell'acido isonicotinico. [**Interference between vitamin B_6 and *iso*nicotinic acid hydrazide.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 960–962. [Ist. Farmacol., Univ. Pavia.]

Pyridoxine hydrochloride was without effect on the inhibition exerted by *iso*nicotinic acid hydrazide on the oxygen consumption of *Mycobacterium tuberculosis* or of homogenates of rabbit's lung.

E. M. Hume.

PANTOTHENIC ACID

4427

MARNAY, C. Étude de quelques aspects du rôle biochimique et physiologique de l'acide pantothénique. [**Some aspects of the biochemical and physiological role of pantothenic acid.**] *Ann. Nutrit. Alimentation*, 1956, **10**, 5–38 (*Rev.*).

A review.

4428

PASQUINELLI, F. Il coenzima A. [**Coenzyme A.**] *Sperimentale, Sez. Chim. biol.*, 1955, **5**, 69–125. [Ist. Patol., Univ. Florence.]

The article is an extensive review with 389 references. It deals chiefly with the structure, biosynthesis and distribution of coenzyme A and with its important functions in intermediary metabolism. There is a very short section on its connection with pathological changes, in relation to steatosis, ketosis and pantothenic acid deficiency.—E. M. Hume.

4429

WOLLEMANN, M. and FEUER, GY. Phosphatübertragungsprozess zwischen Adenosintriphosphat und Coenzym-A im Hirngewebe. [**Transfer of phosphate between adenosine triphosphate and coenzyme A in brain tissue.**]

FEUER, GY. and WOLLEMANN, M. Die Rolle des Phosphoryl-Coenzym-A in der Azetyl-Coenzym-A-Synthese des Hirngewebes. [**Role of phosphoryl coenzyme A in the synthesis of acetyl coenzyme A in brain tissue.**] *Acta physiol. hung.*, 1955, **7**, 329–342; 343–359. [Biochem. Inst., Hungarian Acad. Sci., Budapest.] Russian summaries.

(a) An enzyme concerned in the transfer of phosphate between adenosine triphosphate and coenzyme A was isolated from an aqueous extract of brain, dried with acetone, mostly from ox, cat and rat. The partially purified preparation had maximum activity at *p*H from 8·1 to 8·5.

(b) In a series of experiments with the enzyme prepared from ox brain, transfer of phosphate to coenzyme A was shown to be an essential step in the formation of acetyl coenzyme A. The reversible nature of phosphorylated and acetylated coenzyme A was demonstrated.—A. M. Copping.

4430

SEVERI, C. and FONNESU, A. **Decrease of coenzyme A content in fatty liver.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91**, 368–370. [Inst. Gen. Pathol., Univ. Milan.]

Fatty livers were produced in adult rats by injection of CCl_4. The diet did not produce fatty livers in rats not given CCl_4. In the livers of treated and untreated rats, respectively, the mean fat content was 2·41 and 1·32 mg. total lipids per mg. liver N, and the amount of coenzyme A, estimated by the method of Handschumacher *et al.* (Abst. 1784, Vol. 21), was 1·54 and 2·2 μg. per mg. liver N.—D. Duncan.

4431

ANGELICO, R. and QUINTILIANI, M. Rapporti dell' acido pantotenico con la funzione surrenale. [**Relation of pantothenic acid to adrenal function.**] *Rend. Ist. Super. Sanità, Rome*, 1955, **18**, 1278–1294. [Lab. Biol., Ist. Super. Sanità, Rome.] French, English and German summaries.

The subject is reviewed, the authors' own recent work being included (Title 4297, Vol. 23; Absts. 3544, 3545, 3546, Vol. 25; and the 3 following Absts.).

The tentative conclusion is reached that in pantothenic acid deficiency the adrenal glands synthesise corticosteroids with difficulty, but the difficulty becomes apparent only in emergency when the demand is increased.—E. M. Hume.

4432

ANGELICO, R. and QUINTILIANI, M. Effetto della carenza di acido pantotenico sulla produzione *in vitro* di corticosteroidi da parte di ghiandole surrenali di ratto. [**Effect of pantothenic acid deficiency on the production of corticosteroids *in vitro* by the adrenal glands of the rat.**] *Rend. Ist. Super. Sanità, Rome*, 1955, **18**, 1269–1273. [Lab. Biol., Ist. Super. Sanità, Rome.] French, English and German summaries.

Male rats weighing from 35 to 40 g. were given a complete diet with or without pantothenic acid. After from 30 to 50 days, when weight increase was slackening, they were killed and the adrenal glands were removed. Preparations of them were incubated in Krebs Ringer phosphate with 0·2 per cent. glucose with and without 0·1 I.U. adrenocorticotropic hormone in 2 ml. medium. After incubation, corticosteroids in the medium were estimated by their spectral absorption in ultraviolet light and by colorimetric measurement of formaldehyde formed by oxidation with periodic acid as described elsewhere (*Rend. Ist. Super. Sanità, Rome*, 1955, **18**, 1261). There was no significant difference between the amounts of corticosteroids formed by adrenal tissue from normal and deprived rats unless adrenocorticotropic hormone was included in the incubation medium. Adrenal tissue from nondeprived then showed a

large increase in the corticosteroids formed, as measured with ultraviolet light, but adrenal tissue from deprived rats was incapable of making any such response.—E. M. Hume.

4433

QUINTILIANI, M. Eliminazione urinaria di corticosteroidi nel ratto carente di acido pantotenico. [**Urinary excretion of corticosteroids in the rat deprived of pantothenic acid.**] *Rend. Ist. Super. Sanità, Rome*, 1955, **18,** 1274–1277. [Lab. Biol., Ist. Super. Sanità, Rome.] French, English and German summaries.

Total reducing corticosteroids were estimated with tetrazolium blue in the urine of 2 groups of 12 rats, maintained from the bodyweight of 50 g. on a diet complete except for pantothenic acid. One group received the same diet with 100 mg. Ca pantothenate per kg. added. In the urine excreted in 24 hr., there was no significant difference after 10, 20 or 30 days of the diets between the deprived and the non-deprived group in their excretion of corticosteroids.—E. M. Hume.

4434

ANGELICO, R. and QUINTILIANI, M. Studi sulla gluconeogenesi nel ratto florizinato, carente di acido pantotenico. 3. Azione del cortisone e dell'acido pantotenico sulla eliminazione urinaria di glucosio e azoto. [**Glyconeogenesis in phloridzinised rats deprived of pantothenic acid. 3. Effect of cortisone and of pantothenic acid on urinary excretion of glucose and nitrogen.**] *Rend. Ist. Super. Sanità, Rome*, 1955, **18,** 1253–1260. [Lab. Biol., Ist. Super. Sanità, Rome.] French, English and German summaries.

For part 2 see Abst. 3546, Vol. 25.

Groups of from 8 to 15 male rats weighing from 65 to 70 g. were given a complete diet with or without Ca pantothenate. One group of 10 in each series received no further treatment. The adrenal glands were removed from the rest from 5 to 8 weeks after the beginning of the experiment. Three days later, after a 24-hr. fast, all the rats were given a single injection of 50 mg. phloridzin. At the same time in the series with and without pantothenate, one group received no further treatment, one group received a single injection of 1 mg. cortisone acetate, and another group had the same injection of cortisone and a single injection of 8 mg. Ca pantothenate. Urine was collected and glucose, N and ketone bodies were estimated in it. In the rats given phloridzin and deprived of their adrenal glands, whether they were at the same time deprived of pantothenic acid or not, cortisone did not significantly modify the urinary excretion of glucose, N or ketone bodies. When, however, a large dose of Ca pantothenate was given at the same time as the cortisone, the deprived rats showed a considerable increase in urinary excretion of glucose and N.—E. M. Hume.

4435

HAZELWOOD, R. L., BENNETT, L. L. and NELSON. M. M. **Effect of pantothenic acid deficiency on insulin sensitivity and response to ACTH of intact and diabetic rats.** *Endocrinology*, 1956, **58,** 427–434. [Dept. Physiol., Univ. California, Berkeley.]

The response to insulin of intact rats deprived of pantothenic acid was low after 8 weeks, whether they were pair-fed or not, but after 14 weeks' deprivation it was greater than in non-deprived, pair-fed rats. In partly depancreatised rats the degree of glycosuria was not affected by deprivation of pantothenic acid. Their sensitivity to insulin was low after 14 weeks' deprivation, about normal after 19 weeks and above normal after 23 weeks. Such diabetic rats still showed a response to adrenocorticotropic hormone after 140 days' deprivation. It was concluded that the adrenal cortex was overactive during the early stages of pantothenic acid deficiency, but that, in the later stages, activity was less than normal.

A. M. Copping.

4436

BÁNHIDI, Z. G. and KAVANAU, J. L. **Studies of the metabolism of B-vitamins and related compounds in embryonic sea urchin development. 1. Pantothenic acid and *Lactobacillus bulgaricus* factor.** *Exp. Cell Res.*, 1956, **10,** 405–414. [Wenner-Gren Inst. Exp. Biol., Univ. Stockholm.]

Extracts of eggs and embryos of the sea urchin *Paracentrotus lividus* at 22 stages of development were made with acetone and HCl by the methods used in preparations for estimation of amino acids (*Exp. Cell. Res.*, 1954, **6,** 563); free and bound pantothenic acid were estimated microbiologically. There was a remarkable correlation between increase in free pantothenic acid content and periods when new embryonic synthesis of protein was taking place. It was not possible from the results to decide whether the free pantothenates of the sea urchin embryo were independent of coenzyme A metabolism or whether they were involved only in that metabolic process.

A. M. Copping.

4437

GIROUD, A., LEFEBVRES, J., PROST, H. and DUPUIS, R. Malformations des membres dues à des lésions vasculaires chez le foetus du rat déficient en acide pantothénique. [**Malformation of limbs due to vascular lesions in the foetus of rats deprived of pantothenic acid.**] *J. Embryol. Exp. Morphol.*, 1955, **3,** 1–12. [Lab.

Embryol., Fac. Méd., Paris.] English summary.

Female rats kept on a purified diet without pantothenic acid until they showed signs of deficiency mated and produced young. Of 224 foetuses taken between the thirteenth and the twenty-first day of gestation from deprived mothers, 22·7 per cent. showed abnormalities. After the sixteenth day deformity of the limbs was very common. Deformities appeared to arise from arrest of circulation with accumulation of blood clots in the tissues. Pressure from the clots caused distortion and degeneration from which a state of ectodactyly followed and, in the most advanced stages, after 18 days of gestation, the epidermis broke down with haemorrhage at the extremities and sometimes amputation of a limb followed.—A. M. Copping.

4438

FISHER, H. and HUDSON, C. B. **Chick viability and pantothenic acid deficiency in the breeding diet—a case report.** *Poultry Sci.*, 1956, **35,** 487–488. [Dept. Poultry Husb., Rutgers Univ., New Brunswick, N.J.]

Chicks from certain hatcheries were listless and weak, and mortality during the first few days after hatching was high. The hatch was good and no pathogen was detected in the chicks. Results of oral administration of single vitamins of the B group suggested that the chicks did not have enough pantothenic acid ; addition of pantothenic acid to the breeding diet, which theoretically was adequate, prevented the disorder. It is suggested that addition of fat to poultry rations increases the requirement of pantothenic acid, a major component of coenzyme A, which is essential for normal metabolism of fat.

E. M. Cruickshank.

4439

FIDANZA, A., RAIMONDI, A. M., ESPOSITO, L. and BONOMOLO, A. Sintesi batterica intestinale dell'acido pantotenico e sua utilizzazione. [**Synthesis of pantothenic acid by intestinal bacteria and its utilisation.**] *Quad. Nutrizione*, 1954, **14,** 159–164. [Ist. Fisiol. Gen., Univ. Rome.] Summaries, French p. 192, English p. 194, German p. 196.

The experimental diet contained, per cent., vitamin-free casein 18, sucrose 67, salts 4, cystine 0·2, cod liver oil 2 and washed butterfat 9, with vitamin B_1, riboflavin, vitamin B_6, nicotinic acid, *p*-aminobenzoic acid, ascorbic acid, choline, inositol, menadione bisulphite, folic acid, biotin, vitamin B_{12}, α-tocopherol and ethyl linoleate, but no pantothenic acid. Three groups of male rats weighing initially 50 g. received for 6 weeks the diet alone, or with, per head daily, 1 mg. calcium pantothenate or 5 mg. crystalline aureomycin. After 6 weeks urine and faeces were collected for 10 days from 5 rats of each group in metabolism cages. The rats given no supplement then had clinical signs of deficiency.

The mean pantothenic acid output in μg. per 24 hr. in faeces and urine, respectively, was for rats given calcium pantothenate $51{\cdot}5 \pm 14$ and 150 ± 30, for rats given no supplement $3{\cdot}5 \pm 2$ and $10{\cdot}0 \pm 6$, and for rats given aureomycin, $20{\cdot}1 \pm 8$ and $50{\cdot}0 \pm 9$. Thus the intestinal bacteria of the deprived rats synthesised some pantothenic acid, though not enough to prevent arrest of growth and signs of deficiency. In the rats given aureomycin growth was only slightly inferior to that of rats given pantothenic acid and there was no other sign of deficiency. The constant appearance of pantothenic acid in the urine, even of deprived rats, showed that it was absorbed.—D. Duncan.

BIOTIN

4440

TERROINE, T. (with BUISSON, L. F. and ROUX, G.) Quelques aspects du métabolisme glucidique dans la carence en biotine. Études *in vivo*. [**Carbohydrate metabolism in biotin deficiency. Studies *in vivo*.**] *Arch. Sci. physiol.*, 1956, **10,** 59–71. [Lab. Biochim. Nutrit., C.N.R.S., Bellevue (Seine-et-Oise).]

Glucose tolerance, sugar and pyruvate in the blood, and glycogen and reducing sugar in the liver and muscle were measured in normal rats and in rats deprived of biotin. In acutely deficient animals increase of blood pyruvate was associated with acidosis and low blood sugar. There was no glycosuria or specific alteration in the liver or muscle glycogen, and glucose tolerance was moderate. Free reducing sugar fell in the liver but not in the muscle. The comparatively mild changes in carbohydrate metabolism in biotin deficiency are discussed with reference to other studies on the subject.—A. M. Copping.

4441

DELOST, P. and TERROINE, T. (with BUISSON, L. F., DELOST, H. and VINCENT, M. A.) Les troubles endocriniens dans la carence en biotine. [**Endocrine disorders in biotin deficiency.**] *Arch. Sci. physiol.*, 1956, **10,** 17–51. [Lab. Physiol. Gén., Sorbonne.]

Measurements of weight increase, skeletal growth

and weight of the adrenal glands, testes and seminal vesicles, and histological studies of the thyroid and adrenal glands and reproductive organs were made in male rats on a diet without biotin, and on a normal diet in unrestricted amount or with food intake restricted to that of the rats deprived of biotin. Development in weight and length was retarded less in simple inanition than in biotin deficiency. The thyroid and adrenal glands appeared normal even at an advanced stage of deficiency, but severe retardation of development was found in all the reproductive tissues. No correlation was found between the development of skin lesions or motor disturbances and the endocrine changes observed.—A. M. Copping.

4442

TRAUB, A. and LICHSTEIN, H. C. **Cell permeability: a factor in the biotin-oleate relationship in *Lactobacillus arabinosus*.** *Arch. Biochem. Biophys.*, 1956, **62,** 222–233. [Dept. Bacteriol. Immunol., Univ. Minnesota, Minneapolis.]

The lag period, characteristic of the growth curve of *Lactobacillus arabinosis* starting from a small inoculum in presence of an optimum amount of biotin, was much less when Tween 40 (polyoxyethylene sorbitan monopalmitate) was included in the medium. Malate also in the medium improved growth of *L. arabinosus* and it seemed possible that traces of biotin in the medium were made available to the organism through changes in its cell permeability. The problem of cell permeability was studied with oleate, of which the growth effect seemed to depend on its making biotin available to the organism. Oleate promoted the growth of *L. arabinosus* only when biotin was present.—A. M. Copping.

FOLIC ACID (PTEROYLGLUTAMIC ACID)

4443

DOCTOR, V. M. and AWAPARA, J. **The incorporation of serine-3-C^{14} into citrovorum factor.** *J. Biol. Chem.*, 1956, **220,** 161–167. [Sect. Exp. Med., Univ. Texas, Houston.]

Optimum conversion of pteroylglutamic acid to citrovorum factor by powder freshly prepared by precipitation with acetone from aqueous extract of chick liver (see Abst. 1997, Vol. 25) was obtained with addition of homocysteine, serine, Mg, diphosphonucleotide and adenosine triphosphate. Formate or formaldehyde instead of serine gave less efficient conversion. When serine-3-^{14}C was used the β-carbon of serine was incorporated into the citrovorum factor. A tentative scheme is put forward for the mechanism of the conversion process.

The citrovorum factor synthesised by the enzyme from chick liver was shown by chromatographic analysis to be similar to naturally occurring leucovorin.

A. M. Copping.

4444

INFANTE, R. and TURCHETTO, E. Influenza della tiroxina sulla proprietà lipotropa dell'acido folico. [**Influence of thyroxine on the lipotropic action of folic acid.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 787–788. [Ist. Chim. Biol., Univ. Bologna.]

Eight groups of 6 rats weighing from 120 to 130 g. were given a diet of, per cent., crude casein 10, sucrose 59, cottonseed oil 10, lard 15, cod liver oil 2·5, salts 3, cholesterol 0·5, inositol 0·3, with vitamins E and K, and B vitamins except vitamin B_{12} and folic acid. One group received no addition and one had 15 mg. folic acid daily. The remainder had daily 1 or 3 mg. folic acid, alone or with 100 or 200 μg. thyroxine. Some were killed after 10 and some after 16 days. After 16 days, the mean value for total lipids in the liver, in g. per 100 g., was 16·2 for the rats given no addition, and from 5 to 6 for the rats given 15 mg. folic acid or 3 mg. folic acid with 100 or 200 μg. thyroxine, but for those given no thyroxine or thyroxine with only 1 mg. folic acid the values ranged from 10·7 to 14·3.—E. M. Hume.

4445

VITALE, J. J., GERSHOFF, S. N., SINISTERRA, L., HEGSTED, D. M. and ZAMCHECK, N. **Effect of aminopterin administration on the metabolism of liver and small intestine of guinea pigs and rats.** *J. Biol. Chem.*, 1956, **220,** 363–368. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Young adult female guineapigs and rats were given subcutaneous injections of 240 μg. aminopterin per kg. bodyweight daily for 4 days, an amount which for rats had been found to be severely toxic and to reduce oxygen uptake by the intestinal mucosa (Abst. 479, Vol. 25). The concentration of folinic acid in the liver of guineapigs and rats was not affected by aminopterin, but that in rat intestine was greatly reduced. In guineapigs the oxygen uptake by the intestinal mucosa appeared not to be affected by aminopterin. A tracer dose of ^{32}P given 2, 4 or 8 hr. before the rats or guineapigs were killed showed that the rate of cell proliferation was much greater in the intestine of the rat than of the guineapig.

A. M. Copping.

See also Absts. 4479, 4973.

VITAMIN B_{12}

4446

WILLIAMS, W. L., STIFFEY, A. V. and JUKES, T. H. **Microbiological and chick assay of vitamin B_{12} activity in feed supplements and other natural products.** *J. Agric. Food Chem.*, 1956, **4,** 364–367. [Nutrit. Physiol. Sect., Res. Div., Amer. Cyanamid Co., Pearl River, N.Y.]

A comparative study by 4 methods was made of the vitamin B_{12} potency of 40 samples of products obtained from bacterial or *Streptomyces* fermentations, sewage sludge, fish solubles or other sources of vitamin B_{12}. Recent modifications of the growth method with chicks and of microbiological methods with *Ochromonas malhamensis*, *Bacterium coli* and *Lactobacillus leichmannii* were used. Pseudocobalamins promoting growth of micro-organisms but not of animals were not present to any large extent in the materials tested. Some fermentation products contained substances which inhibited the growth of chicks. It was concluded that *L. leichmannii* gave a reliable result for most feed supplements but that an occasional biological or protozoan test was advisable.—A. M. Copping.

4447

MIYAKE, A. and KINOSHITA, T. **Studies on antibiotics. 8. Qualitative separation of tetracycline and vitamin B_{12} by paper chromatography.** *J. Pharm. Soc. Japan.*, 1955, **75,** 1358–1361. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

4448

DE MERRE, L. J. and WILSON, C. **Photolysis of vitamin B_{12}.** *J. Amer. Pharm. Assoc.*, 1956, **45,** 129–134. [Med. Labs., Army Chem. Centre, Md.]

Exposure for 2 hr. to sunlight of intensity about 8000 foot-candles caused 34 per cent. loss of potency of vitamin B_{12} in neutral solutions. There was no noticeable destruction after exposure to intensity of 300 foot-candles for the same length of time. Incandescent light of 14,000 foot-candles produced no detectable alteration. With monochromatic light destruction was found to be greater at the shorter wavelengths. A high light intensity in the red produced no destruction in 2 hr. Ultraviolet light showed a pattern similar to that of sunlight.—K. H. Coward.

4449

CALET, C. Données récentes sur la structure de la vitamine B_{12}. [**Recent results on the structure of vitamin B_{12}.**] *Ann. Nutrit. Alimentation,* 1956, **10,** 39–56 (*Rev.*). [Lab. Biochim. Nutrit., C.N.R.S., Bellevue.]

A review.

4450

DELLWEG, H., BECHER, E. and BERNHAUER, K. Biosynthesen in der Cobalamin-Reihe. 1. Cobalamin-Analoge der Benzimidazol-Reihe. [**Biosyntheses in the cobalamin series. 1. Cobalamin analogues of the benzimidazole series.**] *Biochem. Ztschr.*, 1956, **327,** 422–449. [Biochem. Forschungslab., Aschaffenburger Zellstoffw., Stockstadt a.M.]

1. With "etiocobalamin" obtained as described by Friedrich and Bernhauer (*Angew. Chem.*, 1953, **65,** 627) as starting material, resting cells of a wild strain of *Bacterium coli* synthesised benzimidazole analogues of cobalamin from 5 : 6-dimethyl-5-methyl-, 5 : 6-diethyl-, and 5 : 6-dichloro-benzimidazole. Many other substituted benzimidazoles were tested but few cobalamin analogues were obtained. It appeared that substitution in the C_2 position in the benzimidazole molecule by methyl, phenyl, amino or hydroxy groups prevented biological synthesis of a cobalamin analogue. Certain other C_2 substituents such as carboxyl, acid amide or hydroxymethyl groups could be eliminated by the organism, and benzimidazole analogues then formed. The analogues were identified by spectroscopic and chromatographic procedures and their biological activity was measured with *Ochromonas malhamensis*, *Bact. coli* 113–3 and *Lactobacillus leichmannii* 313.—A. M. Copping.

4451

FANTES, K. H., O'CALLAGHAN, C. H. and GOODINSON, D. W. **A note on the comparison of the microbiological potencies of two different growth factors with special reference to the assay of desdimethylcyanocobalamin.** *Biochim. biophys. Acta*, 1956, **20,** 397–398. [Glaxo Laboratories, Ltd., Sefton Park, Stoke Poges, Bucks.]

In tests with *Bacterium coli*, desdimethylcyanocobalamin appeared to be about 2·4 times as potent as cyanocobalamin under carefully defined conditions. Studies of the responses showed some difficulties inherent in the making of such comparisons.—A. M. Copping.

4452

BAURIEDEL, W. R., PICKEN, J. C. (Jr.) and UNDERKOFLER, L. A. **Reactions of cyanocobalamin and aquocobalamin with proteins.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 377–381. [Vet. Med. Res. Inst., Ames, Iowa.]

For investigating the reactions between cobalamins and proteins, a method was devised which depended on the different rates of dialysis in a special apparatus of free and combined cyanocobalamin and aquocobalamin. By using cobalamins labelled with ^{60}Co, the free and combined forms could be measured directly. Aquocobalamin (vitamin B_{12b}) appeared to combine more readily than vitamin B_{12} with diverse protein preparations. Denaturation increased and an acid medium decreased the affinity between protein and vitamin, and it is suggested that formation of cobalichrome might play a part in the reactions. Cyanocobalamin and aquocobalamin were bound equally by extracts of gastric mucosa, and the formation of complexes was not affected by excess of cyanide in neutral solution but was inhibited by it in highly alkaline media. The relation between formation of complexes with proteins and the structure of vitamin B_{12} is discussed.

A. M. Copping.

4453

PLUM, C. M. **Effects of liver extracts and vitamin B_{12} on experimentally produced liverfibrosis with macrocytosis compared with the effect of a spleen extract.** *Arch. internat. Pharmacodyn.*, 1956, **105,** 49–67. [Lab. Colony Filadelfia, Dianalund, Denmark.]

Fibrosis of the liver associated with macrocytosis was produced in male rats by ligation of the common bile duct. An earlier observation that spleen extract partly protected against those changes was confirmed. Crude liver extract given parenterally gave a similar degree of protection, but purified liver extracts and vitamin B_{12} were ineffective.—L. Wills.

4454

WONG, W. T. and SCHWEIGERT, B. S. **Role of vitamin B_{12} in nucleic acid metabolism. 1. Hemoglobin and liver nucleic acid levels in the rat.** *J. Nutrition*, 1956, **58,** 231–242. [Div. Biochem. Nutrit., Amer. Meat Inst. Found., Chicago, Ill.]

When deficiency of vitamin B_{12} was induced in rats by giving a diet containing iodinated casein, growth rate and ability to regenerate liver tissue after partial removal of the liver were less than in animals given vitamin B_{12}; the deoxyribonucleic acid and ribonucleic acid contents of the liver were low also.

Deficiency of vitamin B_{12} uncomplicated by the effect of iodinated casein on the thyroid gland was produced in young rats born of mothers deprived of vitamin B_{12} on a diet in which protein was from soya bean. In the young animals the growth rate and ribonucleic acid content of the liver were significantly low; 4 or 10 per cent. of dried liver added to the diet did not improve the growth response to vitamin B_{12} though it raised the Hb content of the blood, which was low in rats not given vitamin B_{12}. The young rats on the soya protein diet had scaly feet and porphyrin-stained whiskers.—A. M. Copping.

4455

ERICSON, L. E., HARPER, A. E., WILLIAMS, J. N. (Jr.) and ELVEHJEM, C. A. **Effect of diet on the betaine-homocysteine transmethylase activity of rat liver. 2. Vitamin B_{12}.** *J. Biol. Chem.*, 1956, **219,** 59–67. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Transmethylase activity in the betaine-homocysteine system was measured in homogenates of rat liver and expressed as μg. methionine per g. fresh liver as described by Ericson and Harper (Abst. 4505, Vol. 26). Vitamin B_{12} was estimated with *Lactobacillus leichmannii*. Iodinated casein was not used to produce vitamin B_{12} deficiency, since in preliminary experiments it was found to reduce liver transmethylase whether vitamin B_{12} was present or not. In rats receiving purified diets with or without vitamin B_{12} for 10 weeks, differences in growth rate were slight, but the transmethylase and vitamin B_{12} contents of the liver were less in rats deprived of the vitamin. Liver transmethylase activity was not affected by addition *in vitro* of the apoenzyme (Ericson *et al.*, *J. Biol. Chem.*, 1955, **212,** 537), but with livers from rats deprived of vitamin B_{12} addition of the cofactor raised the transmethylase activity to that of livers from animals given vitamin B_{12}. Vitamin B_{12} added to the liver preparations increased also the synthesis of labile methyl groups. Adenine triphosphate and α-ketoglutarate were found to be essential for the full effect of vitamin B_{12} *in vitro*. The findings are discussed with reference to other recent studies of the role of vitamin B_{12} in transmethylation. It is concluded that in the rat vitamin B_{12} influences the synthesis of methionine through its effects on the formation of the cofactor of betaine-homocysteine transmethylase and on new synthesis of labile methyl groups.

For part 3 see Abst. 1780, Vol. 26.

A. M. Copping.

4456

SREENIVASA MURTHY, V., DESIKACHAR, H. S. R. and SWAMINATHAN, M. **Effect of vitamin B_{12} deficiency on liver dehydrogenase activity in rats.** *Nature*, 1956, **177,** 750–751. [Central Food Technol. Res. Inst., Mysore.]

In the liver of young rats born of mothers deprived of vitamin B_{12} and maintained for 12 weeks on a basal diet without the vitamin, the activity of lactic, glutamic, succinic, butyric and choline dehydrogenase was reduced. Addition of

vitamin B_{12} to liver homogenates *in vitro* did not raise the dehydrogenase activities to equal those of normal livers.—A. M. Copping.

4457

MARTINI, V. Richerche sulla rigenerazione delle fibre nervose corneali : azione della vitamina B_{12}. [**Regeneration of the corneal nerve fibres: action of vitamin B_{12}.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 745–746. [Ist. Fisiol., Univ. Bari.]

In rabbits weighing about 2 kg., fed on a mixed diet, the corneal nerves were cut under general anaesthesia. Some rabbits were given a daily intravenous injection of 30 μg. vitamin B_{12}. Regeneration of the corneal nerve was judged by return of the blinking reflex. The mean time in days for the return of the reflex was 22·2 for 14 eyes of rabbits given vitamin B_{12}, and 30·7 for 26 eyes of untreated rabbits.—E. M. Hume.

4458

WEIS, J. Sur l'absorption de la vitamine B_{12} radioactive par l'intestin isolé du rat. [**Absorption of radio-active vitamin B_{12} by the isolated intestine of the rat.**] *C.R. Acad. Sci.*, 1956, **242,** 2598–2600.

Isolated segments of rat intestine were incubated for 2 hr. in Warburg flasks in Krebs medium with known amounts of vitamin B_{12} containing ^{60}Co; they were then thoroughly washed with fresh medium, and the retention of vitamin B_{12} was measured from the radio-activity of the tissue. It appeared that the vitamin was rapidly absorbed by the intestinal mucosa and, once fixed, was not removed by washing. The amount absorbed depended on the original concentration of vitamin B_{12} in the medium.—A. M. Copping.

4459

HOLDSWORTH, E. S. and COATES, M. E. **Absorption of vitamin B_{12} from the rat intestine.** *Nature*, 1956, **177,** 701–702. [Nat. Inst. Res. Dairying, Univ. Reading.]

Absorption of vitamin B_{12} containing ^{57}Co, alone, or with saline extract of rat's stomach, or a crude intrinsic factor from pig's pyloric mucosa, or a purified protein isolated from the crude preparation, was studied in rats by a technique involving isolation *in vivo* of a section of the small intestine. The extract of rat's stomach increased absorption but intrinsic factor from pig's stomach had a slight inhibitory effect. With all preparations vitamin B_{12} was shown to be bound to protein, but it appeared that only homologous bound forms from the same species were available to the rat.

A. M. Copping.

4460

NIEWEG, H. O., ARENDS, A., MANDEMA, E. and CASTLE, W. B. **Enhanced absorption of vitamin B_{12} in gastrectomized rat by rat intrinsic factor.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 328–332. [Thorndike Mem. Lab., City Hosp., Boston, Mass.]

Excretion in the faeces of radio-active vitamin B_{12} containing ^{60}Co after a single dose of 0·015 μg. was measured in normal and gastrectomised rats. Normal rats absorbed 40 to 60 per cent. of the vitamin B_{12} but gastrectomised rats excreted almost the entire dose. When a preparation of intrinsic factor from rat's stomach was given with the radio-active vitamin to gastrectomised rats, absorption of vitamin B_{12} was normal. Intrinsic factor as human gastric juice or a preparation of pig's stomach had no effect. The intrinsic factor in rat's stomach thus appeared to be specific for that animal.—A. M. Copping.

4461

MILLER, R. F., NORRIS, L. C. and HEUSER, G. F. **The vitamin B_{12} requirement of White Leghorn chicks.** *Poultry Sci.*, 1956, **35,** 342–349. [Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

When breeding hens were given 0·125 or 0·19 μg. vitamin B_{12} per 100 g. diet, 63 and 83 per cent., respectively, of the eggs hatched. Vitamin B_{12} was estimated in the liver and unabsorbed yolk sac of the chicks at hatching. and a reasonably good correlation was found to exist between the amounts of vitamin B_{12} in the yolks of the hens' eggs, the livers and unabsorbed yolk sacs of the chicks and the hatching capacity of the fertile eggs. The requirement of the chick during the first 6 weeks of life was related to these values. When about 63 per cent. of the eggs hatched the chick's requirement for vitamin B_{12} was not more than 0·25 μg. per 100 g. diet or 0·53 μg. per 100 g. liveweight gain ; when 83 per cent. hatched the chick's requirement was not more than 0·125 μg. per 100 g. of a diet estimated to provide 194 Cal. productive energy, or 0·16 μg. per 100 g. of a diet that provided from 234 to 242 Cal. The requirement of these chicks per 100 g. gain was not more than 0·37 μg. The addition of pantothenic acid to practical rations, which usually contain 1 mg. free pantothenic acid per 100 g., did not decrease the chick's vitamin B_{12} requirement.

E. M. Cruickshank.

4462

KUROKI, M., YAMAGUCHI, M. and IWAMURA, I. **Observation and discussion on the effect of vitamin B_{12}-administration in goats on the secretion of milk.** *Bull. Fac. Agric. Univ. Miyazaki*, 1956, **1,** 171–175. [Lab. Zootech. Sci., Fac. Agric., Univ. Miyazaki.] In Japanese : English summary.

Vitamin B_{12}, 0·05 μg. per kg. bodyweight daily for 10 days, given by intramuscular injection,

increased the yield of milk, butterfat and casein of an Alpine goat weighing 38·1 kg. A larger amount, 0·12 μg., gave only a slight improvement in a goat weighing 45·4 kg. compared with a third goat without extra vitamin. The results suggested that a definite amount of vitamin B_{12} was necessary for the synthesis of milk constituents by goats given a standard ration of concentrates and roughage. (From summary.)—T. D. Bell.

4463

NURMIKKO, V. and VIRTANEN, A. I. Der Vitamin-B_{12}-(Cobalamin-) Gehalt der Kuhmilch. [**Vitamin B_{12} (cobalamin) content of cow's milk.**] *Milchwissenschaft*, 1956, **11**, 192–196. [Lab. Valio, Biochem. Inst., Helsinki.] English, Spanish and French summaries.

The average vitamin B_{12} content of milk from 8 farms, estimated microbiologically with *Euglena gracilis*, was 3·9 μg. per litre; for morning and evening milk the average values were 3·8 and 4·0. Large differences were found between individual cows, and at different stages of lactation in the same cow, with a range from 1·3 to 14·5 μg. per litre for single samples of milk. In general a high milk yield was associated with a low value for vitamin B_{12} and a low yield with a high value. There was little difference in the vitamin B_{12} content of their milk between cows on pasture and stall-fed cows except on one farm where inclusion in the feed of large amounts of A.I.V. silage was associated with a high vitamin B_{12} content.

A. M. Copping.

See also Absts. 4326, 4329.

VITAMIN C (ASCORBIC ACID)

4464

MOOR, H. Bestimmung der Ascorbinsäure in Lebensmitteln und biologischem Material. [**Estimation of ascorbic acid in foods and biological material.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1956, **47**, 20–27. [Lab. Vit. Abt., Hoffmann la Roche Co. A.G., Basle.] French and English summaries.

In an improved form of the method of Schmall and colleagues (Absts. 1852, Vol. 24; 2034, Vol. 25), diazotised 2-nitroaniline was used instead of 4-methoxy-2-nitroaniline; the yellow product of reaction with ascorbic acid was extracted from the aqueous solution with *iso*butanol, the reddish blue sodium salt was formed and removed by shaking with 2 per cent. (w/v) NaOH, and the extinction at 540 mμ. was compared with that of a blank in which any ascorbic acid present had been oxidised with dichlorophenolindophenol. For concentrations between 0·5 and 4 μg. ascorbic acid per ml. the relation between concentration and extinction was linear. Recovery of ascorbic acid added to difficult materials, such as roasted coffee, dried skimmed milk, red wine, flour and a vitamin tonic, was much better than by Schmall's method or by titration with dichlorophenolindophenol; the error did not exceed 10 per cent. The application of the method to dried whole milk is described in detail.

W. M. Deans.

4465

OWEN, J. A. and IGGO, B. **The use of *p*-chloromercuribenzoic acid in the determination of ascorbic acid with 2 : 6-dichloro-phenolindophenol.** *Biochem. J.*, 1956, **62**, 675–680. [Dept. Clin. Chem., Univ. Edinburgh.]

Spontaneous fading of indophenol at *p*H below 3·5 made colorimetric estimation based on the reduction of indophenol impossible at such *p*H. *p*-Chloromercuribenzoic acid did not affect the reduction of indophenol by ascorbic acid (see Abst. 2035, Vol. 25) but suppressed almost completely the reducing activity of many S compounds, with the exception of sulphite. It removed almost completely the interfering reducing substances in extracts of human erythrocytes and of rat liver and kidney, but those in human urine only partly. It was concluded that use of *p*-chloromercuribenzoic acid increased the specificity of the indophenol method for estimating ascorbic acid in biological material.—A. Hepburn.

4466

TORII, K. and MORIYAMA, T. **On the interaction of cyclic amino acids with ascorbic acid. 1. 2.** *J. Biochem., Tokyo*, 1955, **42**, 193–199; 201–206. [Dept. Biochem., Med. Univ., Nara.]

1. Low values had been obtained in estimations of tryptophan. Spectral absorption curves showed that when ascorbic acid was present interaction occurred between it and tryptophan, resulting in tryptophan values 30 per cent. below those expected theoretically. The finding was confirmed by paper chromatography, and further experiments suggested that the reaction took place in the nucleus, not in the side chain. A kynurenine-like substance was formed when air bubbled through a mixture of tryptophan and ascorbic acid at 37° C.

Ascorbic acid interfered with the estimation of tyrosine and histidine also.

2. For the formation of kynurenine when air was bubbled through a mixture of tryptophan and ascorbic acid the optimum *p*H was 5·2, and Cu^{++} but not Fe^{+++} catalysed the reaction. Colloidal platinum decreased the production of kynurenine

by 70 per cent. and the effect was not influenced by the addition of cyanide.

It is concluded that tryptophan combines loosely with ascorbic acid and that hydrogen peroxide is then formed and acts upon the complex to promote decomposition to kynurenine.

M. H. Pierce.

4467

IMANAGA, Y. **Autoöxidation of L-ascorbic acid and imidazole nucleus. 1. The effects of imidazole derivatives on the autoöxidation of L-ascorbic acid. 2. The decomposition products of imidazole derivatives present in the autoöxidation mixture.** *J. Biochem., Tokyo*, 1955, **42,** 657–667; 669–676. [Dept. Sci., Women's Univ., Nara.]

4468

CUZZOCREA, G. Sulla forma combinata della vitamina C. [**The combined form of vitamin C.**] 5. Variazioni nel corso della maturazione. [**5. Variations during maturation.**] 6. Comportamento cromatografico. [**6. Chromatographic behaviour.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 826–827; 827–828. [Ist. Biochim., Univ. Messina.]

5. Combined vitamin C was estimated by difference after hydrolysis, by a method previously described (Abst. 2157, Vol. 22), in samples of pulp taken from the same 4 lemons left hanging on the tree, at 9.0 a.m. and 5.0 p.m. on 6 successive days. The mean values for combined vitamin C were always higher in the morning and decreased with maturation; the morning and evening values, respectively, in mg. per 100 g. pulp, were 13·09 and 5·46 on the second day and 7·51 and 2·16 on the sixth day.

6. The protein precipitate from the juice of citrus fruits was washed till it no longer gave any reaction for vitamin C. After acid hydrolysis of the precipitate, free vitamin C was recognised by paper chromatography and comparison with an authentic sample of ascorbic acid. (See also Abst. 2157, Vol. 22.)—E. M. Hume.

4469

SANTINI, R. (Jr.) and NEVAREZ, J. **Extraction of ascorbic acid from acerolas (*Malpighia punicifolia* L.).** *J. Agric. Univ. Puerto Rico*, 1955, **39,** 184–189. [Agric. Exp. Stat., Univ. Puerto Rico, Río Piedras.]

4470

ZWEEDE, A. K. De voedingswaarde van zwarte bessen. [**Nutritive value of black currants.**] *Voeding*, 1956, **17,** 125–132. [Inst. Bewaring Tuinbouwprod., Wageningen.] English summary.

Published values for the vitamin C content of black currants are discussed with special reference to varieties and crosses. New results from Wageningen are reported for vitamin C, sugar, acid and dry matter in 12 varieties which contained from 202 to 246 mg. vitamin C per 100 ml. juice and 8 varieties with only from 72 to 104 mg. There was no obvious difference in the other components measured.—I. Leitch.

4471

KERSTEN, H., KERSTEN, W. and STAUDINGER, H. Zum Wirkungsmechanismus der Ascorbinsäure. [**Mode of action of ascorbic acid.**] *Biochem. Ztschr.*, 1956, **328,** 24–34. [Zentrallab., Städt. Krankensanst., Mannheim.]

Further experiments on the effect of ascorbic acid in accelerating the removal of hydrogen from dihydrodiphosphopyridine nucleotide by adrenal mitochondria and on the influence of ultraviolet light confirmed earlier results (Absts. 485, 1810, Vol. 26). As before, dehydroascorbic acid was inactive; D-*iso*ascorbic acid was about 1/5 as active as L-ascorbic acid.

When dihydrodiphosphopyridine nucleotide and adrenal mitochondria were allowed to react in a Warburg apparatus, consumption of oxygen was greatly increased by addition of ascorbic acid, which was taken as further evidence in favour of the authors' hypothesis that the effect of ascorbic acid on biosynthesis of corticosteroids in the adrenal cortex is to be ascribed to activation of cell respiration.

The exact mode of action of ascorbic acid remained unclear; reasons are given against the idea that it might be due to intermediate formation of peroxide and the suggestion of an active radical, perhaps monodehydroascorbic acid, is repeated.

Preparations of mitochondria from pig adrenals themselves contained 26 mg. ascorbic acid per 100 g. dry weight even after 3 washings, which is about 1 per cent. of the total adrenal ascorbic acid.

W. M. Deans.

4472

EHMKE, D. A., DAVEY, B. L. and TODHUNTER, E. N. **The influence of age and diet on ascorbic acid metabolism in rats.** *J. Nutrition*, 1956, **58,** 281–290. [Lab. Human Nutrit., Sch. Home Econ., Univ. Alabama, Tuscaloosa.]

Three groups of weanling male and female rats were fed on a stock diet, or the same diet with addition of 50 mg. ascorbic acid daily for 21 days before being killed or a synthetic diet free of ascorbic acid for the last 21 days. The rats were killed at 63 or 112 days of age. In all groups males had a significantly higher value for ascorbic acid in plasma, whole blood, and white cell and platelet fractions than females. There was no difference

between groups of the same sex, and with one exception age had no significant effect. With the supplement of ascorbic acid there was increased excretion of the vitamin in the urine, but the increase was small compared with the amount given ; relative to bodyweight there was no difference between the sexes in the amount excreted. Males had significantly heavier livers and kidneys and lighter adrenal glands than females, but the ascorbic acid concentrations were significantly different only in the kidneys, being greater in males. The supplement of ascorbic acid increased the ascorbic acid content of the liver in males at 63 days of age, but the content in the adrenal glands, kidneys and sex organs was not affected by the supplement or by age.—A. Hepburn.

4473

McCraw, J. Y. Mécanisme d'action de l'acide ascorbique sur les temps de saignement et de coagulation. [**Mode of action of ascorbic acid on bleeding and coagulation times.**] *Rev. canad. Biol.*, 1956, **14,** 295–321. [Dept. Exp. Physiol., Laval Univ., Quebec.] English summary.

In guineapigs rendered fully scorbutic, compared with normal animals, there was an increase of 50 per cent. in prothrombin time, a decrease of 45 per cent. in the number of platelets and an increase of 60 per cent. in fibrinogen which was probably associated with the scorbutic haemorrhages ; serum Ca concentration was not appreciably altered. A decrease in antithrombin was considered probable as the serum albumin with which it is associated was reduced. The results and the literature on the factors affecting bleeding time and coagulation, with special reference to the changes seen in scurvy, are discussed in considerable detail.—L. Wills.

4474

McCraw, J. Y. and Desmarais, A. Influence des vitamines A et D sur le temps de saignement et de coagulation chez le cobaye carencé ou non en acide ascorbique. [**Effect of vitamins A and D on bleeding and coagulation time in the normal or vitamin C deficient guineapig.**] *C.R. Soc. Biol.*, 1955, **149,** 2060–2063. [Dept. Exp. Physiol., Laval Univ., Quebec.]

Four groups of 15 guineapigs were given a diet without vitamin C for 56 days. Daily supplements were given to groups 2 and 4 of 5·0 mg. ascorbic acid, and to groups 3 and 4 of 0·075 mg. calciferol for the first 16 days and of 0·075 mg. β-carotene during the rest of the period. Group 1 was without supplement. At intervals bleeding time and coagulated time were measured.

Without ascorbic acid or other supplement bleeding time had risen by 37·9 per cent. in the 56 days. With ascorbic acid alone bleeding time fell by 20·5 per cent. in 16 days, but the fall did not persist, and the initial value was regained at the end of the 56 days. Vitamin D did not affect the bleeding time of animals without ascorbic acid but prevented the fall in those given it. When carotene was substituted for it there was a fall followed by a rise in those given and not given ascorbic acid.

Coagulation time rose steadily in the deprived animals without supplement, and at the end of the experiment was 62·1 per cent. greater than at the beginning. With ascorbic acid the coagulation time had fallen by 10·9 per cent. at the end of the experiment. Vitamin D had no appreciable effect, but in the animals without ascorbic acid carotene gave a slight rise of 6·1 per cent. by the 56th day.—I. M. Sharman.

4475

Desmarais, A. and McCraw, J. Y. Étude de la crase sanguine chez le cobaye carencé ou non en acide ascorbique. [**Blood picture of guineapigs deprived and not deprived of ascorbic acid.**] *Rev. canad. Biol.*, 1956, **14,** 322–329. [Dept. Exp. Physiol., Laval Univ., Quebec.] English summary.

In adult guineapigs given a scorbutogenic diet, hypochromic anaemia appeared associated with a decrease of platelets and an increase of leucocytes, due in the early stages of the deficiency to an increase of granulocytes and later to an increase of lymphocytes. Animals having the same diet with ascorbic acid had a normal blood picture.

L. Wills.

4476

Sakai, N. and Shimosato, E. **On the influence of the deficiency of ascorbic acid upon the activity of the complement in the serum.** *J. Biochem., Tokyo*, 1955, **42,** 677–684. [Biochem. Inst., Matsumoto Med. Coll.]

Complement was estimated from the degree of haemolysis produced in sheep's red cells by the serum containing the complement in presence of haemolysin. Ascorbic acid was estimated in serum by the method with 2 : 4-dinitrophenylhydrazine. Guineapigs were given a scorbutogenic diet and, by injection, 50 mg. ascorbic acid daily for about a week. One group was then continued in the same way, and the other was given no further ascorbic acid. Even when signs of scurvy were present and the concentration of ascorbic acid in the serum was low, there was no effect on the activity of complement. *In vitro* the activity of the complement in guineapig serum was not affected by adding ascorbic acid to the serum or by destroying the ascorbic acid in the serum with $CuCl_2$.—E. M. Hume.

4477

LAHIRI, S. and BANERJEE, S. **Coenzyme A activity in tissues of normal and scorbutic guinea pigs.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 583–584. [Dept. Physiol., Presidency Coll., Calcutta.]

Scorbutic guineapigs excreted in the urine less injected *p*-aminobenzoic acid in the acetylated form than normal guineapigs (see earlier work, Abst. 539, Vol. 25). Coenzyme A activity in the liver, kidneys, and brain was unchanged. Total body cholesterol rose. It is suggested that oxidation of acetate by way of the tricarboxylic acid cycle is inhibited in scurvy and that excess acetate might be used to increase synthesis of cholesterol.

A. Hepburn.

4478

FABIANEK, J. Influence du taux de caséine et de l'amide de l'acide nicotinique sur la croissance, la résistance vasculaire et les taux tissulaires d'acide ascorbique du cobaye. [**Effect of the amount of casein and nicotinamide on growth, vascular resistance and concentration of ascorbic acid in the tissues of the guineapig.**] *C.R. Soc. Biol.*, 1956, **150,** 88–92.

Guineapigs of about 300 g. weight given 20 mg. ascorbic acid daily and a purified diet containing 30 per cent. casein showed no significant difference in growth rate, capillary resistance or ascorbic acid content of the liver, kidney, spleen, adrenal glands and blood whether nicotinamide was included or not. When the casein content of the diets was reduced to 14 per cent., growth and capillary resistance were not affected but ascorbic acid in the organs was higher especially in the spleen and adrenal glands, whether nicotinamide was given or not.—A. M. Copping.

4479

LAHIRI, S. and BANERJEE, S. **Metabolic interrelationship between ascorbic acid and pteroylglutamic acid.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 545–548. [Dept. Physiol., Presidency Coll., Calcutta.]

Groups of 12 rats weighing from 100 to 170 g. were given a diet of milk and added minerals. With a supplement of 40 μg. aminopterin daily they excreted less ascorbic acid in the urine than rats on the diet alone, but rats given 20 mg. chloretone daily excreted much more ascorbic acid than untreated rats even when given aminopterin or sulphaguanidine as well. Aminopterin reduced the concentration of ascorbic acid in the liver, kidneys, adrenal glands and intestine; chloretone increased it, except in the adrenal glands of normal rats. Chloretone or aminopterin alone or together had no effect on the concentration of ascorbic acid in the testis and pancreas. Chloretone also increased further the amount of citrovorum factor in the urine of rats with an excretion already high through administration of pteroylglutamic acid, and raised the concentration of ascorbic acid but not of citrovorum factor in the liver.—A. Hepburn.

4480

DEBONS, A. F., WALLACE, J. W. and BACCHUS, H. **Ketone body metabolism in ascorbic acid deficiency. *In vitro* formation of ketone bodies by liver slices.** *Amer. J. Physiol.*, 1956, **185,** 31–34. [Dept. Physiol., Sch. Med., George Washington Univ., Washington, D.C.]

When incubated with phosphate buffer, liver slices from scorbutic guineapigs produced less ketone bodies than slices from pair-fed animals given ascorbic acid, which produced more than slices from normal guineapigs. When octanoate was added to the medium, ketone production by liver slices from scorbutic guineapigs was significantly greater than in the other groups over a whole period of 31 days, but daily analyses revealed no significant difference. The fat content of the liver of scorbutic guineapigs was normal, but the results suggested that the decreased formation of ketones might be related to a decrease in the availability of fatty acids from liver fat.—A. Hepburn.

4481

DAYTON, P. G., REICHENTHAL, J. and BURNS, J. J. **Observations on bound ascorbic acid in guinea pig liver.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 326–327. [Third (N.Y. Univ.) Med. Div., Goldwater Mem. Hosp., New York.]

The average percentage of bound ascorbic acid (see Absts. 2098, 2102, Vol. 22) in the liver from 3 guineapigs, calculated from measurements of radio-activity 24 hr. after injection of L-ascorbic-1-^{14}C acid, was 19 and in 2 guineapigs given a diet without ascorbic acid for 14 days, 28. When D-ascorbic-1-^{14}C acid was injected into 2 guineapigs fed on the scorbutogenic diet, the percentage in the liver that was bound was about 35, 2 hr. after the injection.—A. Hepburn.

4482

LANGHAM, M. E. and HEALD, K. **Factors affecting the concentration of ascorbic acid in the crystalline lens of cattle and rabbits.** *Biochem. J.*, 1956, **63,** 52–56. [Ophthalmol. Res. Unit (Med. Res. Counc.), Inst. Ophthalmol., London, W.C.1.]

In 14 rabbits the concentration of ascorbic acid in the lens was about 80 per cent. of that in the aqueous humour. The average values were 18·9 and 24·4 mg. per 100 g. water with ranges of 11 to 37 and 13 to 40. The average amount of dehydroascorbic acid and diketogulonic acid together in the lens was 3·6 mg. There was no difference between

right and left eyes, and the concentration did not change 2 hr. after death. Intramuscular injection after a single intravenous injection of ascorbic acid raised the concentration in both the aqueous humour and lens, but much less in the lens. Whole rabbit and cattle lenses inhibited the destruction of ascorbic acid in ox aqueous humour diluted with phosphate buffer; dehydroascorbic acid increased the effect. Dehydroascorbic acid in phosphate buffer was reduced by dialysed extracts of cattle or rabbit lens in the presence of reduced glutathione, but the process was apparently not enzymic. It is concluded that the concentration of ascorbic acid in the lens is governed mainly by the rate of transfer of ascorbic acid into the eye and the permeability of the lens to ascorbic acid.

A. Hepburn.

4483

BÁRÁNY, E. and LANGHAM, M. E. **On the origin of the ascorbic acid in the aqueous humour of guinea-pigs and rabbits.** *Acta physiol. scand.*, 1955, **34**, 99–115. [Pharmacol. Inst., Univ. Upsala.]

Ascorbic acid was estimated by the method of Roe and Kuether (Abst. 261, Vol. 13).

As the ascorbic acid in the plasma of guineapigs fed on a scorbutogenic diet approached zero that in the aqueous humour disappeared, but in rabbits the value in the aqueous humour was 14 mg. per 100 ml. when the value in the plasma was at its lowest. The transport mechanism of the ciliary processes was saturated when the value in the plasma was about 0·8 mg. per 100 ml. for guineapigs and from 2 to 3 mg. per 100 ml. for rabbits. Above those plasma values there were steady concentrations of 24·6 and 67·5 mg. per 100 ml. in the aqueous humour. Repeated injection of dehydroascorbic acid did not raise the concentration of ascorbic acid above that corresponding to the concentration in the plasma. High concentrations of dehydroascorbic acid or its degradation products appeared to depress the transfer mechanism in guineapigs. It was concluded that the uptake of dehydroascorbic acid from the plasma by the ciliary processes was of little importance for the maintenance of ascorbic acid concentration in the eye, and that although local synthesis of ascorbic acid might occur in rabbits it did not occur in guineapigs.—A. Hepburn.

4484

UYAMA, Y., OGINO, S. and ICHIHARA, T. **Biochemical studies on cataract. 3. Experimental black cataract and ascorbic acid.** *Med. J. Osaka Univ.*, 1955, **6**, 761–766. [Dept. Ophthalmol., Med. Sch., Osaka Univ.]

For part 2 see Abst. 3095, Vol. 26.

3. When a daily intraperitoneal injection of 30 mg. dihydroxyphenylalanine (dopa) quinone was given to 2 guineapigs fed on a scorbutogenic diet, cataracts appeared after 3 or 4 days. With other pairs of animals treated in the same way but given 0·05 and 0·2 mg. ascorbic acid daily, cataracts developed after 5 and 7 days and with the latter dose they were black. Of 2 guineapigs given dopa quinone and 2 mg. ascorbic acid, one survived for over 25 days and the other died after 13 days. Cataracts did not develop.

Ascorbic acid apparently prevented the formation of cataracts by virtue of its reducing properties. When anthranilic acid with a similar redox potential replaced ascorbic acid in doses of 0·5 and 1·0 mg. daily, cataracts developed after 4 or 5 and 7 or 8 days; with 1·0 mg. the cataracts were black. With 5 mg. there was no cararact. Glutathione and sodium thiosulphate in doses of 10 mg. daily did not prevent cataract.—A. Hepburn.

4485

UYAMA, Y. and OGINO, S. **Studies on the metabolism of vitamin C in the crystalline lens. 4. Distribution of diketogulonic acid in the crystalline lens.** *Med. J. Osaka Univ.*, 1955, **6**, 767–770. [Dept. Ophthalmol., Med. Sch., Osaka Univ.]

For part 3 see Abst. 3094, Vol. 26.

4. In 30 fresh eyes from rabbits the average concentration of ascorbic acid, in mg. per 100 g. tissue, was in the lens 12·99, cornea 5·05, iris and ciliary body 7·88, choroid 5·98 and retina 8·88. Corresponding values for dehydroascorbic acid were 1·63, 0·67, 1·33, 1·06 and 1·46. Diketogulonic acid had a value of 1·15 in the lens but there was none in the other tissues. Separation into its parts of the rabbit, bovine and guineapig lens showed that all 3 acids were present in the cortex, ascorbic acid in the greatest amount. Dehydroascorbic acid was present in the capsule, cortex and nueleus, but there was a negligible amount of ascorbic acid and no diketogulonic acid in the capsule and nucleus.—A. Hepburn.

4486

ABERCROMBIE, M., FLINT, M. H. and JAMES, D. W. **Wound contraction in relation to collagen formation in scorbutic guinea-pigs.** *J. Embryol. Exp. Morphol.*, 1956, **4**, 167–175. [Dept. Anat., University Coll., London.]

After tattoo marks enclosing 2 squares of average area 25·5 sq. mm. had been made, one on each side of the dorsilumbar region, guineapigs were given a scorbutogenic diet with or without ascorbic acid. After 5 days tracings were taken of the tattoo points and within one set a square wound of 17 sq. mm. was made. Ten days later the animals were killed and tracings were again taken. Collagen in newly formed tissue and in scabs was estimated by the method of Neuman and Logan (Title 4638,

Vol. 20) based on estimation of the hydroxyproline content.

Repair tissue was similar in amount in the 2 groups; mean wet weights were 13·0 ± 1·7 mg. in the deprived and 10·3 ± 1·3 mg. in the non-deprived group. There were differences in texture and hydroxyproline content; in the deprived group the texture was friable and the hydroxyproline content was, on the average, 10·4 ± 2·6 μg., but in the non-deprived group the texture was firm and the content 74 ± 8 μg. Scabs were smaller in area and thinner in the non-deprived than in the deprived group; their mean wet weights were 3·7 ± 1·4 and 28 ± 6 mg., respectively. In the deprived group the content of hydroxyproline in the scabs was 112 ± 23 μg. and was substantially greater than in the non-deprived group, when it was 10 ± 8 μg.

The average contraction during 10 days was 8·3 ± 1·0 sq. mm. in the deprived animals and 10·1 ± 1·4 sq. mm. in the non-deprived. The extent was significant in the deprived group and did not differ significantly from that in the non-deprived group.

There was no evidence from the non-wounded squares in the groups that lack of ascorbic acid caused loss of collagen from the tissue.

It is suggested that the force causing contraction is produced not by newly formed collagen but by the connective tissue cells within the wound.

D. Harvey.

4487

RUDAS, B. (with NAGY, G.) **Changes in the nucleoprotein content of granulation tissue on the effect of vitamin C in various modes of administration.** *Acta physiol. hung.*, 1955, **8,** 253–258. [Nat. Inst. Food Nutrit. Sci., Budapest.] Russian summary.

Four groups of guineapigs were fed on a normal diet, a scorbutogenic diet, or a scorbutogenic diet containing 10 mg. ascorbic acid as a vegetable or as the synthetic vitamin. After 5 days the animals were wounded and from 17 to 24 days later they were killed. In the group having the scorbutogenic diet the amounts of ribonucleic acid and of deoxyribonucleic acid in epithelium-free granulation tissue from the wound were significantly less than in the other groups. When wounds in the group having had the scorbutogenic diet for 5 days were treated locally with ascorbic acid the amount of ribonucleic acid was less than normal, but if 1 mg. ascorbic acid was given daily by mouth for 5 days before wounding the nucleic acid values were normal. The daily administration of 50 mg. ascorbic acid by mouth or by injection at the time of wounding and subsequently [time not stated] failed to raise the ribonucleic acid value to normal.

A. Hepburn.

4488

JOHANNES, A., STAUDINGER, H. and WILZ, H. Stoffwechsel der Nebennierenrinde und Biosynthese der Corticosteroide. 10. Wirkung von ACTH auf den Ascorbinsäuregehalt von überlebendem Nebennierengewebe. [**Metabolism of the adrenal cortex and biosynthesis of cortical steroids. 10. Effect of ACTH on the ascorbic acid content of surviving adrenal tissue.**] *Biochem. Ztschr.*, 1956, **327,** 484–490. [Zentrallab., Städt. Krankenanst., Mannheim.]

Pituitary adrenocorticotropic hormone (ACTH) incubated with minced pig adrenal gland, 0·5 to 1·5 I.U. per g. tissue, raised the rate of formation of corticosteroids without change in the concentration of ascorbic acid.—I. Leitch.

4489

CONSTABLE, B. J., HARRIS, L. J. and HUGHES, R. E. **Effect of continued administration of cortisone and ACTH on vitamin C levels in guinea-pig adrenals.** *Brit. J. Nutrition*, 1956, **10,** 91–100. [Dunn Nutrit. Lab., Univ. Cambridge.]

Groups of 10 normal guineapigs were maintained for 20 days on diets containing graded amounts of ascorbic acid, from 0 to 50 mg. daily, or 15 g. cabbage daily. During the last 10 days half the animals received injections of 15 mg. cortisone acetate daily and some received 8 mg. adrenocorticotropic hormone. Some groups of 12 guineapigs received 7·5 mg. cortisone and ascorbic acid for 14 days.

Concentration of ascorbic acid in the adrenal glands rose with increase of ascorbic acid in the diet. The weight and ascorbic acid concentration in the glands decreased in the animals receiving cortisone. In those receiving adrenocorticotropic hormone the concentration fell but the total quantity rose since the glands were greatly enlarged. Nearly half of the changes were found individually significant by statistical analysis and the aggregate results were unlikely to be due to chance. The change in weight of the adrenal glands produced by cortisone or adrenocorticotropic hormone was independent of the dietary intake of ascorbic acid.

A. Hepburn.

4490

NATH, M. C. and NAYUDU, S. G. **Effect of acetoacetate on the adrenal cholesterol and ascorbic acid of guinea-pigs.** *Indian J. Med. Res.*, 1956, **44,** 289–294. [Dept. Biochem., Univ. Nagpur.]

When daily injections of acetoacetate, increasing from 175 mg. per kg. bodyweight by 40 mg. every 3 days for 21 days, were given to normal and scorbutic guineapigs, the concentration of cholesterol in the adrenal glands and blood was not affected.

Scorbutic guineapigs lost more ascorbic acid from the adrenal glands but the weight of the glands did not increase. All the animals given acetoacetate showed mild glycosuria and ketonuria. Normal guineapigs whose tissues were saturated with ascorbic acid showed no significant change in the concentration of cholesterol or ascorbic acid in the adrenal glands, 1½ or 3 hr. after a single injection of 300 mg. acetoacetate per kg. bodyweight, so that acetoacetate apparently did not exert its diabetogenic effect through stimulation of the adrenal cortex.—A. Hepburn.

4491

BLAMOUTIER, J. Effet de spoliations sanguines sur la teneur du cortex surrénalien en acide ascorbique. [**The effect of withdrawals of blood on the ascorbic acid content of the adrenal cortex.**] *C.R. Soc. Biol.*, 1956, **150,** 93 – 96. [Clin. Méd. Propédeutique, Hôp. Broussais, Paris 14.]

After withdrawal of 2 ml. blood from the ophthalmic sinus of rats the concentration of ascorbic acid in the adrenal glands fell by about 40 per cent. in 30 min. The decrease reached its maximum of about 53 per cent. after 3 hr., and the concentration returned to normal after 24 hr. In other experiments the extent of the decrease in ascorbic acid bore some relation to the amount of blood withdrawn.—A. Hepburn.

4492

RATSIMAMANGA, A. R. and NIGEON-DUREUIL, M. Déviation du métabolisme des corticostéroïdes au cours du scorbut expérimental. [**Changes in metabolism of corticosteroids during experimental scurvy.**] *Bull. Soc. Chim. biol.*, 1956, **38,** 183–203. [Centre Nat. Recherche Sci., École Hautes-Études, Fac. Méd., Paris.] English and German summaries.

As scurvy developed in guineapigs the concentration of ascorbic acid and of water-soluble corticosteroids in the adrenal glands decreased. The concentration of total corticosteroids fluctuated, but the absolute total increased with the development of hypertrophy. The adrenal changes were not caused by absence of adrenocorticotropic hormone or inability of the adrenal glands to mobilise corticosteroids, since the glands remained sensitive to adrenocorticotropic hormone. Adrenal glands from scorbutic guineapigs, when incubated with progesterone or derivatives of cholesterol, synthesised less corticosteroids than normal glands, and metabolised deoxycorticosterone to polar compounds which were toxic to scorbutic animals. Ascorbic acid facilitated hydroxylation, oxidation and oxygenation of corticosteroids. It is suggested that the active cortical hormone may be a complex of corticosteroids, water-soluble vitamins including ascorbic acid, and perhaps forms of adrenocorticotropic hormone.—A. Hepburn.

4493

DURY, M. and DURY, A. **Effects of ascorbic acid pretreatment on the response of blood glucose and adrenal cholesterol in the intact rat to insulin.** *Endocrinology*, 1956, **58,** 671–674. [Dorn Lab. Med. Res., Bradford Hosp., Bradford, Pa.]

In male rats, weighing from 350 to 400 g., daily subcutaneous injection of 50 or 250 mg. ascorbic acid per 100 g. bodyweight for 4 days did not alter the response of blood glucose to insulin, and the weight and cholesterol content of the adrenal glands and the glycogen content of the liver were not affected.—A. Hepburn.

4494

MACDONALD, M. K. and BHATTACHARYA, S. K. **Histological changes in rats rendered hyperglycaemic by injection of dehydroascorbic acid.** *Quart. J. Exp. Physiol.*, 1956, **41,** 153–161. [Dept. Pathol., Univ. Edinburgh.]

The diabetogenic action of dehydroascorbic acid, which resembles alloxan in structure and properties, is well established.

Wistar Glaxo rats weighing from 145 to 216 g. were fed on cubes of a stock diet. Five fasting rats had injected from 0·7 to 0·8 ml. dehydroascorbic acid solution (100 mg. per ml.) per 100 g. bodyweight on 2 consecutive days and were killed 24 hr. later. A group of 9 rats was treated in the same way for 3 consecutive days and killed 4 days later. Six rats were given no dehydroascorbic acid. Blood sugar was estimated at least 24 hr. after the last injection and certain organs were taken for histological examination.

Blood sugar in 4 rats in the first group rose to between 252 and 316 mg. per 100 ml.; in the fifth it was only 92. Values for the 9 rats in the second group ranged from 336 to 500 mg. Values for those not given dehydroascorbic acid were from 89 to 124 mg. On histological examination, changes in the kidneys, liver and thyroid gland were not great; in the adrenal cortex there were changes in staining properties. In the pancreas of rats in the second group the number of islets was reduced; they were smaller and the structure was disorganised. The beta cells were fewer and smaller than normal; their cytoplasm was shrunken, and many nuclei were pyknotic. There was some deposition of glycogen in the cells. Alpha cells were not abnormal but varied greatly in number and distribution. In the first group of rats the changes were not nearly so severe. The changes were in many ways like those caused by alloxan.—E. M. Hume.

OTHER VITAMINS

4495

HERZ, A. Über die Wirkung von Flavon- und Cumarinabkömmlingen auf rote Blutkörperchen. [**Effect of flavone and coumarin derivatives on red blood cells.**] *Arch. exp. Pathol. Pharmakol.*, 1956, **227**, 328–341. [Pharmakol. Inst., Univ. Munich.]

Studies were made on the effect of flavone and coumarin derivatives on the osmotic resistance, sodium and potassium content and glycolysis of red cells from guineapig's and horse's blood. Many of the substances tested increased the osmotic resistance and reduced that of horse's red cells. Sodium and potassium were lost from guineapig's red cells during incubation for 4 hr. with quercetin, aesculetin or hesperidin. Inhibition of glycolysis was demonstrated with guineapig's red cells in presence of many flavones and coumarins. The mechanisms involved in the changes are discussed.—A. M. Copping.

4496

MASQUELIER, J. Identification et dosage des facteurs vitaminiques P dans diverses boissons fermentées. [**Identification and estimation of vitamin P factors in fermented drinks.**] *Bull. Soc. Chim. biol.*, 1956, **38**, 65–70. [Lab. Zool., Fac. Méd., Bordeaux.] English and German summaries.

Leucoanthocyanins and flavones, both of them substances regarded as having vitamin P activity, were extracted with butanol and ether, and estimated colorimetrically and gravimetrically. Cider and dry white wine contained large amounts of both. Sweet white wines and beers contained only flavones in varying amounts.—A. M. Copping.

4497

RABBI, A., MARCHETTI, M., VIVIANI, R. and MORUZZI, G. **Orotic acid as a survival factor in rats deficient in the animal protein factors of casein.** *Nature*, 1956, **177**, 757–758. [Ist. Chim. Biol., Univ. Bologna.]

In extension of earlier work (see Abst. 502, Vol. 26), 3 groups of 10 weanling female rats were fed on diets containing crude casein, or purified casein without and with orotic acid. Percentage mortality of the first and second generation, respectively, in the first 21 days, was for the 3 groups 2 and 2, 72 and 100, and 6 and 7.—A. Hepburn.

See also Absts. 4275, 4325, 4399, 4965.

4. PHYSIOLOGY OF NUTRITION

ENZYMES

4498

BERGAMINI, A., BENDANDI, A., MAGGI, G. and CHIEREGO, G. Azione di sostanze lipotrope sul quadro enzimatico del tessuto epatico nella steatosi da tetracloruro di carbonio. [**Effect of lipotropic substances on the enzymes of the liver made fatty by carbon tetrachloride.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 800–801. [Ist. Clin. Med., Univ. Modena.]

Forty-one rats weighing from 130 to 150 g. were given intramuscular injections of CCl_4 for 15 days. They received in addition by intramuscular injection 100 mg. methionine, or 25 mg. choline chloride, or 60 mg. inositol, or by mouth 100 mg. lipotropic substance of the pancreas, or no addition. In the liver total lipids were increased by CCl_4. All the treatments decreased the toxic effect, choline and methionine having the greatest effect. Tributyrin esterase activity was reduced to about one-third; inositol did not counteract this effect, but the other supplements improved activity to nearly half the normal. Alkaline β-glycerophosphatase was increased somewhat by treatment with CCl_4; the activity was favourably affected by all the supplements, and was completely normal with choline and pancreatic factor. β-Glucuronidase activity was increased by about one-third by CCl_4 and was restored to normal by choline, methionine or pancreatic extract.—E. M. Hume.

4499

THOMPSON, R. H. S. **Esterases, lipases and phosphatases of the nervous system.** *Guy's Hosp. Rep.*, 1956, **105**, 93–107. [Dept. Chem. Pathol.]

A review, with references.

4500

KITTS, W. D., BAILEY, C. B. and WOOD, A. J. **The development of the digestive enzyme system of the pig during its pre-weaning phase of growth. A. Pancreatic amylase and lipase.**

BAILEY, C. B., KITTS, W. D. and WOOD, A. J. **B. Intestinal lactase, sucrase and maltase.**

Canad. J. Agric. Sci., 1956, **36,** 45–50 ; 51–58. [Div. Animal Sci., Univ. British Columbia, Vancouver.]

A. Pigs selected from 2 litters were killed at ages from birth to 49 days and the pancreas was removed and stored at — 10° C. Amylase and lipase activity were estimated in extracts.

Amylase activity relative to the weight of the pancreas and relative to bodyweight increased with age and bodyweight. The 5 estimations showed a large increase between 1 and 6 days of age and another between 22 and 37 days.

Lipase activity, estimated for 9 glands with fat from sow's milk, was high at birth and remained so without showing the same steady increase as amylase, although the activity on a bodyweight basis increased some 3½ times in 49 days.

B. Eleven and 10 pigs from 2 litters were killed at ages from birth to 51 days and the small intestine was washed out and stored at — 10° C. The intestine was divided into 3 sections before preparation of enzyme extracts.

At birth the extracts hydrolysed lactose, but not sucrose or maltose. Lactase activity was highest in pigs from 1 litter after 1 and 2 weeks and in the other litter after 3 weeks, and then declined sharply. Some sucrose and maltose were hydrolysed at 1 week and thereafter the amounts gradually increased until more sucrose and maltose than lactose were hydrolysed at 7 weeks. Activity of all 3 enzymes tended to be greatest in the middle third of the intestine.

D. Duncan.

4501

MAGEE, D. F. and HONG, S. S. **Changes in pancreatic enzymes brought about by amino acid additions to the diet.** *Amer. J. Physiol.*, 1956, **184,** 449–452. [Dept. Pharmacol., Sch. Med., Univ. Washington, Seattle.]

In each of 2 experiments 40 rats in groups of 10 were given a semi-synthetic diet with 7 per cent. casein and, in the first, 1 per cent. *iso*leucine, methionine or phenylalanine or, in the second, leucine, lysine or tryptophan. In each experiment a control group had the diet with 8 per cent. casein and no added amino acid. Each animal was given 14 g. daily for 21 days. The rats were then killed and pancreatic enzymes were estimated by methods already described (Abst. 510, Vol. 26); amylase also was measured.

In the first experiment methionine increased both lipase and protease, phenylalanine and *iso*leucine only protease ; amylase was not significantly affected, but tended to be less in the phenylalanine and *iso*leucine groups than in the control group. In the second experiment the amino acids caused no change in any of the enzymes studied.—D. Harvey.

4502

SZABOLCSI, G. and SZÖRÉNYI, E. **Action of trypsin and chymo-trypsin on native homologous proteins.** *Acta physiol. hung.*, 1956, **9,** 293–299. [Inst. Biochem., Hungarian Acad. Sci., Budapest.] Russian summary.

Crystalline bovine trypsin and chymotrypsin and non-crystalline horse and pig trypsin were prepared and were tested on purified human, bovine, pig and horse albumin and on crystalline 3-phospho-*d*-glyceraldehyde dehydrogenase (PGAD) from cattle, pig and rabbit.

Trypsin and chymotrypsin digested native protein very slowly. For example, bovine trypsin in 1 hr. digested bovine, horse and human albumins at relative rates of 100 : 170 : 250. Serum albumin from pigs was not digested at all by pig or bovine trypsin. For bovine trypsin the relative rates of digestion of PGAD from cattle, pig and rabbit were 100 : 145 : 260. The specific difference was not found with denatured proteins.—D. Duncan.

4503

YOUNATHAN, E. S., FRIEDEN, E. and DITTMER, K. **Sensitivity of rat liver xanthine oxidase to amino acid analogues.** *J. Biol. Chem.*, 1956, **219,** 531–537. [Dept. Chem., Florida State Univ., Tallahassee.]

When β-3-thienyl-DL-alanine or DL-propargylglycine was given to rats there was a significant decrease in liver xanthine oxidase. This was shown by paired feeding experiments to be only partly due to lower food intake. The recovery of enzyme activity after a standard basal diet was given to rats depleted of protein was inhibited by the inclusion of thienylalanine or DL-ethionine. Phenylalanine reversed the inhibition due to thienylalanine.—A. Hepburn.

4504

KIERMEIER, F. and VOGT, K. Ursachen unterschiedlicher Xanthindehydrase-Aktivität in Kuhmilch aus verschiedenen Anlieferungsbezirken. [**Causes of differences in xanthine dehydrase activity in cow's milk from different districts.**] *Ztschr. Lebensmittel - Untersuch. Forsch.*, 1956, **103,** 355–361. [Süddeutsch. Versuchsanst. Milchwirtsch., Weihenstephan.]

Mixed milk samples from a 2000-litre container at the creamery showed considerable variations in xanthine dehydrase activity. Samples from churns showed even greater variation and especially low values. From 264 individual herd samples during winter feeding and 277 during summer it was found that more low values occurred in winter. The mean activity was higher in herds on alkaline soils than in those on acid soils. The possibility that the difference depends on the lower availability of Mo in acid soils is discussed.—D. Duncan.

4505

ERICSON, L. E. and HARPER, A. E. **Effect of diet on the betaine-homocysteine transmethylase activity of rat liver. 1. Amino acids and protein.** *J. Biol. Chem.*, 1956, **219**, 49–58. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

1. The betaine-homocysteine transmethylase activity of rat liver rose when the protein in the basal diet was increased from 9 to 18 per cent. casein. Supplements of threonine or tryptophan increased the activity to a slighter extent. Tryptophan, in contrast to the findings of Dinning *et al.* (Abst. 3452, Vol. 24), was not particularly important, nor was the activity negligible when the diet contained adequate methionine. The increases were generally accompanied by increases in liver protein and decreases in liver fat. The enzyme activity of liver from rats on the basal diet decreased for 3 weeks, then gradually increased until the seventh week. Liver protein showed a similar trend, but liver fat varied inversely with enzyme activity.

The apoenzyme stimulated activity when it was low. Growth was retarded by excess leucine, methionine or tryptophan, but not by *iso*leucine. In all these rats and in fasted rats the weight and total protein content of the liver decreased, but the enzyme activity increased.

For part 2 see Abst. 4455, Vol. 26.

A. Hepburn.

4506

MORI, K. **Cholesterol esterase activity of the reproductive endocrine gland in the essential fatty acids-deficient rat.** *J. Vitaminol., Japan*, 1956, **2**, 12–17. [Lab. Physiol. Chem., Fac. Agric., Univ. Tottori.]

Weanling rats were given a purified diet with or without essential fatty acids. Animals were killed every 10 days for 80 days. Homogenates of adrenal, testis and ovary were examined for cholesterol esterase activity.

Homogenates from rats deprived of essential fatty acids showed low cholesterol esterase activity, especially in adrenal tissue. The cholesterol esterifying system was always affected more than the cholesterol ester hydrolysing system.

A. K. Lough.

4507

AUGUSTIN, E. and HUWALD, R. Vorkommen und Aktivität der alkalischen Phosphatase im Eileiter des Weibes. [**Occurrence and activity of alkaline phosphatase in the oviduct of women.**] *Arch. Gynäkol.*, 1955–56, **187**, 406–425. [Frauenklin., Univ. Freiburg i. Br.]

4508

DHOM, G. and MENDE, H. J. Die alkalische Phosphatase in den Hiluszellen des Ovars. [**Alkaline phosphatase in the hilus cells of the ovary.**] *Virchows Arch.*, 1956, **328**, 337–346. [Pathol. Inst., Univ. Würzburg.]

4509

SRÉTER, F. and SZÉKY, P. Vérketaláze- és májfunkciós vizsgálatok magyartarka szarvasmarhákkal. [**Blood catalase and liver function in Hungarian Pied cattle.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1**, No. 9, 29–39. [Inst. Animal Physiol., Univ. Agric. Sci., Budapest.] German, English and Russian summaries.

Blood was examined and liver function tests were made on 25 highly productive cows and 20 of lower productivity. There was a low positive correlation between blood catalase level and milk yield, but no change in catalase with age. Average packed cell volume and Hb value increased with increasing milk yield. (From English summary.)

D. Duncan.

4510

SZÉKY, P. Vérkataláze-aktivitás vizsgálatok nyulakon. [**Blood catalase activity in rabbits.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1**, No. 9, 17–26. [Inst. Zool., Univ. Agric. Sci., Budapest.] German, English and Russian summaries.

Catalase activity in blood showed specific differences between wild and domestic rabbits (*Oryctolagus cuniculus* and *O. cuniculus domesticus*) and hares (*Lepus europaeus*). (From English summary.)—D. Duncan.

4511

FALUDI, B., FEDORCSÁK, I., ZGYERKA, S. and MÜHLRAD, A. **The chemical properties and active group of rhodanese and the mechanism of rhodanese action. A preliminary report.** *Acta physiol. hung.*, 1955, **7**, 175–178. [Inst. Gen. Biol., Eötvös Loránd Univ., Budapest.]

4512

WIELAND, T., PFLEIDERER, G. and LAU, H. H. Zur Kenntnis der Glyoxalasen. [**Glyoxalases.**] *Biochem. Ztschr.*, 1956, **327**, 393–406. [Inst. Org. Chem., Univ. Frankfort a.M.]

See also Absts. 4115, 4116, 4791, 4838, 4867, 4872, 4897.

DIGESTION AND ABSORPTION

4513

GRASTYÁN, E., LISSÁK, K. and KÉKESI, F. **Facilitation and inhibition of conditioned alimentary and defensive reflexes by stimulation of the hypothalamus and reticular formation.** *Acta physiol. hung.*, 1956, **9**, 133–151. [Inst. Physiol., Med. Sch., Univ. Pécs.] Russian summary.

4514

SZAKÁCS, F., ENDRŐCZI, E. and CSEKE, I. Wirkung der Reizung der Area hypothalamica posterior auf den bedingten Ernährungsreflex am Hund. [**Effect of stimulation of the area hypothalamica posterior on the conditioned feeding reflex in the dog.**] *Acta physiol. hung.*, 1956, **9**, *Suppl.*, 49–50. [Physiol. Inst., Med. Univ., Pécs.]

4515

FARRELL, J. H. **The effect of mastication on the digestion of food.** *Brit. Dent. J.*, 1956, **100**, 149–155. [Sutherland Dent. Sch., Newcastle upon Tyne.]

Twenty-nine foods were tested by 10 healthy adults whose ability to masticate was assessed by the method of Manly and Braley (*J. Dent. Res.*, 1950, **29**, 448). Two specimen cubes of the food, volume about 1 c.c., were weighed and one was chewed thoroughly, 20 times if necessary. Each was then sewn into a bag of open (1·5 mm.) cotton mesh, with a ball-bearing as marker, and the 2 bags were tied together and swallowed as part of an ordinary meal. On recovery from the faeces the bags were washed gently and the contents, if any, were examined and weighed. Tests in which the time of passage exceeded 40 hr. were rejected.

The following foods left large undigested residues if unchewed and might leave some residues even if chewed: pork, roast or fried; fried bacon; beef, roast, fried or stewed; mutton, roast or stewed; lamb, roast or fried; potatoes, fried or boiled, old or new; boiled peas; boiled carrots. Roast chicken and stewed lamb were more digestible, and the following usually left no residue even if unchewed: beef fat, fried or stewed; cod, fried or boiled; fried kipper; hard-boiled egg; boiled rice; bread, white or wholemeal; Cheddar cheese. The results with different subjects were strikingly similar. Further tests on fried pork with subjects who wore full or partial dentures, or chewed with incisors only, showed that digestion was not affected by reduction of efficiency of mastication.

W. M. Deans.

4516

FARRELL, J. H. **The effect on digestibility of methods commonly used to increase the tenderness of lean meat.** *Brit. J. Nutrition*, 1956, **10**, 111–115. [Sutherland Dent. Sch., Newcastle upon Tyne.]

In each of 58 experiments with 1 female and 5 male subjects aged from 24 to 33 years, 2 weighed portions of fried beefsteak, taken from similar portions of meat treated by different tenderising methods, were sewn into separate cotton-mesh bags, which were then tied together and swallowed. On recovery from the faeces any residues contained in the bags were examined and their weights were compared. Five methods which may be used to improve the tenderness of meat were tested, namely, soaking the meat for 12 hr. in diluted vinegar, treating the meat with papain, salt and sugar in the form of a proprietary meat tenderiser called Meatendra, beating the meat with a rolling pin or with a spiked hammer, and beating the meat with a spiked hammer and then treating it with Meatendra.

Two of the methods tested, soaking in vinegar solution and beating with a rolling pin, had no significant effect on the digestibility of the meat. The spiked hammer increased the digestibility by 28 per cent., Meatendra increased it by 16 per cent., and a combination of the spiked hammer and Meatendra increased it by 37 per cent. It is suggested that the effectiveness of the spiked hammer method in influencing digestibility is due to an increase in the surface area of the meat.

G. F. Garton.

4517

CASTLE, E. J. **The rate of passage of foodstuffs through the alimentary tract of the goat. 2. Studies on growing kids.** *Brit. J. Nutrition*, 1956, **10**, 115–125. [Dept. Vet. Prevent. Med., Univ. Liverpool.]

For part 1 see Abst. 3140, Vol. 26.

2. The rate of passage of stained hay increased up to weaning and then remained fairly constant. When strained faecal residues were given by mouth the markers first appeared in the faeces at the same time. The remainder of the stained faecal fragments were excreted more rapidly than the stained hay, which suggested that the larger particles of hay were retained in the reticulo-rumen for a longer time. Dry matter content of faeces, in general, increased progressively with age and was correlated positively with excretion time of 5 per cent. of stained particles and negatively with total water intake.—F. C. Aitken.

4518

CASTLE, E. J. and CASTLE, M. E. **The rate of passage of food through the alimentary tract of pigs.** *J. Agric. Sci.*, 1956, **47,** 196–204. [Fac. Vet. Sci., Univ. Liverpool.]

Small amounts of pig meal stained with basic fuchsin or brilliant green were added to rations of one sow and 4 fattening pigs. The stained particles were counted as they appeared in faeces collected at fixed intervals after feeding, and excretion curves were plotted. These curves were sigmoid in shape and from them were obtained the mean retention times of the stained particles in the digestive tract.

The times between feeding and the excretion of 5 and 95 per cent. of the stained particles were for fattening pigs 21 hr. and 53 hr. and for sows 38 hr. and 68 hr. The mean retention time in hours of all the stained particles in the entire tract was for fattening pigs on the average 34·2 hr., for sows 51·1 hr. The time was significantly shorter for a marker in the morning feed than in the evening feed.

With the fattening pigs there was no statistically significant relation between mean retention time and liveweight, digestibility of the ration, or dry matter content of the faeces.—I. A. M. Lucas.

4519

MANGOLD, E. and BEHM, G. Zur Frage der Durchgangszeiten beim Kaninchen, besonders unter dem Einfluss des Rohfasergehaltes im Futter. [**Time of passage (through the intestinal tract) in rabbits, especially as affected by the crude fibre content of the feed.**] *Arch. Tierernährung*, 1956, **6,** 35–43. [Inst. Tierernährungslehre, Humboldt Univ., Berlin.]

Six rabbits each received 120 g. daily of a diet of dried yeast, haymeal and cooked potatoes in which the percentage of hay, providing fibre, was 10, 20 or 30. They were fed twice daily. For labelling of contents each rabbit received on the 6th day 2000 particles of straw chaff stained with fuchsin, made up into tablets with rye flour and water. These were later counted in diluted faeces. Three rabbits were used in each experiment. They wore collars to prevent coprophagy.

There was no significant difference in transit time of labelled particles which could be related to the hay content of the diet.—D. Duncan.

4520

JUKES, H. G., HILL, D. C. and BRANION, H. D. **Effect of antibiotic on the rate of passage of feed marker through the digestive tract of the chick.** *Poultry Sci.*, 1956, **35,** 232–234. [Dept. Nutrit., Ontario Agric. Coll., Guelph.]

In 9 experiments supplements of 10 p.p.m. procaine penicillin G or aureomycin hydrochloride were given to chickens 2½ to 3½ weeks old, and rate of passage of feed was estimated with carmine in capsule or water suspension as a marker. In all experiments the antibiotic increased rate of passage of the feed through the intestinal tract, though not always significantly at the 0·5 per cent. level of probability. When penicillin was removed from or added to the ration the effect was observed between 17 and 71 hr. after the change.

T. D. Bell.

4521

UVNÄS, B. **Digestion.** *Annu. Rev. Physiol.*, 1956, **18,** 145–158. [Dept. Pharmacol., Karolinska Inst., Stockholm.]

4522

SPIRO, H. M. **Present-day concepts of anacidity.** *J. Amer. Med. Assoc.*, 1956, **161,** 9–12. [Sch. Med., Yale Univ., New Haven, Conn.]

4523

MERTEN, R. and FETSCHER, W. Beziehungen zwischen Gesamtausscheidung und Konzentration von freier Salzsäure, Pepsin und Kathepsin in der Basalsekretion, nach Histamin und Insulin. [**Relations between total secretion and concentrations of free hydrochloric acid, pepsin and cathepsin in fasting gastric secretion after histamine and insulin.**] *Ztschr. ges. exp. Med.*, 1956, **127,** 133–152.

Gastric juice was collected every 15 min. for an hour from 100 subjects who had fasted for 16 hr. In 50 subjects collection continued for another hour after injection of histamine and in 30 after injection of insulin. The volume, total free HCl, total pepsin and total cathepsin of the gastric juice were estimated, and correlations were examined statistically.

In the fasting secretion there were statistically significant positive correlations between total output of free HCl and pepsin or cathepsin, between pepsin and cathepsin relative to volume and between the concentrations of pepsin and cathepsin. There was no correlation between concentration of free HCl and of enzymes.

Both histamine and insulin increased total volume and total output of acid and enzymes. Free HCl concentration increased after histamine, that of enzymes possibly increased. After insulin concentrations of both HCl and enzymes increased. The mechanisms of action of histamine and insulin are discussed.—D. Duncan.

4524

HOFFMANN, W. Die Zehnuhr-Zwischenmahlzeit in der Schule. Untersuchungen über die Magenverweildauer von Milch und Äpfeln, mit und ohne Brot. [**The 10 o'clock snack in**

schools. Length of stay in the stomach of milk and apples with and without bread.] *Schweiz. med. Wochenschr.*, 1956, **86,** 733–734. [Dufourstrasse 28, St. Gallen.]

Complaints were made by mothers that mid-morning milk deprived the children of appetite for dinner. Apple was recommended instead as containing vitamins, mineral salts, organic acids and easily absorbed carbohydrates, since the Swiss child's diet was held to include too much milk and too little fruit. A study was published in 1952 (Abst. 1078, Vol. 22), showing that apple left the stomach more quickly than milk or bread. The results were questioned by Wild (*Schweiz. med. Wochenschr.*, 1954, **84,** 298) and further tests have therefore been made, in which 10 g. barium sulphate with 200 ml. milk or 200 g. apple were given at 10 a.m. on successive days to 45 children aged from 7 to 15 years. The stomach was examined radiologically between 12.15 and 12.30. The pictures showed for the milk and apple, respectively, children with stomach empty 4 and 36, partly empty 8 and 8, and full 33 and 1. A similar test with 17 children given on 4 successive days milk and apple as before, with or without 50 g. bread, showed that bread tended to retard emptying so that the numbers with quite empty stomach were milk and bread 0, milk 2, apple and bread 9, and apple 17.—E. M. Hume.

4525

SCHAPIRO, H. and WOODWARD, E. R. **Inhibition of gastric motility by acid in the duodenum.** *J. Appl. Physiol.*, 1955, **8,** 121–127. [Dept. Surg., Univ. California, Los Angeles.]

Movements of the stomach and duodenum were recorded from balloons in 26 human subjects. When 0·1 *N* HCl was introduced into the duodenum in 7 patients with duodenal ulcer, 2 with vagotomy and pyloroplasty, 2 with lumbar sympathectomy, 3 with splanchnic sympathectomy and 2 with destructive lesions of the lower thoracic spinal cord, there was always rapid inhibition of gastric motility, which lasted up to 40 min. or more. In some subjects the same effect was produced by acid in the jejunum. Duodenal motility was affected in some tests, but not in all. In one subject 0·1 *N* H_2SO_4 was as effective as HCl. In 2 patients with ileostomy and 2 with colostomy, introduction of HCl into terminal ileum or colon had no effect on gastric motility. Physiological saline in the duodenum rarely affected gastric motility, and when it did so the effect was transitory.—D. Duncan.

4526

HUNT, J. N. **Some properties of an alimentary osmoreceptor mechanism.** *J. Physiol.*, 1956, **132,** 267–288. [Dept. Physiol., Guy's Hosp., London, S.E.1.]

The properties of the postulated osmoreceptors in the duodenum have been tested by extensive measurements of gastric emptying time in man after a variety of test meals had been introduced into the stomach. Water produced more rapid emptying than a solution containing sucrose. With NaCl solution with up to 100 m. equiv. per litre, the rate of emptying rose with concentration, but concentrations of 160 to 350 m. equiv. per litre caused a progressive decrease. Similar results were obtained with $NaHCO_3$ or urea solutions; but glucose, sorbitol or KCl caused a steady decrease in the rate of emptying as the concentrations increased. It is postulated that the receptors are impermeable to potassium and the sugar used but not to the sodium chloride and bicarbonate ions.—A. T. Phillipson.

4527

MOXON, A. L. and BENTLEY, O. G. **Research on rumen function and ruminant nutrition.** *Trans. Amer. Assoc. Cereal. Chem.*, 1955, **13,** 15–30. [Dept. Animal Sci., Ohio Agric. Exp. Stat., Wooster.]

4528

SMITH, P. H., SWEENEY, H. C., ROONEY, J. R., KING, K. W. and MOORE, W. E. C. **Stratifications and kinetic changes in the ingesta of the bovine rumen.** *J. Dairy Sci.*, 1956, **39,** 598–609. [Dept. Statistics, Virginia Agric. Exp. Stat., Blacksburg.]

Three steers with rumen fistulae were offered grain and hay to appetite and surplus feed was removed after the evening meal before experiments. For experiments the animals had in the morning 2 lb. grain and all the hay they could eat in 1 hr. and samples of ingesta were taken from top and bottom of the rumen, and in some experiments also from the middle, before and every hour for 12 hr. after the feed. In some trials the animals had a second feed 8 hr. after the first.

Ingesta from the top of the rumen were generally higher than bottom samples in total N, N.P.N., organic N.P.N., ammonia, water- and alcohol-soluble sugars, volatile fatty acids and crude fibre, but lower in ether extract, *p*H and ability to digest cellulose *in vitro*. The differences were all statistically significant, except possibly that in concentration of alcohol-soluble sugars. Similar results were obtained with ingesta removed under local anaesthesia from a cow without a fistula, showing that the stratification was not due to the presence of the fistula.

The statistical and physiological interpretations of the results are discussed.—D. Duncan.

4529

HUNGATE, R. E. and DYER, I. A. **Effect of valeric and isovaleric acids on straw utilization by steers.** *J. Animal Sci.*, 1956, **15,** 485–488. [Dept. Bacteriol. Pub. Health, State Coll. Washington, Pullman.]

When bullocks were fed on a ration containing 82 per cent. wheat straw, the addition of 8·44 g. valeric and 2·75 g. *iso*valeric acid per 60 lb. feed made the ration more palatable, but feed intake was controlled, and the total amount of feed eaten with and without the acids was similar. Weight changes of the bullocks were similar, and digestibility of crude fibre in the ration was not affected by the addition of the acids.

Manometric studies of fermentation in contents extracted from the rumen showed less activity in bullocks given the acids than in the others. When hay was added to incubated rumen contents the rate of fermentation was about the same in all animals. It is suggested that the results may have been due to lack of fermentable carbohydrate in the ration, and this is discussed.—T. D. Bell.

4530

EVANS, R. E. and MAGUIRE, M. F. **The influence of dietary antibiotics on the activity of the cellulose-splitting bacteria in the intestine of the bacon pig.** *J. Agric. Sci.*, 1956, **47,** 344–349. [Sch. Agric., Univ. Cambridge.]

Of 4 littermate pigs 2 were fed on bran, maizemeal, white fish meal and lucerne meal, and the other 2, which had been receiving penicillin since weaning, were given the same feed supplemented with 18 mg. procaine penicillin per lb. feed. Digestibilities were studied by comparative analyses of faeces and feed for 12 days.

Both pairs were then given daily, mixed with the feed, 500 g. cellulose prepared from wheat straw by the method of Woodman and Evans (Abst. 3898, Vol. 17). Digestibility trials were continued for 12 days. Penicillin was next given for 12 days to the pair of pigs which had previously been without it, in order to detect any temporary effect of the antibiotic. The penicillin was then replaced by aureomycin hydrochloride, 5 mg. per lb. ration, during 9 days. Results of analyses made in the last experiment were confirmed with 2 other pigs given cellulose in the ration, one without and one with aureomycin.

Detailed results for digestibility trials in each experiments are given. The digestibility of no feed constituent was altered by antibiotic. Digestibility of the cellulose product remained high, the mean digestion coefficients for crude fibre in each experiment lying between 92·8 and 95·9 per cent., and when N-free extractives, probably largely xylan, were included the values were about 85 per cent. Addition of cellulose reduced the digestibility of protein and much gas was produced, but these effects also were independent of either antibiotic.—J. C. Appleby.

4531

WISEMAN, R. W., BUSHNELL, O. A. and ROSENBERG, M. M. **Effect of rations on the pH and microflora in selected regions of the intestinal tract of chickens.** *Poultry Sci.*, 1956, **35,** 126–132. [Dept. Bacteriol., Univ. Hawaii, Honolulu.]

Two groups of 12 six-week-old pullets received grower's rations differing only in that one contained 58·5 per cent. yellow maizemeal and the other 53 per cent. molasses and 5·5 per cent. bagasse pith as their main sources of carbohydrate. All the pullets were fed for 11 days and then 3 from each group were killed weekly for examination of microflora and *p*H of the digestive tract.

The ration had little effect on *p*H in any part of the digestive tract. The contents were very acid until they reached the duodenum, where there was a sharp rise of *p*H, and the *p*H continued to rise until the posterior small intestine was reached.

Bacterial counts of aerobes and lactobacilli from all parts of the tract were smaller with molasses than with maizemeal and tended to rise and fall with *p*H. The molasses ration as eaten contained more lactobacilli than the maize ration.

D. Duncan.

4532

AUGUSTE, C., SWYNGEDAUW, J., GUERRIN, F. and ROHART, J. L'absorption jéjunale après gastrectomie. Recherches faites au moyen de l'iode radioactif. [**Absorption from the jejunum after gastrectomy. Investigation with radio-active iodine.**] *Arch. Mal. Appar. diger.*, 1956, **45,** 181–188. [Lille.] English summary.

The rate of absorption was measured with radioactive NaI in doses equivalent to 500 μC. ^{131}I and containing 5 μg. iodine, in 15 patients after gastrectomy and in 20 normal subjects. The radioactivity of plasma from peripheral blood and of the thyroid was studied frequently during the hour after the test dose. In plasma the degree of radioactivity after the test dose was always greater when the patient was examined in the sitting position than in the recumbent position, in normal euthyroid subjects and in gastrectomised patients; in the gastrectomised subjects examined sitting, the rise in radio-activity was much greater and appeared earlier than in normal subjects or in recumbent gastrectomised subjects. Measurements of radio-activity in the thyroid gave similar but less precise results. It is concluded that the main cause for the increased rate of absorption by the jejunum after gastrectomy is the acceleration of passage.—L. Wills.

4533

KERPEL-FRONIUS, E., MESTER, A., SZY, S., BARKA, I., ZSÁMÁR, E. and KELEMEN, I. **Enteral absorption in experimental anhydraemia and hypothermia.** *Acta physiol. hung.*, 1955, **7,** 103–111. [Dept. Paediat., Med. Sch., Univ. Pécs.] Russian summary.

Absorption of glucose, sodium thiocyanate and oil was studied in rats by the technique of Cori (*J. Biol. Chem.*, 1925, **66,** 691). In some animals anhydraemia equal to medium-grade shock was induced by the method of Darrow and Yannet (Abst. 677, Vol. 5); others were cooled in suitable water-baths, and there were untreated controls. Average values for percentage of glucose absorbed, total glycogen in liver in mg. and blood sugar in mg. per 100 ml. were, in normal animals after 3 hr., 96·6, 107 and 150, and in anhydraemic rats after 3 hr., 34·0, 22 and 184, and after 5 hr., 63·0, 17 and 158. In normal and anhydraemic rats, respectively, averages for absorption of NaCNS after 3 hr. were 71·7 and 76·0 and of oil after 6 hr. 47·0 and 9 per cent. Data for glucose absorption, in the same order as above for anhydraemia, were, with rectal temperature 34° C., 85·0, 15 and 164, at 27° C., 40·0, 17 and 125 and at 20° C., 14·0, 10 and 76. For NaCNS at 21° C. absorption was 50·0 and for oil at 30° C. 14 and at 26° C. 3·3 per cent.

The results are discussed and, except at the lowest temperature, which is unlikely to be reached, similar interference with absorption is thought likely to occur in patients in whom there are similar fluid and temperature changes.—D. Harvey.

4534

LARSEN, H. J., STODDARD, G. E., JACOBSON, N. L. and ALLEN, R. S. **Digestion and absorption of various carbohydrates posterior to the rumino-reticular area of the young bovine.** *J. Animal Sci.*, 1956, **15,** 473–484. [Iowa State Coll., Ames.]

Three male calves, aged 8 to 9 months, with rumen and caecal fistulae, were given 4 experimental diets directly into the omaso-abomasal cavity. Each diet was given for 2 days and the order of the diets was different for each animal. The diets differed in carbohydrate, which was maize, maize starch, maltose or glucose. For digestion experiments 1 per cent. chromium oxide was added to the diet.

Digestion studies and levels of reducing sugar in the blood indicated that glucose and maltose were readily absorbed, but there was little digestion of starch or of carbohydrate in maize.

In studies with isolated visceral sections in 2 of the animals there was ready absorption of glucose from jejunum and ileum and less efficient absorption from rumen and caecum.—F. C. Aitken.

4535

PACKHAM, M. A. **The absorption of labelled glucose, sodium glucuronate, and glucurone from the gastrointestinal tract of the rat.** *Canad. J. Biochem. Physiol.*, 1956, **34,** 587–591. [Dept. Biochem., Univ. Toronto, Ont.]

The rate of excretion of ^{14}C as CO_2 in the expired air and the residues of ^{14}C in the stomach, small intestine and large intestine were measured at intervals after glucose, glucuronate or glucurone labelled with ^{14}C was given to rats by stomach tube. The results showed that most of the glucose was absorbed rapidly from the small intestine, but a time lag occurred with glucuronate and glucurone and their ^{14}C was not absorbed before the large intestine. It was concluded that very little of these compounds is absorbed and that decomposition occurs in the large gut.

A. T. Phillipson.

4536

MAYER, J. and YANNONI, C. Z. **Increased intestinal absorption of glucose in three forms of obesity in the mouse.** *Amer. J. Physiol.*, 1956, **185,** 49–53. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

The mice included animals with hereditary obesity and diabetes and their non-obese littermates, Swiss females with obesity produced by injection of gold thioglucose or by hypothalamic lesions, and mice operated on but not obese. For experiments the mice were fasted for 20 hr. and then given by stomach tube 50, 100, 200 or 400 mg. glucose in 0·5 ml. solution. They were killed 30 min. later for a study of absorption.

Absorption of glucose by non-obese mice reached a plateau at a dose of 100 mg. in littermates of genetically obese mice and at 200 mg. in other controls. With all 3 types of obesity absorption continued to increase with the dose. The amount absorbed by obese mice was consistently greater than that absorbed by controls, despite blood sugar values, in the genetically obese group, considerably above the normal. The amount of glucose recovered in the stomach after 30 min. was of the same order in all groups, so the differences are ascribed to differences in intestinal absorption as such. Of that glucose which had reached the intestine the percentage absorbed was considerably higher in obese mice than in their controls, though it was less in the obese diabetic mice and their littermates than in the Swiss mice, obese or not. When obese and control mice of all types were underfed or given for a week a high-fat, carbohydrate-free diet, there was a tendency for absorption of sugar to be less, but the difference was significant only in mice with hypothalamic obesity.—D. Duncan.

4537

HARTMANN, F., LENZ, H., LOPEZ-CALLEJA, C. and MÜNZENBERG, H. Die Resorptionsweise von Aminosäuren aus dem Dünndarm. [**Mode of absorption of amino acids from the small intestine.**] *Arch. exp. Pathol. Pharmakol.*, 1956, **228,** 403–413. [Med. Klin., Univ. Göttingen.]

The 16 dogs used were mostly about 20 to 25 kg. in weight. They were anaesthetised and a cardiac catheter was passed from the jugular into the hepatic vein. In small dogs a transfusion was set up into the femoral vein, and in 3 dogs a cross circulation was established between the mesenteric artery and the femoral vein of another dog. The dogs were heparinised and the upper part of the small intestine was exposed and clamped at both ends of a loop 40 to 50 cm. long. An injection of 100 ml. 50 per cent. amino acid solution (Aminovit) was given into this loop, which was then replaced in the abdominal cavity. Blood samples of 10 ml. were taken from the mesenteric and hepatic veins at intervals up to 120 min. Arterial blood was taken also from some dogs. Amino acids were estimated by paper chromatography of serum. The mixture administered contained, per cent., lysine + ornithine 6·8, cystine + cysteine 3·1, glutamic acid 9·1, aspartic acid + arginine 9·8, glycine 5·2, serine 7·0, alanine 8·1, threonine 6·4, valine 12·8, methionine 6·9, leucine + *nor*leucine + phenylalanine + tryptophan 12·4, *iso*leucine + tyrosine 9·6 and proline 2·8.

Absorption began within 5 min. of administration of the amino acid mixture. The rate of absorption of individual amino acids was not closely related to their concentration in the intestine. Glutamic acid and proline were absorbed at much the same rate.

The course of absorption was not the same for all amino acids. There were 3 peaks of absorption, one in the first 15 min., one at about 35 to 40 min. and the third after about 1 hr. The concentration of amino acids in the hepatic vein hardly rose at all, but some amino acids rose slowly, though in no quantitative relation to their concentration in the mesenteric vein.

As absorption of individual amino acids was not related to their molecular weight, their diffusion constant or the concentration gradient between the intestinal contents and the portal blood, it must be an active process. The liver removes amino acids selectively from the portal blood.—D. Duncan.

4538

HARTMANN, F., LENZ, H., LOPEZ-CALLEJA, C. and MÜNZENBERG, H. Über die Serumeiweissfraktionen des Pfortader- und Lebervenenblutes während der Resorption eines Aminosäuregemisches aus dem Darm. [**Serum protein fractions in the blood of portal and hepatic vein during absorption of a mixture of amino acids from the intestine.**] *Arch. exp. Pathol. Pharmakol.*, 1956, **228,** 414–420. [Med. Klin., Univ. Göttingen.]

The experiments were those described in the preceding Abst. Serum proteins were studied refractometrically and by micro-electrophoresis in blood from the portal and hepatic veins. The results are given in tables and a graph. There were always slight differences in composition between serum proteins in blood entering and leaving the liver.—D. Duncan.

4539

TIDWELL, H. C. **Effect of choline, methionine and ethionine on fat absorption.** *J. Nutrition*, 1956, **58,** 569–578. [Dept. Biochem., Univ. Texas Southwestern Med. Sch., Dallas.]

Fasting adult albino male rats were each given by stomach tube 0·3 ml. olive oil per sq. decimetre body surface followed by an intraperitoneal injection of a solution of either DL-methionine, choline chloride, prostigmine, Mecholyl or saline. A blood sample was taken before the olive oil was given and subsequently hourly for 3 hr. for chylomicron counts. In further similar experiments the animals were killed 3 hr. after the administration of olive oil and the unabsorbed fat was recovered from the gut and weighed. Chylomicron counts were made also on the blood of animals which were given repeated injections of methionine, choline or ethionine with or without previous administration of olive oil by mouth.

It was concluded that fat absorption was promoted by choline ; prostigmine and Mecholyl did not affect the rate of absorption, suggesting that the choline effect may be due to increased synthesis of lecithin. Methionine promoted absorption of olive oil to a slight extent. Significantly increased blood fat values were found also after administration of ethionine.—G. A. Garton.

4540

WOLFF, R. and BRIGNON, J. J. Recherches expérimentales sur la résorption intestinale du cholestérol chez le lapin. [**Experimental research on absorption of cholesterol from the intestine of the rabbit.**] *Bull. Soc. Chim. biol.*, 1956, **38,** 99–109. [Lab. Chim. Biol., Fac. Méd., Nancy.] English and German summaries.

Serum cholesterol was estimated in groups of normal rabbits at intervals, and was shown to be constant. Cholesterol was then given by mouth as a solution in cottonseed oil or oleic acid or as a component of an emulsion containing arachis oil and bile salts. Maximum values for serum cholesterol were obtained 24 hr. after administration of

the cholesterol. Cottonseed oil or arachis oil emulsion alone did not affect serum cholesterol, but oleic acid alone at 3 ml. per kg. bodyweight reduced serum cholesterol.

In further experiments serum cholesterol was estimated before and 24 hr. after oral administration to rabbits of cholesterol alone or with soya bean sterols. The inhibitory effect of soya bean sterols on absorption was reflected in lower serum cholesterol values after 24 hr.—G. A. Garton.

4541

FRIEDMAN, M., ROSENMAN, R. H. and BYERS, S. O. **The effect of beta-sitosterol upon intestinal absorption of cholesterol in the rat.** *Circulation Res.*, 1956, **4**, 157–161. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.] Interlingua summary.

In contrast to the findings of Hernandez *et al.* (Absts. 585, Vol. 24; 3669, Vol. 25), β-sitosterol had only a slight retarding effect on the absorption of cholesterol by the rat.—A. Hepburn.

4542

BENSON, J. A. (Jr.), LEE, P. R., SCHOLER, J. F., KIM, K. S. and BOLLMAN, J. L. (with VAN HOOK, E. and ANDERSON, J.) **Water absorption from the intestine via portal and lymphatic pathways.** *Amer. J. Physiol.*, 1956, **184**, 441–444. [Sect. Biochem., Mayo Found., Rochester, Minn.]

D_2O and ^{24}Na were given in saline solution by stomach tube to rats in which the mesenteric lymphatic was cannulated and portal blood and femoral arterial blood were collected. Nearly all the isotope passed into the portal bloodstream, the amount in the lymph was proportional to the lymph volume and the concentrations were practically identical with that in arterial plasma, whether the isotope was given by stomach tube or by injection into the arterial or portal system.

A. T. Phillipson.

4543

DONNET, V. and GARNIER, L. Facteurs endocriniens de l'absorption intestinale de l'eau et du chlorure de sodium. [**Endocrine factors in intestinal absorption of water and sodium chloride.**] *C.R. Acad. Sci.*, 1956, **242**, 2401–2403.

Eleven dogs with Thiry Vella loops 50 cm. long in the upper part of the small intestine were trained to maintain Pavlov's position without restraint during experiments. The loop was perfused at constant rates with NaCl solutions of different concentration, and the mean absorption in successive 10-min. intervals was studied. Each dog was used 2 or 3 times a week, for one week or more, to obtain a standard for that dog, and then different modifications were introduced.

Solutions with less than 0·1 or more than 1·6 per cent. NaCl gave irregular results. Solutions of 0·5 or 0·6 per cent. were most rapidly absorbed, and in those of 0·6 to 0·8 per cent. the concentration remained unchanged. During digestion, absorption of water increased by from 11 to 17 per cent., but absorption of NaCl was not changed. Injection of from 25 mU. to 10 U. posterior pituitary extract increased absorption of both water and NaCl, the haematocrit showed haemodilution and intestinal motility was reduced. Section of the supra-optic-hypophyseal tract reduced absorption of water, greatly increased absorption of NaCl and haemodilution.

Thyroxine had a variable effect on the absorption of water, reduced absorption of NaCl by 40 per cent. and caused haemodilution. Removal of the thyroid or treatment with antithyroid substances caused a small decrease in absorption of water, a larger decrease in absorption of NaCl and haemoconcentration of 10 per cent.

Female sex hormones increased absorption of water and haemoconcentration, but oestradiol gave equivocal results. Pregnancy gave a similar effect on absorption, but with haemodilution. Deoxycorticosterone acetate had no effect when the diet was normal, but when it followed a salt-deficient diet it increased absorption of both water and NaCl. During "phenomena of physical thermoregulation" [the conditions are not defined] absorption of water and of NaCl increased significantly only in athyroid dogs.—D. Duncan.

See also Absts. 4458–60, 5288, 5373.

COMPOSITION OF BODY FLUIDS AND TISSUES

BLOOD

4544

SOHAR, E., BOSSAK, E. T., WANG, C. I. and ADLERSBERG, D. **Serum components in the newborn.** *Science*, 1956, **123**, 461–462. [Dept. Med., Mount Sinai Hosp., New York.]

Umbilical cord blood was obtained from 10 infants at birth. Proteins, lipoproteins and glycoproteins in serum were estimated by paper electrophoresis. Total protein, albumin, globulins, cholesterol, total and esterified, total polysaccharides and hexosamine in serum were estimated chemically. The results are tabulated and contrasted with data for adult blood.—F. C. Aitken.

4545

SPIVEK, M. L. **Microchemical blood standards for normal five-day-old newborn infants.** *J. Pediat.* 1956, **48,** 581–587. [Los Angeles County Hosp., Beverly Hills, Calif.]

Arithmetic and geometric means, standard deviations and 95 per cent. confidence limits are given for Hb, packed cell volume, blood sugar and N.P.N. and serum albumin, globulin, bicarbonate, chloride, phosphate, calcium, potassium and sodium in heel blood of 40 term infants 5 days old, of whom all but 5 were breast fed, and who were taken at random irrespective of race or sex. Blood was usually taken between 2 and 3½ hr. after feeding; blood sugar and N.P.N. were not clearly related to interval since feeding. The microchemical methods, which require only from 0·02 to 0·05 ml. serum or whole blood for each value, are outlined.—W. M. Deans.

4546

KOLLER, F. Die Blutgerinnung und ihre klinische Bedeutung. [**Coagulation of blood and its clinical significance.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 516–524. [Krankenanst. Neumünster, Zürich.]

A review.

4547

FETTERMAN, G. H., WRATNEY, M. J., DONALDSON, J. S. and DANOWSKI, T. S. **Muscular dystrophy. 1. History, clinical status, muscle strength, and biopsy findings.**

GIRDANY, B. and DANOWSKI, T. S. **2. Radiologic findings in relation to severity of disease.**

DANOWSKI, T. S., WIRTH, P. M., LEINBERGER, M. H., RANDALL, L. A. and PETERS, J. H. **3. Serum and blood solutes and other laboratory indices.**

DANOWSKI, T. S., BASTIANI, R. M., MCWILLIAMS, F. D., MATEER, F. M. and GREENMAN, L. **4. Endocrine studies.**

DANOWSKI, T. S., GILLESPIE, H. K., EGAN, T. J., MATEER, F. M. and LEINBERGER, M. H. **5. Blood sugar and serum electrolytes following insulin and dextrose, alone or in combination.**

FERGUS, E. B., NICHOLS, W. R., HORNE, L. M. and DANOWSKI, T. S. **6. Diminished blood sugar and serum electrolyte responses to epinephrine.**

DANOWSKI, T. S., GREENMAN, L., MATEER, F. M., WRATNEY, M. J. and DONALDSON, J. S. **7. Trials of a pituitary growth factor.**

DONALDSON, J. S., WRATNEY, M. J., PASCASSIO, A., WEIGAND, F. A. and DANOWSKI, T. S. **8. Trials of protein hydrolysate, vitamin supplements and physical therapy.** *Amer. J. Dis. Child.*, 1956, **91,** 326–338; 339–345; 346–355; 356–364; 429–435; 436–441; 442–448; 449–453. [Child. Hosp., Sch. Med., Pittsburgh, Pa.]

1. Thirty-one children with a history of motor weakness suggestive of muscular dystrophy were studied. Muscle biopsy specimens were obtained from 22. In general all the muscle groups tested for motor strength showed impairment. There was a high positive correlation between biopsy findings and clinical status in patients with muscle strength reduced below 50 per cent. of normal, but histological changes appeared to precede clinical deterioration. Motor strength was not further impaired by biopsy.

2. Changes in long bones, spine and soft tissues in muscular dystrophy are described. All of these, except those in the soft tissues of the calves, were attributable to prolonged disuse.

3. Blood findings in the 31 patients with muscular dystrophy were compared with those in a non-dystrophic control group. The only noteworthy differences were that serum Ca and P were significantly higher and cholesterol and Cl were lower than normal in muscular dystrophy.

4. Serum corticosteroids, urinary gonadotropin and 17-ketosteroids and response to blood sugar tolerance tests were within the normal range. Serum protein-bound I tended to be high and capillary blood sugar change after insulin by vein was less in muscular dystrophy than in normal subjects.

5. The blood sugar response to insulin or glucose was the same in children with muscular dystrophy as in normal controls. When both insulin and glucose were given the dystrophic children became hyperglycaemic and control children became hypoglycaemic. With insulin given alone or in combination with glucose the fall in serum inorganic P, K and bicarbonate was less in dystrophic children than in controls.

6. Adrenaline injected subcutaneously produced a small hyperglycaemic response and smaller decreases in serum inorganic P, K and bicarbonate in dystrophic children than in normal controls.

7. Pituitary growth hormone given daily for 6 to 8 months produced no clinical improvement in 4 children with muscular dystrophy. The growth hormone did not cause changes in serum and blood constituents, nor did it influence N or electrolyte balance. It had no diabetogenic effect, did not stimulate thyroid, adrenal or gonads and did not alter blood volume or clotting time.

8. Treatment with protein hydrolysates and vitamins, with or without physical therapy, for up to 1 year or more produced no objective evidence of improvement in motor power of children with muscular dystrophy. Deterioration occurred in some.—F. C. Aitken.

4548

IVES, M. and DACK, G. M. **"Alarm reaction" and normal blood picture in Macaca mulatta.** *J. Lab. Clin. Med.*, 1956, **47**, 723–729. [Res. Div., American Can Company, Chicago, Ill.]

Mean values with standard errors are given at 3-month intervals for bodyweight, Hb value, and red cell, white cell and differential counts of 36 young healthy monkeys (*Macaca mulatta*) of both sexes maintained in a colony for a year. The stock diet consisted of half an orange, 3 slices of whole wheat bread soaked in whole milk to which 1 ml. cod liver oil was added, and kibbled dog food to appetite, with 0·5 g. of 1 : 20 dried liver powder in 30 ml. water weekly by stomach tube. Six food supplements [not specified here] were given by stomach tube. For this purpose and for other tests the monkeys were put in a new type of adjustable restraining box, padded with foam rubber, which is described in detail, with illustrations. A big fall in white cell count after 3 months is ascribed to lessening of the "alarm reaction" by this method of restraint. Hb value and red cell count changed slightly with age, and Hb value, but not red cell count, was affected by the food supplements.—W. M. Deans.

4549

SCHLICHTING, M., SANDERS, R. and GARDNER, M. **The blood picture of 200 Thoroughbreds.** *Vet. Med.*, 1956, **51**, 151. [Vet. Diagnostic Labs., 220 East 23rd St., New York.]

Average Hb values for 57 yearlings, 114 horses in training, 3 to 5 years old, and 29 brood mares and stallions were 14·0, 15·0 and 14·8 g. per 100 ml., respectively. Erythrocyte counts were 11,936,000, 11,344,290 and 10,900,500, and white cell counts 10,530, 10,286 and 10,035. The distribution of the types of white cell is shown.

T. D. Bell.

4550

BRENON, H. C. **Erythrocyte and hemoglobin studies in Thoroughbred racing horses.** *J. Amer. Vet. Med. Assoc.*, 1956, **128**, 343–345. [Brenon Lab., Inglewood, Calif.]

4551

HOLMAN, H. H. **Changes associated with age in the blood picture of calves and heifers.** *Brit. Vet. J.*, 1956, **112**, 91–104. [Agric. Res. Counc. Field Stat., Compton, Berks.]

The blood picture in calves from birth to 2 years old was studied. Red cells were smaller at birth than in cows, and decreased in size for 2 months; then there was a gradual increase until adult size was attained at 2 years old. Red cell count at birth was 8 million per c.mm., and fell to the adult level of 6 million (see Abst. 1868, Vol. 26), rapidly for 4 months, and then gradually to 1 year old. Packed cell volume was 42 per cent. at birth, and fell to 35 per cent., the adult value, within 4 months. Hb was 13 g. per 100 ml. at birth, but rapidly fell, so that the level found in cows, 11 g. per 100 ml., was reached within a week. M.C.H.C., 31 per cent., and sp. gr., 1·051, were similar to adult values. Of the white cells, at birth lymphocytes were 33 per cent., rising to 72 per cent. at 4 months, then falling gradually to 30 per cent. at 2 years. At birth eosinophils were less than 1·0 per cent., and the rise to the adult level of 10 per cent. was slow and irregular. The findings are discussed and compared with others in the literature.—T. D. Bell.

4552

BOTHWELL, T. H., CALLENDER, S., MALLETT, B. and WITTS, L. J. **The study of erythropoiesis using tracer quantities of radioactive iron.** *Brit. J. Haematol.*, 1956, **2**, 1–16. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

Erythropoiesis was studied in 65 patients, most of whom had some blood disorder, by labelling plasma with ^{59}Fe of high specific activity. Technical difficulties and problems of interpretation arose, so that the method did not yield a quantitative measure of red cell production, but qualitative differences were demonstrated in the pattern of red cell production in different groups of blood disorders.—F. C. Aitken.

4553

JONXIS, J. H. P., HUISMAN, T. H. J., VAN DER SCHAAF, P. C. and PRINS, H. K. **Amino-acid composition of haemoglobin E.** *Nature*, 1956, **177**, 627–628. [Dept. Paediat., Univ. Groningen.]

As Hb E, present as 27 to 44 per cent. of the total Hb in 4 human subjects, could not be separated quantitatively from normal Hb the amino acid composition of the mixture was estimated. Hb E appeared to have the same composition as normal Hb and Hb B (see Abst. 5072, Vol. 25) and had 5 valine groups for N-terminal residues like Hb A, B and C.—A. Hepburn.

4554

DÉVÉNYI, T. **Comparative studies of haemoglobin from some closely related species.** *Acta physiol. hung.*, 1956, **9**, 321–328. [Inst. Biochem., Hungarian Acad. Sci., Budapest.] Russian summary.

Hb from horse, donkey and mule contained the same N-terminal ending valyl-leucyl-(lysine)- and the same C-terminal amino acids tyrosine, leucine and glutamine. This supports the theory that Hb from closely related species has similar chemical structure.—A. Hepburn.

4555

LUCK, J. M. **On the "turnover" of plasma proteins.** *Amer. J. Med.*, 1956, **20,** 319–321. [Dept. Chem., Stanford Univ., Calif.]

4556

GERGELY, J. and GLÁZ, E. Über einige Fragen der Regulation des Albumin- und Globulinspiegels in Plasma. [**Regulation of the albumin and globulin levels in plasma.**] *Acta physiol. hung.*, 1956, **9,** *Suppl.*, 27–28. [3. Inn. Klin., Med. Univ., Budapest.]

4557

DÍAZ DE YRAOLA, G. Electroforesis en sangre materna y placentaria. [**Electrophoresis of maternal and placental blood.**] *Rev. clín. española*, 1956, **60,** 291–296. [Inst. Provinc. Sanid., Seville.] English, German and French summaries.

Samples of serum from maternal and cord blood obtained at parturition were examined for ABO grouping, antibody titre anti-A and anti-B, total protein and electrophoretic fractions: only the last are presented here. Individual values and curves are reproduced [but not all legibly] for 64 mothers and infants.

Low serum albumin and high globulin were found in 54 of the mothers and low β-globulin in 54 of the cord blood samples. The relation of the low β-globulin in the newborn infant to icterus is discussed.—D. Duncan.

4558

SAITO, M., GITTLEMAN, I. F., PINCUS, J. B. and SOBEL, A. E. **Plasma protein patterns in premature infants of varying weights on the first day of life.** *Pediatrics*, 1956, **17,** 657–662. [Dept. Paediat., Jewish Hosp., Brooklyn, N.Y.] Spanish and Interlingua summaries.

Three groups of premature infants, weighing 690 to 1350 g., 1455 to 1910 g. and 1920 to 2385 g., and a group of infants weighing 2415 to 4020 g. were studied.

The concentrations of total protein, albumin and globulin in plasma varied directly with the weight of the infants; γ-globulin, but not α- and β-globulins, also varied directly with weight. The mean fibrinogen was highest in the group of lowest weight.—F. C. Aitken.

4559

BALLABRIGA, A. and DOMINGO, L. Electroforesis sobre papel. Aplicaciones en pediatría. 1. Proteinograma. [**Paper electrophoresis. Its applications in paediatrics. 1. The proteinogram.**] *Rev. española Pediat.*, 1956, **12,** 177–199. [Centro Estudios Crecimiento, Barcelona.] French, English and German summaries.

1. Paper electrophoresis was used to study the serum protein in 625 blood samples from 218 clinically normal infants in the first week of life and in 407 samples from infants and children from 1 month to 15 years old with different disorders. The values for the normal infants will be published elsewhere.

Results obtained for the patients are described and illustrated by 31 diagrams.—D. Duncan.

4560

HOMOLKA, J. and MYDLIL, V. Bílkoviny krevní u kojenců s hlediska kvantity a kvality. [**Blood proteins in infants from the viewpoint of quantity and quality.**] *Čas. Lék. čes.*, 1956, **95,** 113–118. [Child. Clin., Prague.] English and Russian summaries.

4561

VERA E., J. and ROCHE, M. **A note on the distribution of the serum protein fractions in apparently normal persons in Caracas.** *J. Lab. Clin. Med.*, 1956, **47,** 418–422. [Inst. Invest. Méd., Fund. Luis Roche, Caracas, Venezuela.]

Samples from donors to a blood bank in Caracas were analysed by paper electrophoresis for 80 and by optical electrophoresis for 38 subjects. The mean values for total protein were 7·30 and 7·39 g. per 100 ml. serum, and the γ-globulin fractions, expressed as percentages of the total protein, 22·3 and 20·7, respectively, were high in comparison with values reported from elsewhere. Possible causes are discussed.—D. Harvey.

4562

RAWNSLEY, H. M., YONAN, V. L. and REINHOLD, J. G. **Serum protein concentrations in the North American Negroid.** *Science*, 1956, **123,** 991–992. [William Pepper Lab. Clin Med., Hosp. Univ. Pennsylvania, Philadelphia.]

4563

SPINETTI-BERTI, M. Electroforesis sobre papel de filtro en condiciones normales. [**Electrophoresis on filter paper under normal conditions.**] *Acta cientif. venezol.*, 1955, **6,** 204–207. [Dept. Bioquim., Univ. de los Andes.] English summary.

Serum proteins were studied by paper electrophoresis in samples from 100 apparently normal subjects aged from 10 to 60 years, in the town of Merida. Values in g. per 100 ml. serum were: total protein 7·36, S.D. 0·52, albumin 4·49, α_1-globulin 0·25, α_2-globulin 0·56, β-globulin 0·80, γ-globulin 1·26, albumin : globulin ratio 1·6 $\pm$ 0·33.

D. Duncan.

4564

REINER, M. and SULLIVAN, M. X. **Cystine in human serum proteins.** *Clin. Chem.*, 1956, **2,** 65–74. [Chem. Lab., District of Columbia Gen. Hosp., Washington.]

Cystine was estimated by a modification of the 1 : 2 - naphthoquinone - 4 - sulphonate method of Sullivan (U.S.P.H.S. Suppl. (1929), **78,** IV, 4) in serum protein fractions prepared by the procedure of Cohn *et al.* (Title 1320, Vol. 16). Albumin contained 6·4 per cent. cystine, γ-globulin 1·94 per cent. and globulin from human haemoglobin 1·9 per cent. Values are also given for fractions from patients with multiple myeloma.—H. G. Bray.

4565

IYER, G. Y. N. **Distribution of glutamine, glutamic acid and aspartic acid between erythrocytes and plasma.** *Indian J. Med. Res.*, 1956, **44,** 201–204. [Med. Coll., Trivandrum.]

Glutamine, glutamic acid and aspartic acid in plasma and red blood cells from 13 normal donors were estimated by paper chromatography (see Abst. 45, Vol. 26). The average concentrations, in mg. per 100 ml. red cells, were glutamine 7·19, glutamic acid 5·58 and aspartic acid 5·11. The values for plasma were 9·08 and 0·89 for glutamine and glutamic acid. Aspartic acid in plasma was estimated visually and in 6 samples was present in traces only. Red cells contained much more aspartic and glutamic acids than plasma, but glutamine was almost equally distributed when water content was taken into consideration.

A. Hepburn.

4566

WYNNE, E. S. and COTT, C. L. **Effect of food intake on amino acids in human plasma.** *Amer. J. Clin. Nutrition*, 1956, **4,** 275–278. [Sect. Exp. Pathol., Univ. Texas, Houston.]

Blood was taken from healthy volunteers after an overnight fast and 1 hr. and 3 hr. after a meal. Amino acids were estimated microbiologically in unhydrolysed plasma. Food did not influence plasma levels of glycine, *iso*leucine, tryptophan and tyrosine. In 1 of 13 experiments histidine and in 4 of 11 experiments on 8 subjects arginine was significantly higher after food.—F. C. Aitken.

4567

CALKINS, W. G. **The blood ammonia in normal persons.** *J. Lab. Clin. Med.*, 1956, **47,** 343–348. [Dept. Int. Med., Med. Centre, Univ. Kansas, Kansas City.]

4568

DE LA HUERGA, J., DUBIN, A., KUSHNER, D. S., DYNIEWICZ, H. A. and POPPER, H. **Studies of serum mucoprotein (seromucoid). 1. A turbidimetric method.**

KUSHNER, D. S., HONIG, K., DUBIN, A., DYNIEWICZ, H. A., BRONSKY, D., DE LA HUERGA, J. and POPPER, H. **2. Physiologic variations and response to stress.** *J. Lab. Clin. Med.*, 1956, **47,** 403–408; 409–417. [Hektoen Inst. Med. Res., Cook County Hosp., Ill.]

1. Seromucoid was estimated with, as a standard, a sample of Armour's bovine serum albumin, which is a homogeneous preparation electrophoretically pure and commercially available. Agreement was good if the tyrosine method was used for the final estimation. Ranges are quoted for 95 per cent. of the subjects, 30 women and 40 men; for the women [28 or 29 is not clear] values were from 60 to 100 mg. with mean and standard deviation 77·1 $\pm$ 14 mg. per 100 ml. serum. For men they were from 55 to 105 mg. and the mean was 81·2 $\pm$ 18 mg. per 100 ml.

2. The variation of seromucoid was studied under different sets of conditions. On 4 successive days fasting levels in 18 patients in hospital did not vary by more than 5 per cent. The values at monthly intervals for 6 months in 21 men and 5 women aged from 71 to 94 years had a mean of 106 $\pm$ 21 mg. per 100 ml. serum; 95 per cent. were between 75 and 130 mg., indicating a slight rise over normal with ageing. Diurnal variation in an 8-hr. period was more than 10 per cent. of the fasting amount in 11 of 20 subjects studied; the greatest increase was by 59 per cent. of the fasting level. No effect of feeding was found in 12 patients. "Stress" was induced by injecting histamine, heat-killed typhoid bacilli, ACTH or parathyroid extract, and the changes were studied also after surgical operations. The indications were that stimulation of adrenals and breakdown of connective tissue both increased seromucoid.

D. Harvey.

4569

BRAGDON, J. H., EDER, H. A., GOULD, R. G. and HAVEL, R. J. **Lipid nomenclature: recommendations regarding the reporting of serum lipids and lipoproteins made by the Committee on Lipid and Lipoprotein Nomenclature of the American Society for the Study of Arteriosclerosis.** *Circulation Res.*, 1956, **4,** 129.

4570

VANDENBERGHEN, C. and VAN BELLE, M. De verdeling der lipoprotëinen bij normale kinderen en technik van de lipoprotëinekleuring. **[The distribution of lipoproteins in normal children and a method for staining lipoproteins.]** *Maandschr. Kindergeneesk.*, 1956, **24,** 54–59. [Afd. Kindergeneesk., Univ. Ghent.] English and German summaries.

Lipoproteins were separated by electrophoresis on paper and stained with Sudan black by the method of Swahn (*Scand. J. Clin. Lab. Invest.*,

1953, Suppl. 1, 5). Values in the blood serum of normal children from birth to 14 years of age are tabulated for total lipids, cholesterol and α_1-, α_2-, β- and chylomicron fractions of lipoproteins.

E. M. Hume.

4571

CHAPIN, M. A. **The distribution of lipid and phospholipid in paper electrophoresis of normal serum lipoproteins.** *J. Lab. Clin. Med.*, 1956, **47,** 386–391. [Dept. Med., Central Maine Gen. Hosp., Lewiston.]

Lipoproteins were studied in serum from 23 normal subjects by zone electrophoresis and the resulting bands were stained to show total lipids and phospholipins.

The β-lipoprotein fraction contained on the average 73 per cent. of the total lipid and 61 per cent. of the phospholipins. Phospholipins comprised on the average 42 per cent. of the total lipids, 38 per cent. associated with β-lipoproteins and 47 per cent. with α-lipoproteins. The lipid : phospholipin ratios for the α- and β-lipoproteins were 0·7 and 1·2.—G. A. Garton.

4572

HERBST, F. S. M., LEVER, W. F. and WADDELL, W. R. **Effects of intravenously administered fat on the serum lipoproteins.** *Science*, 1956, **123,** 843–844. [Dept. Dermatol., Harvard Med. Sch., Boston, Mass.]

Eight normal human subjects were each given a single intravenous infusion of 500 ml. of an emulsion containing 50 g. of either cottonseed oil or synthetic triolein ; 8 dogs were similarly treated with 3000 ml. of the same emulsion. Blood samples were taken before and at the end of the infusions and for several hours subsequently ; serum was subjected to paper electrophoresis and the resulting strips were stained for proteins and lipids.

The fat increased electrophoretic mobility of the α- and β-lipoproteins, and the rise persisted after the infusions had been completed. Injections of heparin during alimentary lipaemia in normal persons have a similar effect.—G. A. Garton.

4573

PAGE, I. H., LEWIS, L. A. and GILBERT, J. **Plasma lipids and proteins and their relationship to coronary disease among Navajo Indians.** *Circulation*, 1956, **13,** 675–679. [Res. Div., Cleveland Clin. Found., Ohio.] Interlingua summary.

Hospital records are quoted to show the extreme rarity of myocardial infarction among Navajo Indians. Their diet is often rich in fat and cholesterol and, in relation to the views already put forward on the origin of atherosclerosis (see Title 823, Vol. 25), blood analyses were undertaken. Samples from 2 groups of Indians in hospital with diseases known not to increase blood lipids, a younger with 12 men and 3 women, average age 31, and an older with 13 men and 8 women, average age 59 years, were compared for protein content with samples from 12 men and 15 women, average age 29½ years, in Cleveland. For the groups in that order, only the data for α_1- and α_2-globulin, 0·70, 0·68 and 0·54 g., and for γ-globulin, 1·49, 1·53 and 1·04 g. per 100 ml. serum, showed differences between the Indian and Cleveland subjects. Lipoproteins and cholesterol were measured in 36 of the Indians and compared with data for 224 control subjects in Cleveland. The S_{70-400} and S_{40-70} fractions were similar ; the mean values for cholesterol in the Indians were lower, 178 and 189, 175 and 186 mg. per 100 ml. for the younger and older men and women, respectively, than in the younger and older groups of men and women in Cleveland, 230 and 216, 242 and 230 mg., respectively.

From these results and from others with 2 strains of dwarf pigs (Lewis and Page, *Circulation*, 1956, **14,** 55) it is suggested that heredity may be of importance in determining level of cholesterol and density of lipoproteins in serum and thereby incidence of coronary disease.—D. Harvey.

4574

BERSOHN, I. and WAYBURNE, S. **Serum cholesterol concentration in new-born African and European infants and their mothers.** *Amer. J. Clin. Nutrition*, 1956, **4,** 117–123. [S. African Inst. Med. Res., Johannesburg.]

Estimations were made of total, free and esterified cholesterol in the blood of 51 African and 37 European mothers at parturition and in the cord blood of their infants. The ages of the mothers were comparable and all were healthy ; no infant weighed less than 5½ lb. The averages for total cholesterol in Africans and Europeans, respectively, were for infants 71·3 and 75·3 and for mothers 189·8 and 258·5 mg. per 100 ml. serum. Corresponding averages in the same order of race were, for free cholesterol, in infants 20·1 and 19·8 and in mothers 48·8 and 67·4 ; for esters, in infants 52·1 and 56·6 and in mothers 142·2 and 191·2 mg. For each constituent the racial difference was not significant for infants, but was highly significant for mothers. Esterified cholesterol as a percentage of total cholesterol was the same in infants, 73 and 75, and in mothers, 75 and 74, irrespective of race.

The findings are discussed in relation to race, diet, occurrence of liver disease and level of production of sex hormones, none of which is considered to account, by itself, for the differences found between African and European mothers.

D. Harvey.

4575

VAN ZYL, A. and KERRICH, J. E. **The serum lipids and age in the baboon (*Papio ursinus*).** *S. African J. Med. Sci.*, 1955, **20,** 97–117. [Dept. Physiol., Univ. Witwatersrand.]

Serum total lipids, cholesterol, lipid P and the cholesterol : lipid P ratio were studied in 44 baboons from newborn to about 13 years old and, for purposes of comparison, in 5 healthy normal persons, 7 monkeys, 7 cows, 9 dogs, 5 guineapigs, 29 rats, 12 fowls and 8 frogs.

In the sucking baboon serum total lipids were about 573 ± 69, cholesterol 200 ± 25·7 and lipid P 12·6 ± 1·5 mg. per cent.; in adult baboons serum total lipids were 470 ± 24, cholesterol 139 ± 12 and lipid P 9·6 ± 0·6 mg. per cent. From 26 estimations on 3 female baboons over 13 years of age, serum total lipids were 573 ± 61, cholesterol 160 ± 11 and lipid P 10·5 ± 2·3 mg. per cent. No significant seasonal or sex difference was found in the mean serum lipids of the baboon. The cholesterol : lipid P ratio remained constant throughout life and was independent of sex or age. The serum lipid pattern of individual baboons was restricted when compared with that of the baboon population as a whole; the within animal variance of serum lipids was 11 to 16 per cent. and the between animal variance 6 to 15 per cent. of that of the average population mean.

From the data obtained in these studies and from other data serum lipids in primates were compared with those in other animals. It was concluded that the species, strain and individual differences in blood lipids are functions not only of diet, but also of heredity.—G. A. Garton.

4576

VAN ZYL, A. **The lipid and iodine content in blood and milk of the lactating baboon; their influence on the serum lipids of the suckling infant.** *S. African J. Med. Sci.*, 1955, **20,** 119–128. [Dept. Physiol., Univ. Witwatersrand.]

Serial studies on the iodine and lipids in the blood serum and milk of 4 lactating baboons and in the blood serum of their young were made monthly during lactation. Blood samples were obtained from each young baboon directly on removal from its mother and then after 7 or 17 hr. of fasting. At the same time the serum and milk of the mothers were analysed for lipid components and for free and protein-bound iodine.

In serum, total lipids were about 696 ± 101, cholesterol 163 ± 12·5 and lipid P 11·3 ± 1·0 mg. per cent. for the lactating animals compared with 463 ± 9 for total lipids, 138 ± 8 for cholesterol and 9·6 ± 0·8 for lipid P in the serum of normal adult females. During lactation there was a slow decline in cholesterol and lipid P, but total serum lipid remained high. The level of protein-bound iodine in the serum of the lactating baboon was similar to that of the normal female. In the milk, the mean total lipids increased after the third month of lactation. The milk inorganic iodine and bound iodine fluctuated considerably during lactation, with values as high as 38·0 μg. and 6·9 μg. per cent., respectively.

The sucking baboon reached a post-absorptive state in respect of total lipids and lipid P within 7 hr. after feeding; serum cholesterol was hardly affected, but decreased after prolonged fasting.

(See preceding abst.) G. A. Garton.

4577

KRAFT, H. Gezielte Kalzium-Therapie. [**Rational treatment with calcium.**] *Berl. Münch. tierärztl. Wochenschr.*, 1956, **69,** 168–170. [Med. Tierklin., Univ. Munich.] English summary.

Ca was estimated in the blood and urine of different animals by the method of Kramer and Tisdall. The urine was also tested with the Sulkowitch reagent for Ca. It was concluded that the Sulkowitch test could serve as a check on Ca metabolism or treatment with Ca, except in horses, which have much $CaCO_3$ in the urine.

The Ca content of the urine was no guide to that of the blood. Some values are given for serum Ca in horses, cattle and dogs. Two llamas had 12·1 and 13·08, 3 vicunas 9·48, 13·81 and 17·55, an alpaca 8·97 and a guanaco 12·46 mg. per cent.

W. M. Deans.

4578

HAMILTON, J. B., BUNCH, L. and HIRSCHMAN, A. **Serum inorganic phosphorus levels in males and females at progressive ages, with concomitant measurements of urinary ketosteroids and androgens in man.** *J. Clin. Endocrinol.*, 1956, **16,** 463–472. [Dept. Anat., State Univ. New York Coll. Med., Brooklyn.]

With combined data from 188 human subjects aged from 13 to 85 years and data from Bullock (*Amer. J. Dis. Child.*, 1930, **40,** 724), it was shown that serum inorganic P decreased from birth to sexual maturity and thereafter remained constant. The excretion of androgens and ketosteroids in the urine of 45 men aged from 21 to 75 years decreased with age and was not correlated with serum inorganic P.—A. Hepburn.

4579

CLEGG, R. E., ERICSON, A. T., HEIN, R. E., MCFARLAND, R. H. and LEONARD, G. W. **An electrophoretic component responsible for calcium binding in the blood sera of chickens.** *J. Biol. Chem.*, 1956, **219,** 447–454. [Dept. Chem., Kansas State Coll., Manhattan.]

The electrophoretic pattern of serum from cockerels given diethylstilboestrol in the diet

revealed a fast moving high-phosphorus component which changed its position when Ca was added. When radio-active Ca was added to serum of cockerels non-diffusible radio-active Ca became associated with this component, and it is suggested that the high values for non-diffusible Ca in the serum of laying hens and cockerels treated with stilboestrol are due to the presence of this component.—R. Hill.

4580

RIEDESEL, M. L. and FOLK, G. E. (Jr.) **Serum magnesium changes in hibernation.** *Nature*, 1956, **177,** 668. [Dept. Occupat. Health, Univ. Pittsburgh, Pa.]

Bats of the species *Eptesicus fuscus* were collected while hibernating in a cave and were bled while still dormant or after being kept and fed for 4 days. The others, *Myotis lucifugus*, were caught in a summer colony and during hibernation in a cave, and were bled after from 1 hr. to 9 weeks of hibernation.

Serum K showed no significant change. Serum Ca decreased during hibernation and serum Mg was 50 per cent. above the level in active bats. Sp. gr. of serum rose slightly but not consistently. Serum Mg was high after only 1 to 2 hr. of hibernation and had dropped 1 hr. after the bats were aroused. It was not related to season or closely to body temperature.—D. Duncan.

4581

HOLEMANS, K., ANDRÉ, J. and MARTIN, H. Quelques données élémentaires sur le métabolisme du chlore et de l'eau chez les indigènes du Kwango. **[Metabolism of chloride and water in the native inhabitants of the Kwango.]** *Ann. Soc. belg. Méd. trop.*, 1955, **35,** 591–602. Flemish summary.

In natives of the Kwango, chloride in the blood and plasma was estimated for 43 men, and for 28 non-pregnant and 25 pregnant women. Concentration and amount of chloride and volume of urine excreted in 24 hr. were measured for 51 men and for 51 non-pregnant and 57 pregnant women. The volume of water consumed in 24 hr. was measured for 21 men and 21 adult women and for 31 women at the end of pregnancy. The concentration of chloride in the sweat was estimated for 21 native men and 18 European men.

The mean value for chloride in the plasma was 378·1 mg. per 100 ml., which is 10 mg. higher than that accepted for white subjects. In whole blood the mean for all the native subjects was close to that accepted for white subjects, but the values for native men, women and pregnant women, 291·7, 297·5 and 307·0 mg., respectively, were significantly different from one another and were explained by differences in haematocrit.

The mean concentration of chloride in the urine was less than that recorded in Europe, and in pregnant women it was significantly less than in men and non-pregnant women. The mean volume of urine passed in 24 hr. was less than half that, 1500 ml., accepted for Europeans. That for men was lowest, 569 ml., and that for pregnant women, 747 ml., was highest. The mean amount of chloride in the urine in 24 hr., in g., was 2·92 for men, 3·37 for non-pregnant women and 2·96 for pregnant women ; it was only one-quarter of that reported for white subjects.

The mean volume of water drunk in 24 hr. was 488 ml. for men and non-pregnant women, and 611 for pregnant women, compared with from 1400 to 1500 reported for Europeans in temperate climates, but when allowance was made for the water content of cooked food, particularly for that derived from the native staple, manioc, it was concluded that the intake of water by Europeans and natives was about the same.

The mean concentration of chloride in g. per litre sweat was 2·25 for the 21 natives and 4·16 for the 18 Europeans.

It is calculated that the native consumes only about one-quarter of the salt consumed by the European, for whom the 10 to 15 g. consumed in temperate climates is considered insufficient in the tropics. It is concluded that the African native must have some mechanism for sparing chloride.

E. M. Hume.

4582

GILLES, H. M. and SCOTT, J. G. **Serum iron in Gambian Africans.** *Ann. Trop. Med. Parasitol.*, 1956, **50,** 103–104. [Med. Res. Counc. Labs., Fajara, Gambia.]

Serum Fe was estimated in 31 male and 19 female Gambian Africans attending hospital with minor complaints. They had no anaemia and were apparently free from malaria. The results were closely similar to published values for Europeans: 106 μg. per 100 ml., range 72 to 168, for men, and 98, 74 to 150, for women.—F. E. Hytten.

4583

RECHENBERGER, J. Über die Eisenbindungskapazität des Blutserums. 1. Die Eisenbindungskapazität des Serums bei Hepatitis epidemica und chronischen Leberparenchymschäden. **[Iron-binding capacity of blood serum. 1. Iron-binding capacity of the serum in epidemic hepatitis and chronic damage of liver parenchyma.]** *Deutsch. Ztschr. Verdauungs- u. Stoffwechselkr.*, 1956, **16,** 114–119. [Med. Klin., Univ. Leipzig.]

1. In 86 healthy male subjects in groups between the ages of 10 to 19 and 70 to 79 years, serum Fe and total Fe-binding capacity fell with age [after

age 39 in Table 1]. For men the maximum serum Fe was 128 μg. per cent., at age 30 to 39, and the minimum 80 μg.; corresponding Fe-binding capacities were 328 and 281 μg. For 78 women the corresponding values were 110 and 78 μg.; 328 and 276 μg. Bilirubin, serum Fe and Fe-binding capacity were estimated in 30 patients with epidemic hepatitis. All were above normal; in early stages of the disease, binding capacity seemed more closely related to bilirubin than to serum Fe. In 18 patients with chronically damaged liver parenchyma, after hepatitis, serum Fe was above normal, but Fe-binding capacity was well below normal. The course of events in acute hepatitis may be caused by leakage of Fe, or ferritin and possibly apoferritin, from the damaged liver.

I. Leitch.

4584

LANZ, H. Über den Eisengehalt des Rinderserums bestimmt nach der kolorimetrischen Eisenrhodanatkomplex-Methode. [**The iron content of cattle serum estimated by the colorimetric iron thiocyanate complex method.**] *Inaugural Dissertation, Vet.-Med. Fac., Univ. Berne*, 1955, pp. 37. [Inst. Tierzucht Hyg., Univ. Berne.]

The work was suggested by the report of von Grünigen *et al.* (Abst. 2667, Vol. 18) on a deficiency disorder of young cattle, cured by giving Fe.

About a third of this mimeographed publication is occupied by a general discussion of iron metabolism, with references chiefly to medical literature, and about a third of the rest by details of methods of estimating Fe in serum. The phenanthroline method as used by Heilmeyer and Plötner (Abst. 5769, Vol. 6) did not give sufficiently accurate or consistent results and a modification of the thiocyanate method (Abst. 140, Vol. 25) of Josephs [wrongly given as Hugh in text and references], in which the colour was measured by the EEL colorimeter with filter 624, was adopted. An accuracy to within ± 4 μg. per cent. is claimed for the procedure.

The following values for serum Fe were obtained, mostly from healthy animals on one large farm near Berne (numbers in brackets): calves for veal, reared on milk only (58), 50 to 116, mean 81·5 μg. per cent.; calves at or after weaning (14), 170 to 234, mean 195·3; fat cattle aged 1½ to 2½ years at slaughterhouse (21), 130 to 228, mean 165, and yearlings and cattle on farm, in good condition after alpine pasture (31), 140 to 204, mean 171; pregnant cows (81), gradual rise from 150 to 204 μg. per cent. during pregnancy, the difference between the means for cows in the first 4 and in the last 5 months being highly significant, and non-pregnant cows (34), 124 to 200, mean 162·4. No relation between serum Fe and milk yield could be established, and little Fe is excreted in the milk; the greatest demand is during pregnancy, to supply the needs of the foetus. It is suggested that tests with readily absorbed forms of Fe should be made on pregnant cows which do not show the rise in serum Fe, to find out whether the serum Fe can be raised or whether they are in Fe equilibrium. The high values for recently weaned calves are interpreted as being due to reaction to a deficit of Fe produced by the diet of milk only, and it is suggested that the disorder described by von Grünigen *et al.* develops because the deficient animals are too weak to digest anything but milk.—W. M. Deans.

See also Absts. 4018, 4056, 4081, 4107, 4116, 4434, 4537, 4589, 4592, 4600, 4602, 4615, 4702, 4703, 4752, 4761, 4837, 4921, 4933, 4956, 5006, 5019, 5054, 5115, 5172.

LYMPH, CEREBROSPINAL FLUID, ETC.

4585

BRAUN, P., FÖLDI, M., KISFALUDY, S. and SZABÓ, G. **Free amino-acid content of the lymph.** *Nature*, 1956, **177**, 1133–1134. [1. Dept. Med., Univ. Budapest.]

The results will be published in full in *Acta med. hung.*

4586

DREIZEN, S., GILLEY, E. J., MOSNY, J. J. and SPIES, T. D. **The distribution of selected vitamins in human whole saliva.** *Internat. Ztschr. Vitaminforsch.*, 1955, **26**, 257–262. [Dept. Nutrit. Metabol., Northwestern Univ. Med. Sch., Chicago, Ill.] French and German summaries.

Samples of 25 ml. saliva from 50 subjects were centrifuged at 3000 r.p.m. for 15 min., and vitamin A, vitamin C, pantothenic acid, nicotinic acid and biotin were measured in the supernatant fluid and in the sediment by chemical or microbiological methods. All 5 vitamins were present, and the amounts in the sediment were greater than in the supernatant fluid. The values for nicotinic acid in the two fractions differed significantly. In some subjects large doses of vitamins were given for 7 days, but the amounts found in the saliva did not differ significantly from the original values.

A. M. Copping.

4587

BULMER, M. G. and FORWELL, G. D. **The concentration of sodium in thermal sweat.** *J. Physiol.*, 1956, **132**, 115–122. [R.A.F. Inst. Aviation Med., Farnborough, Hants.]

The hypothesis is advanced that sweat is produced from a precursor fluid with the same Na concentration as interstitial fluid and that the sweat glands absorb Na from the precursor. The amount of Na retained is taken as $b(V + K) - yV$,

where b is the concentration of Na in the interstitial fluid, y that in the sweat, V the rate of sweating and K the amount of water absorbed. At high rates of sweating this is supposed to be constant.

Experiments with young men exercised on a treadmill in a warm environment showed that the hypothesis held for sweat concentrations of more than 50 m. equiv. per litre. Below this concentration Na retention is thought to be less than the maximum. Skin temperature had little or no effect on the Na concentration in sweat.

A. Hepburn.

4588

RAMANATHAN, N. L., GUPTA, A. S. and LUNDGREN, N. P. V. **Changes in the salt concentration of sweat during exercise in monsoon weather.** *Indian J. Med. Res.*, 1956, **44,** 377–384. [Indust. Health Res. Unit, Indian Counc. Med. Res., Calcutta.]

Sweat was collected in small petri dishes from the backs of 6 subjects during exercise on a bicycle ergometer. The sweat was transferred to a cell of 1 mm. bore and the NaCl concentration was calculated in as little as 0·03 ml. from the formula

$$\text{per cent. NaCl} = -0{\cdot}0477 + 47{\cdot}74\,k,$$

where k is the specific conductivity. The salt concentration generally increased progressively with the duration of exercise, usually 90 min. Values obtained agreed with those for larger samples collected in a bag on the arm.

A. Hepburn.

See also Absts. 4051, 4577.

TISSUES

4589

ALLEN, T. H., PENG, M. T., CHEN, K. P., HUANG, T. F., CHANG, C. and FANG, H. S. **Prediction of blood volume and adiposity in man from body weight and cube of height.** *Metabolism*, 1956, **5,** 328–345. [Dept. Physiol., Coll. Phys. Surg., Columbia Univ., New York.]

Blood volume, bodyweight and density were estimated in 81 Chinese men and women. The data were used to find the blood volume of the lean body mass and of the adipose tissue in males and females. Blood volume of the lean body mass was the same, 92·8 ml. per kg., for both sexes, but blood volume of adipose tissue was in males 22·3 and in females 11·7 ml. per kg.

Thus, body mass alone is not a measure of blood volume. An equation relating blood volume to bodyweight and the cube of the height is given for each sex.

A second equation was devised, predicting adiposity from weight and height. The equation was tested on data from several other laboratories and was found to give good predictions.—A. W. Boyne.

4590

ALLEN, T. H., PENG, M. T., CHEN, K. P., HUANG, T. F., CHANG, C. and FANG, H. S. **Prediction of total adiposity from skinfolds and the curvilinear relationship between external and internal adiposity.** *Metabolism*, 1956, **5,** 346–352. [Dept. Physiol., Coll. Phys. Surg., Columbia Univ., New York.]

In 87 subjects skinfold thickness was measured at 10 sites and adiposity was estimated by weighing in water as described in the preceding paper. The average skinfold thickness, less 4 mm. representing the skin itself, was used to predict total adiposity as a percentage of bodyweight. Total adiposity was predicted also from the mass of subcutaneous adiposity, and results by the 2 methods agreed well.

Subcutaneous adiposity was estimated and plotted against internal adiposity, both measured as percentages of lean body mass. The proportion of subcutaneous adiposity to internal adiposity increases with increase in total adiposity.

A. W. Boyne.

4591

ALLEN, T. H., PENG, M. T., CHEN, K. P., HUANG, T. F., CHANG, C. and FANG, H. S. **Similarity of vital capacity in terms of body weight less adiposity in both sexes; appendix on the graphic estimation of adiposity and essential body mass from height and weight.** *Metabolism*, 1956, **5,** 353–358. [Dept. Physiol., Coll. Phys. Surg., Columbia Univ., New York.]

The vital capacity was measured in 87 adults and the essential body mass was calculated from equations which are given. The data were plotted against one another and showed a straight-line relation. A large number of other subjects were included, and showed a mean vital capacity of 93 ml. per kg. essential body mass.

In an appendix 2 charts are given, one for men, boys and girls, the other for adult women, showing the relation between essential body mass on the one hand, and height and weight on the other. These are given as an alternative for the accepted methods of measuring adiposity.—A. W. Boyne.

4592

KOVAL'SKII, V. V. and PADUCHEVA, A. L. Sezonnye izmeneniya obmena veshchestv u karakul'skikh ovetz. [**Seasonal variations in the metabolism of Karakul sheep.**] *Dokl. Akad. Nauk SSSR*, 1956, **106,** 505–507. [Vses. Nauch.-Issled. Inst. Zhivotnovodstva.]

In 118 Karakul sheep the average weight reached its peak of 57·6 kg. in October, then fell gradually to 48·4 kg. in February, went up to 52·0 kg. in April and continued to rise till the next October. The April weight is based on 39 non-pregnant sheep.

The post-partum weight of sheep was 46·4 kg., indicating that the weight gain of pregnant animals was due to the products of pregnancy, the real weight increase of mothers beginning in May.

For blood components maximum values were found in autumn and minimum values in spring. The range per cent. was dry matter 8·1 to 7·1, protein 8·0 to 5·6, Hb 9·5 to 6·5., cholesterol 92 to 45 mg., chlorides 420 to 358 mg., Ca 10·5 to 5·5 mg., and P 9·5 to 3·0 mg.

Skin, muscles and subcutaneous tissues were examined by biopsy from the hindquarters. Chloride content appeared to vary erratically. The water content of muscles was most stable, the dry matter between 20 and 23 per cent. with highest values in summer and autumn and lowest by the end of pregnancy in April. In subcutaneous tissues the dry matter varied between 20 and 34 per cent., lowest in spring and highest in summer. The dry matter content of skin was less stable than that of muscles and was greatest in summer and winter.

The better the nutritional state of the animals, the higher the values for dry matter and its content of protein, Hb, cholesterol and chlorides; poor nutrition leads to hydraemia.—F. Billewicz.

4593

PITTS, G. C. **Body fat accumulation in the guinea pig.** *Amer. J. Physiol.*, 1956, **185,** 41–48. [Dept. Physiol., Sch. Med., Univ. Virginia, Charlottesville.]

The carcases of 72 guineapigs were each separated by dissection into 11 gross body structures, comprising heart, liver, kidneys, spleen, gut, gut contents, brain and spinal cord, muscle, unscraped bone with marrow, skin with subcutaneous fat and internal fat, and a group including all other tissues (lungs, trachea, adrenals, eyes, blood and bile). The guineapigs had been fed to appetite on Purina rabbit chow and fresh greens; 47 were adult animals (26 males and 21 females), 18 growing animals from 4 days to 8 months old (9 males and 9 females), and 7 male animals which had undergone severe exercise from weaning to 8 months of age. The sp. gr. of each eviscerated carcase was estimated and the dissected tissues and organs were freeze-dried and extracted with ether and light petroleum to yield total fat. The distribution of fat and the fat content of each organ and tissue were studied statistically.

The accumulation of fat in each of the groups of rats was associated mainly with the saturation of existing fat depots, though some increase in the number and size of lipocytes took place. Females had a larger fat storage capacity than males without hypertrophy or proliferation of lipocytes. At all levels of body fatness the proportion of total body fat in subcutaneous and internal depots was constant except in immature animals, though males had 6 to 7 per cent. less total fat in the subcutaneous depots and proportionately more in the internal depots than had females. The distribution of fat in the organs was similar in both sexes. In adult animals body fatness was related to sp. gr. of the carcase by the following equation:

$$\text{Fatness} = 100\left(\frac{4{\cdot}183}{\text{sp. gr.}} - 3{\cdot}790\right).$$

About 95 per cent. of total body fat was in the fat depots, most of the remainder in the gut, bone, liver, kidneys and heart.—G. A. Garton.

4594

HRACHOVEC, J. Sur les relations entre les différences des vitesses de croissance des organes et l'évolution de leur teneur en composés lipidiques au cours de la croissance du lapin. [**Relations between differences in rate of growth of organs and changes in content of lipid compounds during growth of the rabbit.**] *C.R. Acad. Sci.*, 1956, **242,** 1071–1074.

Lipid P and free cholesterol were estimated in brain, liver, kidneys, lungs, stomach, muscle and perirenal adipose tissue of rabbits killed between the 19th day of embryonic life and the 620th day of age.

Brain showed a progressive increase in lipid P and free cholesterol content throughout growth to the adult state; similar but smaller increases were found in other tissues, except adipose tissue and muscle. In muscle the maximum content of lipid P was found at 3 weeks of age and the maximum value for free cholesterol at the end of gestation.—G. A. Garton.

4595

YARBRO, C. L. and ANDERSON, C. E. **Acetal phosphatides in the adipose tissue of newborn rats.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 408–409. [Dept. Biochem. Nutrit., Sch. Med., Univ. N. Carolina, Chapel Hill.]

Acetal phospholipins, phospholipins and total lipids were estimated in livers and subcutaneous adipose tissue of young rats killed at 1, 2, 3, 5, 8, 15 and 21 days of age.

The content of acetal phospholipins and total phospholipins in the adipose tissue, which was quite high in animals up to 3 days old, decreased rapidly as depot fat was laid down, until only traces were found in the tissues of rats 3 to 8 days old. Similar changes did not occur in liver lipids. The results indicate that acetal phospholipins and phospholipins are involved in some way in the laying down of depot fat in adipose tissue. A similar process in liver, where lipid turnover is more rapid, is not excluded.—G. A. Garton.

4596

CALÌ, V. Sul comportamento dei lipidi e del glicogeno del fegato e dei muscoli nell'intossicazione subacuta da tetracloruro di carbonio. [**Behaviour of the lipids and glycogen of the liver and muscles in subacute poisoning with carbon tetrachloride.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 948–950. [Ist. Med. Lavoro, Univ. Palermo.]

Of 12 guineapigs weighing from 280 to 345 g., fed on a normal diet, 3 received no treatment, and 9 were exposed to inhalation of CCl_4 vapour for about 5 min. twice daily for 8 days, after which the 7 survivors were killed. In the liver and slightly in the muscles of the poisoned animals, total lipids, fatty acids and the unsaponifiable fraction increased; glycogen decreased.

E. M. Hume.

4597

BERNHARD, K. and LINDLAR, F. Lipidgehalte und Fettsäurezusammensetzung des Gehirns und der Leber ganz junger und alter Ratten. [**Lipid content and fatty acid composition of the brain and liver of young and old rats.**] *Helv. physiol. pharm. Acta*, 1956, **14,** 113–119. [Physiol. Chem. Inst., Univ. Basle.] English summary.

Lipids were extracted from the livers and brains of rats aged 3 days or 22 months and separated into neutral fat and phospholipins. The fatty acids of each fraction were examined spectrophotometrically for their content of polyunsaturated acids; the amounts of palmitic and stearic acids were estimated chromatographically (Abst. 1434, Vol. 26).

The brains and livers of older rats had average lipid contents of 47·9 and 18·2 per cent., on dry matter basis, compared with 24·1 and 23·0 per cent. for the young rats. Brains and livers of the older rats contained 27·5 and 13·2 per cent. phospholipins, those of young rats 17·7 and 7·3 per cent. The relative amounts of polyunsaturated and saturated fatty acids in the different lipid fractions did not show any significant change with age.

G. A. Garton.

4598

HESS, W. C., LEE, C. Y. and PECKHAM, S. C. **The lipide content of enamel and dentin.** *J. Dent. Res.*, 1956, **35,** 273–275. [Dept. Biol. Chem., Sch. Med., Georgetown Univ., Washington, D.C.]

The cholesterol content of human enamel is 0·008 per cent. and that of dentine 0·024 per cent. Total lipids other than cholesterol make up 0·60 and 0·36 per cent., respectively.—A. K. Lough.

4599

ODUM, E. P. and CONNELL, C. E. **Lipid levels in migrating birds.** *Science*, 1956, **123,** 892–894. [Dept. Zool., Univ. Georgia, Athens.]

Specimens of 55 migrating birds, representing 8 species, were obtained in Georgia, U.S. The carcases were frozen and then minced before extraction of total lipids. The lipid content of these birds was compared with that of birds before and after their migration and also with that of several non-migratory birds.

The migrating birds, in passage to Central or South America, had a lipid content of about one-third of their dead weight or about two-thirds of their dry weight; this lipid was mostly in large subcutaneous and intraperitoneal depots. By contrast, resident species and migratory species when not engaged in migration contained much smaller amounts of lipid. Just before migration all organs, except the heart, increased in lipid content.

G. A. Garton.

4600

THACKER, E. J., ALDERMAN, M. L. and BRATTON, R. W. **The effect of plane of nutrition on the mineral composition of blood serum, liver, and on the growth of bone.** *J. Animal Sci.*, 1956, **15,** 447–455. [U.S. Plant, Soil Nutrit. Lab., A.R.S., Ithaca, N.Y.]

Holstein bull calves were fed from 3 days old on low, medium or high planes of nutrition with balanced rations. Some calves were slaughtered at 16, 32, 48, 64 and 80 weeks of age.

The composition of bone was not affected by the plane of nutrition, and was the same in calves of the same weight. Up to 80 weeks of age skeletal growth continued normally on all planes of nutrition.

Blood serum Cu, Mo and Mn were not affected by age. Serum Cu increased with rising plane of nutrition.

In liver, water content decreased with age, but there was no difference with plane of nutrition. Iron, Mo and Mn were not affected by the conditions studied. Up to 48 weeks the Cu concentration of the liver decreased; it then remained constant, and was greater on the high than on the lower planes of nutrition.—T. D. Bell.

4601

FORBES, G. B., REID, A. F., BONDURANT, J. and ETHERIDGE, J. **Changes in total body chloride during growth.** *Pediatrics*, 1956, **17,** 334–340. [Dept. Paediat., Sch. Med. Dent., Univ. Rochester, N.Y.] Spanish and Interlingua summaries.

Data on total body chloride in foetuses were obtained from the literature. The authors' own data, obtained by dilution studies with radio-active Br, for infants (Title 1522, Vol. 24) and for adults (Reid *et al.*, to be published) were used also. The data conformed to the differential growth equation $y = bx^k$, where y is total body Cl, x is bodyweight,

log b is the intercept on the y axis and k is the slope. Chloride content is thus a simple power function of bodyweight.—F. C. Aitken.

4602

BECK, A. B. **The copper content of the liver and blood of some vertebrates.** *Austral. J. Zool.*, 1956, **4,** 1–18. [Div. Animal Health Prod., C.S.I.R.O., Lab. Animal Health Nutrit., Dept. Agric., Nedlands.]

Cu was estimated with diethyldithiocarbamate complex in amyl alcohol after destruction of the organic matter with nitric, sulphuric and perchloric acids. Values for liver and blood are given in appendix tables. Livers were obtained from domestic and wild species of mammals, birds, reptiles, amphibians and fish and blood samples from some of the species.—D. Duncan.

4603

WEITZEL, G., BUDDECKE, E., FRETZDORFF, A. M., STRECKER, F. J. and ROESTER, U. Zink im Augenhintergrund des Seehundes. [**Zinc in the fundus of the seal.**] *Hoppe-Seyler's Ztschr.*, 1956, **304,** 1–10. [Biochem. Abt., Med. Forschungsanst., Max-Planck-Gesellsch., Göttingen.] English summary.

Previous work (Title 861, Vol. 24; Abst. 659, Vol. 25; *Hoppe-Seyler's Ztschr.*, 1955, **299,** 193) had shown that the tapetum lucidum of the eye of carnivores was exceptionally rich in Zn and S, present as a complex of Zn and cysteine. In the present paper Zn was again estimated polarographically (Title 119, Vol. 24) and by a complexometric method (Flaschka, *Mikrochemie*, 1952, **39,** 38) and S by the method of Fritz and Freeland (*Anal. Chem.*, 1954, **26,** 1593), and Zn and cysteine were detected by paper chromatography as before in different parts of 200 eyes of seals (*Phoca vitulina*, L.) killed on the west coast of Schleswig-Holstein in summer.

The amounts of Zn found in lens, vitreous humour, retina and iris were trifling. In contrast, very large amounts were found in the choroid, almost all in the relatively abundant tapetum lucidum, which contained from 20 to 30 mg. per g. fresh tissue, or about 10 mg. per eye, in adult seals; young animals, 10 weeks old, had much less. There was roughly half as much S as Zn. Further study showed that again Zn was present as a Zn-cysteine complex, which formed 60 per cent. of the dry matter of the tapetum, the rest being the usual cell constituents; no cystine or other organic compound linked with Zn was detected.

W. M. Deans.

4604

DISCHE, Z., BORENFREUND, E. and ZELMENIS, G. **Changes in lens proteins of rats during aging.** *Arch. Ophthalmol.*, 1956, **55,** 471–483. [Dept. Ophthalmol., Coll. Phys. Surg., Columbia Univ., New York.]

The wet weight of the rat lens increased rapidly from 20 mg. at 35 days old to 54 mg. at 300 days. From then until 151 weeks old the rise was very slow. Total lens protein also increased rapidly from 7·5 mg. to about 18 mg. at 20 weeks old and then more slowly to reach a maximum of about 27 mg. Soluble protein, starting at about 7 mg. was almost doubled at 20 weeks old, reached a maximum of about 15 mg. at a year and then fell to about 12 mg. The insoluble protein of the lens increased at a declining rate from less than 1 mg. to about 15 mg.

The soluble proteins did not contain significant amounts of cystine, but the insoluble proteins contained as much cystine as cysteine. The amount of cystine plus cysteine was about 2·4 per cent. in both proteins in rats under 20 weeks old. In soluble proteins it decreased with age to 1·2 per cent. but it was fairly constant in the insoluble proteins. There were more SH groups available for oxidation by ferricyanide in young than in older rats.—A. Hepburn.

4605

FRANÇOIS, J. and RABAEY, M. Les protéines de l'épithélium cornéen. [**The proteins of the corneal epithelium.**] *Ann. Oculist.*, 1956, **189,** 445–458. [Clin. Ophthalmol., Univ. Ghent.] English summary.

4606

BATTISTONE, G. C. and BURNETT, G. W. **Studies of the composition of teeth. 3. The amino acid composition of human dentinal protein. 4. The amino acid composition of human enamel protein. 5. Variations in the amino acid composition of dentin and enamel.** *J. Dent. Res.*, 1956, **35,** 255–259; 260–262; 263–272. [Dept. Dent. Res., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

3. Dentine was separated by a flotation method from caries-free permanent teeth recently extracted from men over 18 years of age. Decalcification was by ethylenediamine tetra-acetic acid (EDTA) solution, *p*H 7·0 to 7·5, or the dentine protein was extracted by refluxing with distilled water. After hydrolysis by acid, amino acids were separated and estimated chromatographically. The findings for 16 acids are tabulated and, by comparison with Neuman's results (Abst. 533, Vol. 20) the organic matrix of dentine is concluded to be a collagen.

4. Enamel was separated by chipping from teeth from sources as in Part 3 and amino acids were estimated after decalcification with EDTA. The histidine : lysine : arginine ratio, 1 : 4 : 12, was

that of a eukeratin, but the presence of proline and hydroxyproline and the high and low contents, respectively, of glycine and cystine suggested that the protein was not a typical keratin.

5. Six tables are presented to show the amino acid composition of dentine and enamel from non-carious human teeth and to illustrate the effect on that of preserving the teeth for several months, of separating the dentine and enamel by flotation or by chipping and of decalcifying with EDTA, HCl, Morse solution or lactic acid. In preserved teeth there was less proline, total amino acid and N than in freshly extracted teeth. The effect of method of preparation was slight on dentine, but in enamel by the flotation method there was less glutamic and aspartic acids and more ash than by the chipping method. Some losses of amino acids from both dentine and enamel occurred with each decalcifying fluid, least with EDTA.—D. Harvey.

4607

BIÖRCK, G. **The content of cytochrome c in human heart and skeletal muscle.** *Acta med. scand.*, 1956, **154,** 303–316. [Cardiol. Lab., Dept. Med., Univ. Lund.]

See also Absts. 4083, 4350, 4740, 4742, 5070.

DUCTLESS GLANDS AND HORMONES

4608

GODING, J. R. and DENTON, D. A. **Adrenal cortex and the parotid secretion of sodium-depleted sheep.** *Science*, 1956, **123,** 986–987. [Ionic Res. Unit, Dept. Physiol., Univ. Melbourne.]

Sheep with a fistula of the parotid duct rapidly become depleted of Na if not given extra Na to replace losses. When deoxycorticosterone was given to a sheep moderately depleted of Na in this way, the Na content of the saliva fell and the K content rose; but when the sheep was grossly depleted of Na, deoxycorticosterone had little effect on the saliva.

Sheep with a parotid fistula had both adrenals removed. They could be kept in good condition with 5 to 10 mg. deoxycorticosterone and 25 mg. cortisone daily when enough Na was given also. When the hormones were withdrawn there was the expected large loss of Na in urine and fall in the plasma Na : K ratio, but an increase in the Na : K ratio of saliva. When deoxycorticosterone was increased to 40 mg. daily the Na : K ratio of saliva fell in 5 days from 17 to 2. When Na was withheld, there was little change in the ratio, but signs of adrenal insufficiency appeared in 2 to 4 days. When Na was withheld, but deoxycorticosterone was raised to 20 mg. daily, salivary Na : K ratio fell as it did in sheep with adrenals intact.

It is considered that the adrenal is concerned in the response of the parotid to Na depletion.

D. Duncan.

4609

BRUNNER, H., KUSCHINSKY, G. and PETERS, G. Die Beeinflussung der renalen Wasser- und Salzausscheidung normaler und hypophysektomierter Ratten durch Nebennierenrindenhormone. [**Effect of adrenal cortical hormone on renal excretion of water and salt in normal and hypophysectomised rats.**] *Arch. exp. Pathol. Pharmakol.*, 1956, **228,** 578–595. [Pharmakol. Inst., Univ. Mainz.] English summary.

4610

BOIS, P. and SELYE, H. **Inhibition by food restriction of the renal damage due to corticoid-overdosage.** *Experientia*, 1956, **12,** 144–146. [Inst. Med., Univ. Montreal.] German summary.

Five groups, each of 10 rats from which one kidney had been removed, were given 1 per cent. NaCl solution to drink. One group on unrestricted diet served as controls; the 4 other groups were given subcutaneously 1 mg. deoxycorticosterone acetate (DOCA) alone or with 1 mg. cortisol acetate (COLA), 2 groups with diet unrestricted and 2 with diet restricted so as to cause loss of bodyweight of from 1/5 to 1/4 of its initial amount. At the beginning average bodyweight was 99 g. The animals were killed after treatment for 20 days.

Control rats gained weight and showed no nephrosclerosis or myocarditis. With unrestricted diet and DOCA alone bodyweight increased, kidney and heart were much enlarged, nephrosclerosis and myocarditis were present and fluid intake was high; with DOCA and COLA there was slight loss of weight, fluid intake and myocarditis were not altered and nephrosclerosis was aggravated. With restricted diet and DOCA alone loss of weight was 20 per cent. and no cardiac or renal lesion appeared; with DOCA and COLA loss of weight was 27 per cent., nephrosclerosis and myocarditis appeared, weights of kidney and heart and amount of fluid drunk were greater than with DOCA alone, but less than with unrestricted diet.

Reduction of food intake by drugs or other experimental conditions will, it is concluded, inhibit the production of nephrosclerosis by corticoids.—D. Harvey.

See also Absts. 4349, 4407, 4419, 4431, 4432, 4488–93, 4683, 4695, 4733, 4810, 4811.

4611

GILSANZ, V., PAPACIOS, J. M., MEDINA, E. and HUECK, A. La prueba de la sobrecarga de calcio en el hipoparatiroidismo y otros procesos. [**The test of calcium tolerance in parathyroid insufficiency and other disorders.**] *Rev. clín. española*, 1956, **60,** 360–365. [Clín. Méd., Univ. Madrid.] English, German and French summaries.]

The calcium load test of Howard *et al.* (Title 3250, Vol. 23), in which subjects received intravenously 15 mg. Ca ions per kg. bodyweight, was made on 8 patients with different disorders and 1 normal subject. Values for Ca and P in serum and urine before and at intervals after the infusion are tabulated.

In the normal subject and in the 2 patients with mammary cancer, one with chronic Pb poisoning, one with poikiloderma and one with scleroderma, the infusion of Ca caused a rise in serum Ca, increased output of Ca in the urine, high serum P and low urinary P. Similar results were found in one patient with post-operative parathyroid insufficiency, but in another with the same condition the urinary P output increased and serum P was almost unchanged, and there was a particularly sharp rise in serum Ca, initially low. The test is thus of uncertain value in the diagnosis of parathyroid insufficiency. The ninth subject, with multiple sarcoma and many skeletal lesions, showed elevated serum P as well as increased urinary P, and the result was difficult to interpret.

D. Duncan.

4612

MARTMER, E. E., CORRIGAN, K. E., CHARBENEAU, H. P. and SOSIN, A. **A study of the uptake of iodine (I-131) by the thyroid of premature infants.** *Pediatrics*, 1956, **17,** 503–509. [Div. Paediat., Harper Hosp., Detroit, Mich.] Spanish and Interlingua summaries.

The uptake of ^{131}I by the thyroid, 24 hr. after administration of 5 μC. ^{131}I by mouth or by stomach tube, was measured with Geiger Müller and scintillation counters in 65 premature and 5 term infants, aged 1 to 63 days.

The range of uptake was within the normal limits recorded with the Geiger Müller counter in studies of children and adults. The scintillation counter is described. After experience with this equipment was acquired the difference in results obtained by the 2 methods was less than 5 per cent.

F. C. Aitken.

4613

RIVERO-FONTAN, J. L. Influencia de la hiponutrición sobre el tiroides de ratas. [**Influence of undernutrition on the thyroid of rats.**] *Rev. española Enferm. Apar. digest. Nutrición*, 1956, **15,** 239–248. [Clín. Méd., Univ. Seville.] English summary.

Rats of both sexes received for a week a diet containing, per cent., glucose 72, casein 16, lard 8 and mineral mixture 4 and vitamins. Their intake was measured. They were then divided into 3 groups of 23, 20 and 19. One group continued on this diet to appetite, a second had a quarter of their intake during the preliminary week. The third group received a quarter of the energy value, but it was given as a diet containing 64 per cent. casein and 24 per cent. glucose, so that their protein intake was maintained. All the rats had distilled water to drink and were given KI intraperitoneally to ensure an equal I intake. All were killed after 16 days, and 4 hr. before death each received 4 μC. ^{131}I as KI intraperitoneally.

The rats fed to appetite gained weight. The underfed rats on both diets lost between 30 and 34 per cent. of their initial weight. The mean absolute weight of the thyroid in male and female rats, respectively, was in rats fed to appetite 12·26 and 12·25 mg., in those deprived of energy and protein 7·67 and 3·75 and in those with low energy and normal protein intake 7·74 and 3·52 mg. Uptake of ^{131}I by the thyroid, in counts per mg. tissue, was reduced in all the deprived groups, though in female rats with low energy and normal protein intake the fall was not significant. The histological picture of the thyroid in underfed rats showed reduced activity.

It is concluded that protein deficiency did not influence the effect of general undernutrition in the rats.—D. Duncan.

4614

FRIEDBERG, W. and REINEKE, E. P. **Metabolism of iodinated casein in the rat.** *Amer. J. Physiol.*, 1956, **185,** 27–30. [Dept. Physiol. Pharmacol., Michigan State Univ., East Lansing.]

About 2 mg. radio-active iodinated casein was injected into the femoral vein of each of 10 female albino rats of average weight 168 g. After 100 min. 1 to 3 ml. blood was taken from the vein on the opposite side and dried and radio-activity was measured. Tissues were treated in a similar way.

The highest concentration of radio-activity was found in the liver, which showed a concentration 5·65 times that in plasma. The next highest was in spleen and then kidney, stomach, lung, small intestine and large intestine in that order. The lowest concentration was in muscle.

Eight female rats of weight 230 g. had thyroid and parathyroids removed and were treated with Ca to prevent tetany ; 10 mg. radio-active iodinated casein was injected intravenously. Blood from the aorta and liver samples were taken from 2 rats after 1½, 24 and 72 hr. Plasma and liver samples were separated into free thyroxine-like compounds and combined thyroxine-like compounds and the radio-activity was measured.

Within 1½ hr. both compounds were found in plasma and liver. At 24 and 72 hr. the combined thyroxine-like compounds had disappeared from the plasma and were concentrated in the liver. Simultaneously there was a pronounced increase of free thyroxine-like compounds in the plasma. This seemed to indicate that the liver was the principal site for the liberation of thyroxine from iodinated casein.—B. W. Simpson.

See also Absts. 4412, 4444, 4639, 4731, 4734, 4748, 4990.

4615

ZOFFMAN, A. Regulación endocrina de las proteínas del plasma. Influencia de la hipofisis. [**Endocrine regulation of the plasma proteins. Influence of the pituitary.**] *Rev. española Enferm. Apar. digest. Nutrición*, 1956, **15**, 300–308. [Clín. Méd., Univ. Seville.] English summary.

The literature is reviewed. Serum proteins were studied in 2 patients; they were normal in one with pituitary cachexia, and the albumin : globulin ration was high in one with Cushing's syndrome.—D. Duncan.

4616

BAKER, B. (Jr.), HOLLANDBECK, R., NORTON, H. W. and NALBANDOV, A. V. **Growth hormone content of swine pituitaries in relation to growth rate and age.** *J. Animal Sci.*, 1956, **15**, 407–417. [Dept. Animal Sci., Univ. Illinois, Urbana.]

Immature female hypophysectomised rats were used to estimate the growth hormone content of anterior pituitary glands from 65 female Hampshire and Duroc pigs. The pigs represented all ages, foetal, immature, mature and pregnant, up to a liveweight of 600 lb. and 1400 days of age. Composition of carcase and length of femur and tibia of immature and mature animals were estimated.

Percentage of dry matter, ether extract, N and bone ash increased with age up to 1400 days : the increase was rapid up to 300 days, and then slower. Up to 300 days femur and tibia increased rapidly in length, and after 300 days growth continued slowly up to 1400 days.

The weight of the anterior pituitary increased rapidly up to 225 days, and then slowly. The ratio of pituitary weight to bodyweight decreased quickly up to 225 to 300 days, and then remained constant. The growth hormone potency of a given weight of pituitary was significantly less in pigs under 20 days of age than in older animals, and total hormone content was low in the foetal gland and increased constantly. When hormone available per unit liveweight was calculated it was high in foetal and immature animals, and decreased to 225 days, after which it remained constant. Neither breed nor pregnancy appeared to affect the potency of the tissue or availability of the hormone.—T. D. Bell.

4617

GREENBAUM, A. L. **The short-term effect of pituitary growth hormone on the catabolism of fat in the liver.** *Biochem. J.*, 1956, **63**, 159–163. [Dept. Biochem., University Coll., London.]

Female rats, normal or rendered diabetic by injection of alloxan, were given intraperitoneal injections of pituitary growth hormone and were killed either 6 or 12 hr. later. The capacity of liver tissue to oxidise octanoate was investigated as described by Greenbaum and McLean (Abst. 4655, Vol. 23).

Six hours after injection of growth hormone liver tissue of normal rats showed diminished ability to oxidise octanoate; this was not found in similarly treated diabetic rats. Twelve hours after injection of growth hormone, oxidation of fatty acid to 2-carbon fragments, CO_2 and H_2O increased; diabetic rats showed increased oxidation of octanoate to 2-carbon fragments, but no increase in further oxidation.

It is suggested that, in normal animals, the impaired ability to oxidise octanoate 6 hr. after injection of growth hormone is not a direct effect, but is brought about by an effect of the hormone on the pancreas, resulting in release of insulin.

G. A. Garton.

4618

WILGRAM, G. F., BEST, C. H. and BLUMENSTEIN, J. **Effect of growth hormone and testosterone on induction of cardiovascular changes in choline-deficient rats.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91**, 620–622. [Banting and Best Dept. Med. Res., Univ. Toronto, Canada.]

In preliminary investigations which confirmed the findings of Hall and Bieri (Abst. 3362, Vol. 24), the ideal bodyweight of rats to be given the choline-deficient diet was found to be between 110 and 115 g. The experiment reported was with female rats of that size and on the deficient diet, of which 7 were given subcutaneously 3 mg. growth hormone daily, 9 testosterone 1 mg. daily and 11 both hormones; a control group of 18 were given injections of saline. Injections were given for 14 days at most; survivors were kept on the diet for a further 3 weeks, after which they and the control animals were killed.

All control rats had fatty livers, but the incidence of kidney and heart lesions was low. Of those given growth hormone, more than half died of renal cortical necrosis, and at least half of the aortae showed the type of lesion described in Abst. 3240, Vol. 23. In the rats given testosterone the

lesions were similar but less advanced ; in those given both hormones they were more severe in degree, but no more frequent.

It is concluded that in choline deficiency the etiology of cardiovascular lesions is closely associated with kidney damage, but a causal relation could not be established.—D. Harvey.

4619

PALA, A. Influenza dell'ormone somatotropo (STH) e dell'ormone androgeno sulle cartilagini articolari e di coniugazione nel ratto. [**Influence of growth hormone and of the male sex hormone on articular and metaphyseal cartilages in the rat.**] *Rend. Ist. Super. Sanità, Rome*, 1956, **19,** 253–282. French, English and German summaries.

The 16 rats, weighing initially 90 to 92 g., were divided into 4 groups of 4 animals and studied for 75 days. All were fed on stock diet. Four rats received lyophilised growth hormone subcutaneously, 1 mg. daily for 20 days, then 2 mg. daily for 20 days, 4 mg. daily for 10 days and 6 mg. daily for the last 15 days. A second group received daily for the whole 75 days 2 mg. testosterone propionate subcutaneously, a third group both hormones and the fourth group none. All rats were weighed and their body length was measured weekly. At the end X-ray photographs were made and the rats were killed for macroscopic and histological examination. The 2 rats which died after 30 and 35 days of treatment with both hormones were examined in the same way as the others.

The rats treated with growth hormone alone or in combination with testosterone showed irregularity of the articular cartilages of the knee joint and an increase in width of the transparent metaphyseal bands in the femur and tibia. Changes in the vertebral column were less apparent in X-ray photographs, but in the rats given both hormones there seemed to be some decalcification of the vertebral bodies. The histological changes in the cartilages are fully described ; there was hypertrophy, interrupted on articular surfaces by areas of erosion. Testosterone did not in general modify the effects of growth hormone, but sometimes seemed to increase them.

The animals appeared clinically healthy, except that those given both hormones were dull and aggressive and their coats were rough after 2 or 3 weeks. The total gain of weight in 75 days was identical in controls and rats given one hormone, though the curves of growth differed ; rats given both hormones gained only half as much. Growth in length was reduced in rats given testosterone.

Rats treated with growth hormone had smaller pituitaries and testes and larger adrenals than untreated rats. Those given testosterone showed only slight differences from controls. The 2 rats given both hormones for 75 days had small pituitaries, testes larger than those of rats given growth hormone alone, and large adrenals.

The significance of the findings is discussed. There are 44 photographs illustrating the radiological and histological findings.—D. Duncan.

4620

GERTNER, M. L. and SZEGEDI, B. Adatok a zsírbeépítés neurohumorális mechanizmusához. [**Neurohumoral regulation of fat deposition.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1,** No. 10, 17–27. [Inst. Physiol., Univ. Agric. Sci., Budapest.] Russian, German and English summaries.

Fattening in animals is considered as a pathological process, causing compensating mechanisms controlled by the hypothalamus to come into operation. The compensation is seen in the decreased appetite, poorer utilisation of feed and increased basal metabolism of the fat animal.

Lean and moderately fat pigs weighing 110 to 220 kg. had normal blood ketone levels of about 1·613 mg. acetone per cent. In pigs of 350 kg. the value was 2·94 mg. per cent., and in a very fat Berkshire weighing 400 kg., 4·05 mg. The rising ketone level suggests increasing mobilisation of depot fat. A ketogenic hormone prepared from the anterior pituitary was injected into rabbits and raised the mean blood ketone level from 2·5 to nearly 7·5 mg. per cent. in 2 hr. It is concluded that there is a relation between the production of pituitary ketogenic hormone and the fattening tendency in animals. It is hoped that an antagonist to the hormone might improve the utilisation of feed by fattening pigs. (From English summary.)—D. Duncan.

See also Absts. 4674, 4754, 4803, 5094.

4621

RAMACHANDRAN, M., VENKATACHALAM, P. S. and GOPALAN, C. **Urinary excretion of 17-ketosteroids in normal and undernourished subjects.** *Indian J. Med. Res.*, 1956, **44,** 227–230. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

The output of 17-ketosteroids in the urine in 24 hr. by 9 normal Indian men ranged from 3 to 13 mg., average 7·94, and by 12 normal Indian children from 0·06 to 1·80 mg., average 0·41. Five children aged 3 to 12 years, who had kwashiorkor, excreted 0·09 to 0·78 mg. daily, average 0·29, but more normal amounts after several weeks on a diet rich in protein. Six men with nutritional oedema excreted 0·2 to 0·89 mg. daily, average 1·05, and even after 89 days on high-protein diet values were still considerably below normal.

A. Hepburn.

See also Abst. 4578.

4622

KOKAS, E., MICZBÁN, I. and TÖRŐ, I. **Effect of purine nucleotides on working capacity, on the heart and the suprarenal gland.**

BANGA, I., KOKAS, E., MICZBÁN, I. and TÖRŐ, I. **Action of purine nucleotides on the nucleic acid content of the heart during exercise.** *Acta physiol. hung.*, 1955, **7**, 409–420; 401–407. [Inst. Histol. Embryol., Med. Univ., Budapest.] Russian summary.

(a) There were 4 groups, 91 adult rats in all. They received subcutaneous injections daily of physiological saline, corhormone (extract of embryonic heart), adenosine triphosphate (ATP) or a guanylic acid derivative (GAD) isolated from corhormone by Kokas and Banga (*Acta physiol. hung.*, 1950, *Suppl.* **1**, 24). After 2 weeks 9 or 10 rats from each group were made to swim until exhausted every day and the others were not exercised. This continued for 4 weeks, and rats were killed after 12 to 14, 17 to 19 and 22 to 24 days.

Swimming performance, *i.e.*, the time for which the rats could swim, despite a lead weight, before they sank, was progressively improved by corhormone, by ATP and especially by GAD. By the end the untreated rats were still able to swim for about 2 min., those given GAD for nearly 12 min.

At the end the untreated and exercised rats had enlarged hearts compared with those of unexercised animals. Rats given corhormone or ATP also had some enlargement of their hearts, but GAD had prevented enlargement of the heart in exercised rats. The adrenals were also greatly enlarged in exercised rats given saline, slightly enlarged in those given corhormone, but almost or completely normal in size in rats given ATP or GAD.

The effects of GAD in improving performance and preventing hypertrophy of heart and adrenals were statistically significant. It is concluded that GAD is one of the active substances in corhormone.

(b) The nucleic acid P content of the heart was examined in rats treated as described above.

In rats given saline injections the nucleic acid P content of heart tissue was reduced by exercise, but it was normal or increased in exercised rats treated with ATP, corhormone or GAD. There was no effect of the hormones in rats not exercised.

D. Duncan.

4623

KLEIN, E. Der heutige Stand der Thymusforschung. [**Present position of thymus research.**] *Deutsch. med. Wochenschr.*, 1956, **81**, 714–716. [2 Med. Klin., Med. Akad., Düsseldorf.]

A review.

4624

CAREN, R. and CARBO, L. **Pancreatic alpha-cell function in relation to cholesterol metabolism.** *J. Clin. Endocrinol.*, 1956, **16**, 507–516. [Inst. Med. Res., Div. Labs., Cedars of Lebanon Hosp., Los Angeles, Calif.]

In rabbits $CoCl_2$ given intravenously produced a large increase in plasma cholesterol, with a peak after 2 to 3 days and return to normal after 7 days. With this rise and fall there was corresponding destruction and regeneration of alpha cells of the pancreas. Other explanations of the rise in plasma cholesterol were eliminated and it is suggested that the alpha cells may secrete a hormone regulating cholesterol metabolism.—A. Hepburn.

See also Absts. 4441, 4543, 4701, 4850.

ENERGY EXCHANGE AND SPECIFIC DYNAMIC ACTION

4625

KLEIBER, M. **Energy metabolism.** *Annu. Rev. Physiol.*, 1956, **18**, 35–52. [Coll. Agric., Univ. California, Davis.]

4626

STRICKLAND, K. P. **Energetics and cerebral metabolism.** *Guy's Hosp. Rep.*, 1956, **105**, 108–128. [Dept. Chem. Pathol.]

A review, with references.

4627

LEROY, A. M. Verwertung der Futtermittelenergie im tierischen Organismus. [**Utilisation of feed energy by animals.**] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10**, 321–350. [Dept. Zootech., Inst. Nat. Agronom., Paris.] English summary.

See Abst. 5175, Vol. 25.

4628

BENGTSSON, E. **The working capacity in normal children, evaluated by submaximal exercise on the bicycle ergometer and compared with adults.** *Acta med. scand.*, 1956, **154**, 91–109. [Contagious Dis. Hosp., Stockholm.]

The subjects were 37 boys and 39 girls between the ages of 5 and 14 years, 7 boys and 7 girls between 15 and 20, and 12 men and 12 women between 31 and 40. The adults were mostly professional and not active in athletics; few were manual workers. The equipment and methods of study were modifications of those of Wahlund

(*Acta med. scand.*, 1948, *Suppl.* 215). For most subjects loads were adjusted to 3 grades, the first to increase heart rate to between 125 and 130, the second to between 140 and 150 and the third to between 160 and 170 beats per min. Work at each loading lasted 6 min.

For both children and adults the relation of heart rate to intensity of exercise was linear up to the highest of these rates. At rates above 170 beats, when they were tested, the subjects had difficulty in continuing the exercise. Working capacity in adults was about 30 per cent. higher in men than in women, a highly significant difference; in children there was no significant difference between sexes. Variations with age were small among adults; in comparisons among children those from 5 to 6, 7 to 9, and 10 to 11 years had working capacities 37, 50 and 83 per cent., respectively, of that of a child of from 13 to 14 years and 20, 28 and 44 per cent. of that of an adult man.

In relation to bodyweight, children in the 4 groups 17 to 24, 25 to 28, 29 to 39 and 40 to 60 kg. had similar working capacities, and these were consistent with the age groupings 5 to 6, 7 to 9, 10 to 12 and 13 to 14 years. Among children, too, the correlation between intensity of work and bodyweight, surface area or age was highly significant. For subjects between 15 and 20 numbers were small and results generally unreliable. Among adults coefficients of correlation were still lower, except for women, for whom bodyweight and surface area were well correlated with working capacity.

Pulse rate was recorded when it was steady with the highest load and again immediately and 4 and 10 min. after exercise. Correlation values were low and no estimate of working capacity could be based on pulse rate during recovery. Respiration rate, respiratory minute volume and oxygen consumption increased linearly with intensity of exercise.

The findings are discussed, and are to be a basis for an investigation of patients with myocarditis.

D. Harvey.

4629

HOLLMANN, W., MUKERJI, G. S. and SPIEGELHOFF, W. Stoffwechsel, Atmung und Kreislauf bei Yogaübungen. [**Metabolism, respiration and circulation during Yoga exercises.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 675–676. [Med. Klin., Univ. Cologne.]

The oxygen consumption of one of the authors, a Yoga teacher, measured with the Knipping spirometer, was 290 c.c. per min. at rest, and during performance of 12 different Yoga exercises, each of which consists in holding a prescribed pose for ½ to 2 min. and ½ to 2 min. rest in the "dead man" position, ranged from 300 to 590 c.c. per min. Only 2 of the poses involved oxygen debt. The cost of the Yoga sleep position, breathing exercises and profound meditation did not differ from that of rest.—W. M. Deans.

4630

CARLSON, L. D. and PEARL, D. C. (Jr.) **Effects of temperature and work on metabolism and heat loss in man.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 240–244. [Dept. Physiol. Biophys., Sch. Med., Univ. Washington, Seattle.]

Skin temperature, loss of heat and oxygen consumption were measured in 4 men. Experiments began at an ambient temperature of 20° C., which was decreased in ½ hr. to 10° C. and maintained there for 30 to 60 min. The subjects wore shorts. Exercise on a bicycle ergometer at 150 or 70 kg. metres per min. was begun either at the start of cooling or when shivering began.

When exercise began early the skin temperature dropped faster in the first 30 min. than when the subject was at rest, but the final skin temperature was slightly higher. Oxygen consumption during exercise was similar at 20° C. and during cooling. Rectal temperature was maintained when there was exercise, but fell slightly during cooling at rest. When exercise began after cooling, heat input was greater and heat loss from the legs was less. Falls in skin and rectal temperature were arrested, but skin temperature did not rise. After 90 min. of shivering, exercise which at 20° C. required 45 kg. cal. per hr. per sq. m. required an extra 76 kg. cal. and even then did not stop shivering in 30 min.

It is concluded that the energy cost of exercise is greater after than during cooling, though the direct heat loss is less.—D. Duncan.

4631

SAPIN-JALOUSTRE, J. and SAPIN-JALOUSTRE, H. Le ralentissement de la vitesse de croissance des phanères dans l'Antarctique. [**Slowing down of the rate of growth of hair, beard and nails in the Antarctic.**] *Presse méd.*, 1956, **64,** 901–903.

Mean growth of the left thumbnail for 4 men in well heated winter quarters (7° to 14° C. at 1·5 m. above the floor) in Adélie Land was 0·102 mm. between June and November (*i.e.*, spring), about three-fifths of that given by Giroud and Bulliard (*Arch. Morph. Gén. Exp.*, 1930, p. 1) for France. Growth of the hair and beard in 2 of the men was similarly reduced relative to the results of Derobert and Lebreton (*Ann. Méd. Lég.*, 1951, **31,** 173) for France and to those for one of the subjects during the return voyage. The much greater reduction

found by Maclean during the Australian Antarctic Expedition of 1911–14 (*Sci. Rep.*, Vol. 7, Series C, 1919) is considered to have been due to the severer conditions (air temperature near 0° C., walls below); in the present expedition the retardation, though not measured exactly, was much greater during establishment of the base in summer with constant exposure to temperatures from 0° to 15° C. and sleeping in unheated tents. The phenomenon is considered to reveal diminished metabolism of the superficial regions of the body and it is believed that permanent reduction of the temperature of the outer layer of the body plays an essential part in acclimatisation to cold.—W. M. Deans.

4632

SZEGVÁRI, GY. Veränderung des Energieumsatzes und der Temperatur im Darm, Muskel und subkutanem Gewebe im Laufe der chemischen Thermoregulation. [**Changes in energy exchange and temperature of intestine, muscle and subcutaneous tissue in the course of chemical thermoregulation.**] *Acta physiol. hung.*, 1956, **9**, *Suppl.*, 33. [Pathophysiol. Inst., Med. Univ., Pécs.]

4633

ALIM, K. A. and AHMED, I. A. **Effects of climate on body temperature and respiration-rate of buffaloes and Friesian cattle.** *Nature*, 1956, **177**, 900. [Dept. Animal Prod., Fac. Agric., Univ. Alexandria.]

Rectal temperature and respiration rate were measured 3 times a day twice weekly for 7 weeks in 2 Friesian and 2 buffalo cows in the early stages of their first lactation, and 2 buffalo, 2 native and 2 Friesian bull calves. All were kept in open sheds, and the air temperatures, recorded at the same time as the other observations, were between 37·2° and 38·9° C.

There were significant differences between body temperatures and respiration rates on different days and at different times of the day.

Buffaloes had lower average body temperatures and respiration rates than Friesian or native cattle, and native calves lower than Friesian. In buffaloes significant positive correlations were found between air and body temperatures and respiration rates, but not between air temperature and body temperature.—T. D. Bell.

4634

PAGOT, J. Température corporelle des Zébus et des métis Zébus taurins sous les tropiques. [**Body temperature of Zebus and crosses of Zebus with European cattle in the tropics.**] *Rev. Élevage Méd. vét. Pays trop.*, 1956, **9**, 21–41. English and Spanish summaries.

4635

EYAL, E. **The body temperature and cardio-respiratory activities of shorn and unshorn Awassi sheep.** *Bull. Res. Counc. Israel*, 1954, **4**, No. 3. [Dept. Animal Husb., Agric. Res. Stat., Rehovot.]

In an investigation with 20 Awassi milking sheep it was shown that shorn animals had lower rectal temperatures than unshorn, except in summer when exposed to strong sunlight. Records were made at 5 a.m., 9 a.m., 2 p.m., 7 p.m. and midnight; environmental temperature ranged from 11·0° in early morning to 32·5° C. at midday between December 1952 and October 1953. During the autumn it was particularly apparent that the rise in body temperature of the shorn sheep to midday, and the decline thereafter, were much more rapid than that of the unshorn.

The changes in respiration rate showed more striking differences between shorn and unshorn sheep. In the shade in both winter and summer, respiration of the shorn sheep was slower; in summer sun it was faster, and the fall in environmental temperature after noon caused a more rapid fall in respiration rate in the unshorn animals.

Results concerning pulse rate were not sufficiently clear for comparison between shorn and unshorn sheep, but in both groups the pulse was faster and less stable in winter than in summer; this may have been related to the higher metabolic rate during the main milking season.

T. D. Bell.

4636

ERIKSON, H. **Observations on the metabolism of Arctic ground squirrels (Citellus Parryi) at different environmental temperatures. Body temperature of Arctic ground squirrels (Citellus Parryi) at varying environmental temperature. Observations of the body temperature of Arctic ground squirrels (Citellus Parryi) during hibernation.** *Acta physiol. scand.*, 1956, **36**, 66–74; 75–78; 79–81. [Inst. Resp. Physiol., Univ. Oslo.]

(a) Six Arctic ground squirrels were kept in an outdoor cage in Alaska and fed on grain, lettuce, cabbage and meat. They were studied in August, when they were active and gaining weight. Oxygen uptake and carbon dioxide output were studied in an open-circuit system which is described and illustrated.

The squirrels could remain in the cold room at − 30° C. for 24 hr. without ill effect. When metabolic rate was studied in the cold the squirrels were so active that the temperature in the cage did not fall below − 19° C. In 15 experiments at between − 10° and − 19° C. they were always active and their oxygen consumption was from 1·6

to 3·4 ml. per g. per hr. In other conditions the temperatures, numbers of trials and oxygen consumption in ml. per g. per hr. were : — 9° to 0° C., active, 26 trials, 1·4 to 2·8 ml. ; quiet, 13 trials, 1·0 to 1·4 ml. ; + 1° to + 20° C., active, 16 trials, 1·3 to 2·0 ml. ; quiet, 37 trials, 0·6 to 1·4 ml. ; + 21° to + 40° C., active, 2 trials, 1·2 and 1·3 ml. ; quiet, 43 trials, 0·6 to 1·1 ml. At 50° C. they could survive for only 1 hr.

After fasting for 24 hr. the squirrels were restless and their oxygen consumption was high. In 2 squirrels studied during sleep, at night, at 30° C., the oxygen consumption was 0·3 to 0·6 ml. per g. per hr., lower than would be expected from the curve of Brody (Abst. 3813, Vol. 15).

The R.Q. was from 0·7 to 0·9 at — 20° to 0° C., 0·8 to 1·2 at + 1° to + 20°, and 1·0 to 1·4 at temperatures above 20° C. High R.Q.s were commonly found only at above 0° C. within 4 or 5 hr. after a meal in autumn, when the squirrels were laying down fat, but in the spring there was no relation between environmental temperature and R.Q.

(b) In unrestrained squirrels free in the cage the body temperature was constant at from 36·5° to 39° C. at environmental temperatures between — 30° and + 30° C. It rose slightly at an environmental temperature of 35° C. and more at 38° C. Restrained animals fastened to a board were unable to withstand an environmental temperature of — 20° C. and were also slightly less able to withstand heat.

(c) Hibernating ground squirrels kept at between 0° and — 8° C. had a rectal temperature of about + 2° C. when undisturbed for several days, but when they were disturbed the temperature rose even if the animal did not wake.—D. Duncan.

4637

BABINEAU, L. M. Influence de l'alimentation et de la température sur quelques constantes biologiques du rat blanc. [**Effect of diet and temperature on certain biological constants of the white rat.**] *Laval. méd.*, 1956, **21,** 112–133 (to be continued). [Dept. Physiol. Nutrit., Laval Univ.]

This thesis is published in a number of parts. The first part reviews the literature about the method of heat regulation in homoiotherms, the nature of the diets and the body components which promote resistance to cold, and the effects of cold on intermediary metabolism.—E. M. Hume.

4638

HART, J. S. and HEROUX, O. **Utilization of body reserves during exposure of mice to low temperatures.** *Canad. J. Biochem. Physiol.*, 1956, **34,** 414–421. [Div. Appl. Biol., Nat. Res. Labs., Ottawa.]

Two groups, each of 20 adult white mice, were acclimatised for 4 weeks at 22° to 24° C. and 6° to 8° C., respectively ; a high-carbohydrate diet, Master Fox Chow, consisting of protein 15, fat 3 and carbohydrate 82 per cent., was given to appetite. Half the mice, selected at random in each group, were then analysed ; the remainder were exposed to freezing temperatures, the 23° C. mice at — 7° C. and the 6° C. mice at — 13° C. for 4 days with Fox Chow given to appetite and water twice daily. Mice which survived were killed ; all mice were used in subsequent analyses, which included measurements of wet weight, dry weight, ether extract, fat-free dry weight, N in fat-free residue, and heats of combustion of ether extract and fat-free residue.

The mice acclimatised to 6° C. had a body water content greater on an absolute and on a fat-free basis than that of the mice acclimatised to 23° C. When exposed to freezing temperatures the weight loss and loss of water were greater in the group acclimatised to cold. Fat was the major energy reserve used under these conditions ; in both acclimatisation groups it accounted for 85 to 89 per cent. of the total energy, the remainder being supplied mostly by protein. The heat of combustion of the fat of the mice fell during exposure to freezing temperatures, indicating an alteration in chemical composition.—G. F. Garton.

4639

ANDIK, I., NAGY, L. and TÓTH, I. Über die Wirkung der Umgebungstemperatur auf den Stoffwechsel normaler und mit Thyroxin behandelter Ratten. [**Effect of environmental temperature on the metabolism of normal rats and rats treated with thyroxine.**] *Acta physiol. hung.*, 1955, **8,** 399–404. [Pathophysiol. Inst., Med. Univ., Pécs.] Russian summary.

The oxygen consumption over periods of 15 to 20 min. of 8 rats, of bodyweight 180 to 240 g., which had had from 150 to 200 μg. thyroxine daily for from 2 to 6 weeks, and of 8 untreated rats, was measured by Balogh's apparatus (Abst. 124, Vol. 21) at environmental temperatures ranging from 29° to 7° C. and back again to 29° C.

The oxygen consumption of untreated rats showed the expected rise as environmental temperature fell, but that of treated rats fell and was least at 25° C. or even, in some, at 10° or 7° C. In some, oxygen consumption behaved normally about a week after treatment with thyroxine ceased, but in others the effect persisted longer.

Since hyperthermia occurs at 29° C. in rats treated with large doses of thyroxine, it is suggested that the higher oxygen consumption at 29° than at lower environmental temperatures depends on

the same mechanism as the increased rate of energy exchange of normal rats at higher environmental temperatures. Further experiments with urethane and with aminothiazole indicated also that even the minimum oxygen consumption of rats treated with thyroxine depends on regulation through the central nervous system and is not the absolute minimum required for tissue respiration.

W. M. Deans.

See also Absts. 4159, 4774, 4849, 4956.

CARBOHYDRATES

4640

VECCHIOTTI, G. Glicemia e alimentazione artificiale del vitello. [**Blood sugar and artificial feeding of the calf.**] *Riv. Zootec.*, 1956, **29,** 75–78. [Ist. Zootec., Fac. Agrar., Piacenza.]

Seven calves were reared on whole milk, which was reduced in amount at 60 days of age and withdrawn at 105 days, and good hay was always available. Blood was withdrawn from the jugular vein every fifth day from 10 to 120 days, 7 hr. after the first feed, and blood sugar was estimated by the Hagedorn Jensen method. Blood from the cows which provided the milk was analysed also, and the average value found was 62 mg. glucose per 100 ml.

Blood sugar values in the calves ranged from 119 to 133, mean 127 mg. per 100 ml. on the 10th day. The values then fell regularly, reaching normal values for adults between 110 and 120 days; at 120 days they were from 60 to 66 mg. per 100 ml.

T. D. Bell.

4641

BLOOM, R. A. and FENTON, P. F. **Glucose tolerance in relation to obesity and food intake.** *Amer. J. Physiol.*, 1956, **184,** 438–440. [Dept. Biol., Brown Univ., Providence, R.I.]

Mice of 2 strains, one the C57BL/Fn and moderately susceptible to nutritional obesity, the other the C_3H/Fn and highly susceptible, were starved for 18 hr. and then given 10 per cent. glucose solution by intraperitoneal injection in amounts providing 1 mg. glucose per g. total or fat-free bodyweight. Sugar was estimated in blood before and ½, 1, 2 and 5 hr. after injections. Of each strain some were fed on a stock ration, others on a diet with 50 per cent. fat. Blood sugar curves showed that with either rate of administration the highly susceptible strain disposed of glucose more rapidly than did the moderately susceptible. Curves for the high-fat group were throughout at a higher level than those for mice on the stock diet. In both strains fasting blood sugar increased with bodyweight and was generally higher for the mice on the high intake of fat.

The findings are not readily explained by the glucostatic theory of the control of food intake (Mayer, Title 2438, Vol. 24 and Review Article, Vol. 25, p. 605).—D. Harvey.

4642

ARENDT, E. C. and PATTEE, C. J. **Studies on obesity. 1. The insulin-glucose tolerance curve. 2. Blood pyruvate and lactate curves in obese and normal subjects after ingestion of glucose.** *J. Clin. Endocrinol.*, 1956, **16,** 367–374; 375–379. [Clin. Invest. Unit, Queen Mary Veterans Hosp., Montreal.]

1. In 32 obese patients, 30 to 130 per cent. overweight, given insulin by vein and 30 min. later glucose by mouth, the initial mean fall in blood sugar was less, and the subsequent mean rise was greater, than in 20 normal subjects. In all of the normal subjects but in only half of the obese subjects blood sugar had returned to fasting levels after 180 min.

2. In 21 obese subjects, 25 to 130 per cent. overweight, the peak of the mean glucose tolerance curve was significantly higher than in a group of 10 normal subjects. There was no significant difference in the pyruvate curves. In the obese subjects, unlike the controls, lactate levels did not fall during the third hour of the study.

F. C. Aitken.

4643

VILACLARA MIR, J. La diabetes como enfermedad de la regulación. [**Diabetes as a disorder of regulation.**] *Rev. española Enferm. Apar. digest. Nutrición*, 1956, **15,** 290–294. [Hosp. Sta. Cruz y S. Pablo, Barcelona.]

4644

HETÉNYI, G. (Jr.) and FORBÁTH, M. Wirkung des hohen Blutzuckerspiegels auf den Stoffwechsel des diabetischen Tieres. [**Effect of high blood sugar on the metabolism of the diabetic animal.**] *Acta physiol. hung.*, 1956, **9,** *Suppl.*, 18–20. [Physiol. Inst., Med. Univ., Szeged.]

4645

FORBÁTH, M. and HETÉNYI, G. (Jr.) Wirkung der Fruktose-, Glyzerin- und Brenztraubensäure-belastung bei Pankreas-Diabetes. [**Effect of fructose, glycerine or pyruvic acid administration in pancreatic diabetes.**] *Acta physiol. hung.*, 1956, **9,** *Suppl.*, 20–21. [Physiol. Inst., Med. Univ., Szeged.]

4646

SÁNCHEZ AGESTA, A. and NÚÑEZ CARRIL, J. El examen de la regulación glucémica en algunos estados endocrinos. [**Blood sugar regulation in some endocrine disorders.**] *Rev. clín. española*, 1956, **61,** 11–23. [Clín. Méd., Univ. Granada.] English, German and French summaries.

The subjects received after an overnight fast an injection of 0·1 unit of insulin per kg. bodyweight and 30 min. later 0·8 g. glucose per kg. bodyweight by mouth. Blood sugar was studied before and for 180 min. after the injection of insulin. The blood sugar values were expressed as percentages of the initial value.

In 5 normal subjects the curves were all well within the limits of those obtained by Engel and Scott (*J. Clin. Invest.*, 1950, **29,** 151), falling 30 min. after the injection of insulin to between 46 and 66 per cent., reaching a peak of from 121 to 154 per cent. 60 to 90 min. later and reaching 100 ± 20 per cent. after 180 min. from the start.

In 17 patients mostly with endocrine disorders the results varied from the normal. Three subjects with gonadal hypofunction had normal curves, but 2 showed double peaks after the glucose was given and a return to fasting value between. Four hypothyroid patients had low peaks and all had low values 150 and 180 min. after the start of the experiment. In one of them the value fell after insulin to 33 per cent. of normal and even after glucose did not rise during the experiment above 66 per cent. of the fasting value. Similar low values were found in 2 subjects with adrenal insufficiency, one with pituitary insufficiency, and 3 with suspected pituitary insufficiency. Successful treatment in some patients restored the form of the curve to normal.—D. Duncan.

4647

FELTS, J. M., DOELL, R. G. and CHAIKOFF, I. L. **The effects of insulin on the pathways of conversion of glucose to fatty acids in the liver.** *J. Biol. Chem.*, 1956, **219,** 473–478. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Rats rendered diabetic by injection of alloxan were fed on a high-carbohydrate diet, consisting of glucose 60, casein 22, cellu flour 12 and salt mixture 6 per cent., for several days and then killed. Liver slices were incubated in Krebs Henseleit bicarbonate buffer containing labelled glucose, and production of $^{14}CO_2$ and fatty acid ^{14}C was estimated.

When diabetic rats were treated with insulin there was more increase in recovery of $^{14}CO_2$ from glucose-1-^{14}C than from glucose-6-^{14}C. Insulin also increased the uptake of ^{14}C into fatty acids from glucose-6-^{14}C more than from glucose-1-^{14}C.

It was calculated that insulin increased by about 70 times the amount of glucose-6-^{14}C converted to fatty acids by the Embden Meyerhof pathway, and by 375 times the amount metabolised in the phosphogluconate pathway.—A. K. Lough.

4648

SNEDECOR, J. G., MATHEWS, H. and MACGRATH, W. B. (Jr.) **The blood sugar response of turkey poults to insulin.** *Poultry Sci.*, 1956, **35,** 355–360. [Dept. Zool., Univ. Massachusetts, Amherst.]

Doses of 500 units or less of insulin per kg. liveweight given subcutaneously to day-old turkey poults lowered blood sugar for 5 hr. Higher doses raised the blood sugar. When the insulin was free of glucagon the hyperglycaemic response was not obtained, but the glucagon extracted caused a prolonged rise of blood sugar similar to that produced by the unextracted insulin. It was thought that glucagon was the cause of hyperglycaemia in poults injected with a normal insulin preparation. The difference in response of turkeys and mammals is discussed.—T. D. Bell.

4649

IZZO, J. L. (with SUSKIE, A. G. and KELLNER, C.) **Insulin-zinc suspensions. Further studies, with emphasis on lente insulin.** *Amer. J. Med.*, 1956, **20,** 554–563. [Dept. Med., Sch. Med. Dent., Univ. Rochester, N.Y.]

4650

VAN ITALLIE, T. B. **Glucagon ; physiologic and clinical considerations.** *New Engl. J. Med.*, 1956, **254,** 794–803.

A review with 110 references.

4651

BONDY, P. K. and CARDILLO, L. R. **The effect of glucagon on carbohydrate metabolism in normal human beings.** *J. Clin. Invest.*, 1956, **35,** 494–501. [Dept. Int. Med., Sch. Med., Yale Univ., New Haven, Conn.]

Blood samples were obtained almost simultaneously from antecubital vein and brachial artery. The subjects were adult men without history of disturbed carbohydrate metabolism. Their diet contained at least 250 g. carbohydrate daily, and experiments were made after an overnight fast.

After 2 preliminary blood samples, 6 subjects received 1·0 ml. (0·95 mg.) glucagon intravenously. In 1 subject there was no effect, but in the others the arterial glucose concentration began to rise within 1 to 4 min. and the venous concentration rose somewhat less steeply, so that in 10 min. there was a pronounced arterio-venous difference. In 2 of the same subjects given glucose intravenously the effects were similar to those of

glucagon. In 5 subjects glucagon was given by slow intravenous infusion for 2 hr. The rapid rise in blood sugar and the increase in arteriovenous difference appeared initially, but after about 1 hr. the arterial glucose began to fall, and in 4 of the 5 subjects clinical signs of hypoglycaemia occurred 110 to 120 min. after the infusion began. The venous glucose continued to fall after the end of the infusion.

Serum phosphate declined during infusion of glucagon or of glucose, more with the former. Blood and plasma α-amino N also declined progressively. Ketones were not changed, nor was haematocrit.

The results do not support the suggestion that glucagon can produce diabetes.—D. Duncan.

4652

ELRICK, H. **Glucagon and the regulation of carbohydrate metabolism.** *Nature*, 1956, **177**, 892–893. [Med. Res. Lab., Veterans Admin. Hosp., Denver, Colo.]

Fifty-six normal men were given a diet rich in carbohydrate. When they had fasted for 14 hr. and rested for from 30 to 60 min. glucose was infused for from 30 to 60 min., after which glucagon and insulin were injected separately or in combination. Glucose was estimated in samples of arterial and venous blood taken at short intervals. Glucagon, like insulin, caused an increase in the difference between these and, statistically, the difference was more highly significant. When both were given the difference as significantly greater than when either was given alone. Details are being reported elsewhere (Elrick *et al.*, *J. Clin. Invest.*, 1955, **34**, 1830; 1956, **35**, 757).

D. Harvey.

4653

TIMIRAS, P. S., WOODBURY, D. M. and BAKER, D. H. **Effect of hydrocortisone acetate, desoxycorticosterone acetate, insulin, glucagon and dextrose, alone or in combination, on experimental convulsions and carbohydrate metabolism.** *Arch. internat. Pharmacodyn.*, 1956, **105**, 450–467. [Dept. Pharmacol., Coll. Med., Univ. Utah, Salt Lake City.] French and German summaries.

4654

PORTMAN, O. W., LAWRY, E. Y. and BRUNO, D. **Effect of dietary carbohydrate on experimentally induced hypercholesteremia and hyperbetalipoproteinemia in rats.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91**, 321–323. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Groups of rats caged individually were fed to appetite for 28 days on a diet consisting of casein 20, maize oil 8, carbohydrate 56, cholesterol 5, celluflour 5 and salts 4 per cent., with vitamins and trace elements. The carbohydrate was maize starch, sucrose, glucose or fructose; to some of the rations was added 1·5 per cent. cholic acid, alone or with 0·2 per cent. Sulfasuxidine (succinylsulphathiazole). Serum cholesterol was estimated in all groups at the end of the experiment; liver cholesterol and serum β-lipoproteins were estimated in animals of some groups.

Rats fed on the diets containing sucrose, glucose or fructose with cholesterol and cholic acid had higher serum cholesterol and serum β-lipoproteins than control animals given maize starch; no difference in liver cholesterol was found.

When the diets contained no cholic acid the rats given maize starch had lower serum cholesterol than those given sucrose. The addition of Sulfasuxidine to sucrose diets did not change serum cholesterol values, though the addition of Sulfasuxidine to starch rations was accompanied by higher serum cholesterol, comparable to values in animals given sucrose.—G. A. Garton.

4655

GOETSCH, D. D., UNDERBJERG, G. K. L. and SWENSON, M. J. **The utilization of intravenously administered glucose, invert sugar, and fructose in cattle.** *Amer. J. Vet. Res.*, 1956, **17**, 213–216. [Dept. Vet. Med., Kansas Agric. Exp. Stat., Manhattan.]

The sugar tolerance curve in cattle was followed after the injection of glucose, fructose and a solution containing equal quantities of each at the rate of 0·5 g. per kg. bodyweight.

Fructose disappeared from the blood more rapidly than glucose or the mixed sugars and less total sugar was excreted in the urine. On account of its apparently greater speed of metabolism it is suggested that fructose might prove useful in the treatment of ketosis in cattle.—A. T. Phillipson.

4656

HOENIG, V. K utilisaci glukosy organismem. [**Utilisation of glucose in the body.**] *Čas. Lék. čes.*, 1956, **95**, 122–124. [Clin. Int. Med., Karl's Univ., Prague.] French and Russian summaries.

4657

HILL, R. and CHAIKOFF, I. L. **Loss and repair of a glucose-disposal mechanism in dog fed fructose as sole dietary carbohydrate.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91**, 265–267. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Three dogs were fed in 7-day periods on diets containing no carbohydrate, then successively received 18 g. glucose, fructose and galactose per kg. bodyweight. At the end of each period the dogs received a test meal containing 4 g. glucose

per kg. bodyweight and blood sugar was studied for the next 4 hr.

The carbohydrate-free diet produced the lowest ability to dispose of glucose. The fructose diet had a similar effect and the blood sugar peak was 190 mg. per cent. after 2 hr. The peaks after the glucose and galactose diets were 120 and 140 mg. per cent. after 1 hr. Three meals containing glucose given after the 7 days on a fructose diet restored the normal ability to dispose of glucose. Similar results were obtained with rats (see Abst. 741, Vol. 25).—A. Hepburn.

4658

SCHEUNERT, A. and SOMMER, H. Der Ernährungseffekt von Kohlenhydraten mit besonderer Berücksichtigung von Milchzucker und Galaktose. [**Nutritive value of carbohydrates with special reference to lactose and galactose.**] *Biochem. Ztschr.*, 1956, **327,** 461–472. [Inst. Ernährungsforsch., Potsdam-Rehbrücke.]

Earlier findings in respect of tolerance for lactose and galactose in diet, the effect of fat and protein on tolerance, the effect of lactose on composition of the body and the possible chemical intermediates in the conversion of galactose to glucose are briefly summarised. Apart from the admitted effects on absorption of Ca, intestinal flora, and synthesis of vitamins, the metabolism of galactose is ill understood.

Eight experiments with rats, with either semi-synthetic diet or modified cow's milk, are described. The semi-synthetic diet was of casein yeast, hydrogenated rapeseed oil, salt mixture and cod liver oil with, as carbohydrate to make up 65 per cent. of the diet, a proprietary dextri-maltose preparation, dextrinised starch, sucrose, lactose, galactose, glucose or a malt extract which were compared over the series of experiments.

Rats did not thrive with lactose or galactose. Water content of the bodies was not changed, but fat was low and ash in fat-free dry matter (DM) was high. Malt extract produced fat amounting to obesity. When the carbohydrates were given with cow's milk at the rate of 6 or 12 g. per 100 ml. galactose was excreted in urine by all groups tested, namely, proprietary preparation, glucose and lactose, 3 times as much with lactose as with the other sugars.

Since sucking rats do not normally excrete galactose in urine, special experiments were planned to study this result and they showed that, at a lactose concentration not exceeding that in rat's milk, 9·1 per cent. in DM, no galactose is excreted so long as the rat does not eat. The limit of tolerance appears to be about the concentration in rat's milk. In cow's milk there is 37·7 per cent lactose in DM, in human milk 56·9 per cent.

With a constant concentration of 5 per cent. sugar in a synthetic diet, glucose gave slightly better weight increase than galactose; at 12 per cent. also, weight increase was greater with glucose and the difference in DM was chiefly in fat. There was little difference in liver fat.—I. Leitch.

4659

PERRY, J. W., MOORE, A. E., THOMAS, D. A. and HIRD, F. J. R. **Galactose intolerance: observations on an experimental animal.** *Acta paediat.*, 1956, **45,** 228–240. [Royal Child. Hosp., Melbourne, N.3.] French, German and Spanish summaries.

Fifty chickens were fed to appetite on standard pellets and were given 10 per cent. galactose in the drinking water. The mean survival time was 4 days, and that of 17 chicks given 5 per cent. galactose was 12 days. Of 9 chicks given 2½ per cent. galactose some survived for 35 days, but the mean time was 21 days. The chicks given 10 per cent. galactose lost weight and had epileptiform fits. In 29 of these chicks blood glucose varied from 110 to 976 mg. per 100 ml. and blood galactose from 16 to 1735 mg. per 100 ml.; in chicks not given galactose, blood glucose was 190 ± 21 mg. per 100 ml. There was no correlation between blood glucose or galactose and the occurrence of fits.

Plasma α-amino N ranged from 5·7 to 10·1, mean 7·6 ± 1·2 mg. per 100 ml. in chickens given galactose, from 6·3 to 15·0, mean 10·5 ± 2·4 mg. per 100 ml., in controls. The levels were restored to normal 6 days after galactose was withdrawn.

Normal chickens 2 to 4 weeks old were starved for 24 hr. before the small intestine was removed. Segments of intestine were incubated in Krebs bicarbonate buffer with L-histidine and 0·5 per cent. glucose or galactose, and dinitrophenol was added at $10^{-3}M$. Uptake of L-histidine from the medium with glucose was greatly reduced by dinitrophenol. Galactose could not supply the energy necessary for absorption of histidine. The integrity of the mucosa was affected in the presence of galactose.

It is suggested that the chicken will be a useful animal for investigation of galactose intolerance such as occurs in children.—D. Duncan.

4660

HANSEN, R. G., FREEDLAND, R. A. and SCOTT, H. M. (with HAGEMAN, E. and KILBOY, C.). **Lactose metabolism. 5. The uridine nucleotides in galactose toxicity.** *J. Biol. Chem.*, 1956, **219,** 391–397. [Lab. Biochem., Dept. Dairy Sci., Univ. Illinois, Urbana.]

Parts 3 and 4 not traced, 1 and 2 Title 4859, Vol. 23.

5. Chickens were fed from hatching on the purified idet of Rutter *et al.* (Abst. 700, Vol. 24), either with glucose as sole source of carbohydrate or

with 15 per cent. galactose replacing part of the glucose. When the group given galactose developed signs of poisoning, after from 6 to 10 days, all the chickens were killed and nucleotide extracts were made from the livers.

Livers from chickens given galactose contained twice as much uridine diphosphate hexose and 1½ times as much uridine diphosphate as those from chickens given only glucose. The uridine diphosphate hexose from both groups contained some galactose, but there was a much larger proportion in the group given galactose.

The possible significance of uridine derivatives in glucose metabolism is discussed.—D. Duncan.

4661

ALTSCHULE, M. D., PERRIN, G. M. and HOLLIDAY, P. D. **Effect of intravenous administration of lactate on blood pyruvate level in man.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 446–448. [Lab. Clin. Physiol., McLean Hosp., Waverley, Mass.]

Lactate infused into 8 normal adults after fasting produced a great increase in the pyruvate concentration in blood. There was no correlation between the rise in lactic acid and that in pyruvic acid. α-Ketoglutaric acid rose in 6 subjects, fell in one and was unchanged in the other. The rise in blood pyruvate after infusion of glucose was not nearly as high as that after infusion of lactate, and this suggests that lactate enters the metabolic pool more rapidly than glucose.—A. Hepburn.

4662

DRURY, D. R. and WICK, A. N. **Metabolism of lactic acid in the intact rabbit.** *Amer. J. Physiol.*, 1956, **184,** 304–308. [Dept. Physiol., Sch. Med., Univ. S. California, Los Angeles.]

Rabbits had a tracheal cannula inserted and a plastic tube in the jugular vein and were then allowed 3 hr. or more to recover from the anaesthetic. Uniformly labelled L(+)-lactate-^{14}C was then given through the jugular tube and respired CO_2 was collected. Blood samples were taken at intervals for estimation of lactate and glucose.

An initial experiment with 2 rabbits showed that rate of removal of lactate from the plasma was about 63 per cent. in 30 min., indicating one turnover of body lactate in that time. In 3 later experiments labelled lactate was injected at a constant rate equal to the initial dose every 30 min. Under these conditions a plateau was maintained in specific activity of respired CO_2 after about the first 30 min. This indicated very rapid combustion of lactic acid, much quicker than that of labelled glucose. Obviously lactate was not converted to glucose before combustion. Only a small proportion of the ^{14}C activity was found in blood glucose and a minute fraction in muscle and liver glycogen.

It is concluded that lactate produced in emergency under the influence of adrenaline can serve as a quick fuel.—D. Duncan.

4663

MCARDLE, B. **Disturbances of carbohydrate intermediaries in nervous disorders.** *Guy's Hosp. Rep.*, 1956, **105,** 129–141. [Med. Res. Counc., Clin. Res. Unit.]

α-Keto and citric acids were estimated in the urine of normal subjects and patients with nervous disorders, and in the cerebrospinal fluid of such patients, as a contribution to the study of the part played by the Krebs cycle in nervous disease. Relevant literature is reviewed.—F. C. Aitken.

4664

RAKER, C. W. and ROGERS, J. A. **Reports of liver glycogen determinations by biopsies on dairy cows.** *Amer. J. Vet. Res.*, 1956, **17,** 205–206. [New Bolton Centre, Univ. Pennsylvania, Kennett Square.]

A technique for obtaining biopsy samples of liver from dairy cattle for estimation of glycogen is described. Blood sugar of 6 cows was estimated before the liver biopsies were made. The values ranged from 37 to 43 mg. per 100 ml. Liver glycogen values on 3 days, separated by intervals of 7 and 5 days, were from 1·95 to 4·70 mg. per g. liver. Lower values were obtained on the last day. When the animals were slaughtered some scars were found in the livers, but the operation did not cause much haemorrhage, shock or decline in milk yield.—T. D. Bell.

4665

LACHAZE, A. and LEVY, M. Étude de la glycogénolyse au cours de la stéatose produite par des régimes hypoprotéiques hyperlipidiques. Action de la choline. [**Glycogenolysis in fatty liver disorders produced by low-protein high-fat diets. Effect of choline.**] *C.R. Soc. Biol.*, 1955, **149,** 1889–1890. [Lab. Physiol. Gén., Sorbonne.]

Rats weighing about 180 g. received for 3 weeks a normal diet or one high in fat and low in protein and were then fasted for 3 days. Blood sugar was studied after an intramuscular injection of 0·2 mg. adrenaline.

The blood sugar peak after adrenaline was small in rats on the high-fat, low-protein diet, but if such rats received 3 mg. choline intraperitoneally for 4 consecutive days the response to adrenaline became normal. It is concluded that mobilisation of liver glycogen in response to adrenaline is reduced in the fatty liver.—D. Duncan.

See also Absts. 4380, 4435, 4440, 4534, 4675, 4713, 4839, 5082.

PROTEINS AND PROTEIN DERIVATIVES

4666

ALLISON, J. B. **Evaluation of dietary proteins.** *Nutrition Rev.*, 1956, **14,** 129–131. [Dept. Physiol. Biochem., Rutgers Univ., New Brunswick, N.J.]

The argument is that there is need for further researches on a reference protein and its ability to satisfy the needs of the organism for amino acids, because balancing the amounts of these in the diet may be more advantageous than merely increasing the intake of protein.—D. Harvey.

4667

ELVEHJEM, C. A. **Amino acid balance in nutrition.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 305–308. [Dept. Biochem., Univ. Wisconsin, Madison.]

4668

ALBANESE, A. A., HIGGONS, R. A., HYDE, G. M. and ORTO, L. **Lysine and tryptophan content of proteins and their utilization for human growth.** *Amer. J. Clin. Nutrition*, 1956, **4,** 161–168. [Nutrit. Res. Lab., St. Luke's Hosp., New York.]

The utilisation of dietary proteins by infants, calculated from published data as the product of the change in bodyweight in g. daily and the N retention in mg. per kg. daily divided by 1000, increased as the lysine : tryptophan (L/T) ratio approached that of beef muscle. The average coefficient of utilisation of protein, the utilisation of the test protein divided by that of evaporated milk, was for bovine plasma digest (Travamin) 1·82, beef muscle digest 1·43, evaporated milk 1·0, casein digest (Amigen) 0·95, lactalbumin digest (Edamin) 0·89 and wheat gluten 0·52, with corresponding values of 6·9, 5·9, 4·3, 3·9, 3·5 and 2·1 for the L/T ratios. The coefficient of utilisation of protein was a linear function of the L/T ratio. The growth of 13 infants aged from 1 week to 14 months receiving milk proteins was increased by 250 mg. lysine daily at below, or 500 mg. above 4 kg. bodyweight, so that the L/T ratio was maintained at 6·0 to 7·0 (see previous work, Abst. 5241, Vol. 25).—A. Hepburn.

4669

SHARP, G. S., LASSEN, S., SHANKMAN, S., GEBHART, A. F. (Jr.) and HAZLET, J. W. **Studies of protein absorption using nitrogen^{15} as a tag.** *J. Nutrition*, 1956, **58,** 443–457. [Pasadena Found. Med. Res., Calif.]

Methods for the study of protein absorption in man are reviewed and discussed. A yeast in which the protein was labelled with ^{15}N was prepared ; evidence for the general distribution of the isotope throughout the protein fraction of the yeast is reviewed. Absorption was studied on 6 subjects ; a woman and a man, each aged 24, were controls and had apparently normal gastric function, 2 women aged 57 and 66 had long-standing achlorhydria and 2 women, each aged 70, had well established hypochlorhydria. All received an 1800 Cal. diet which provided much animal protein, on the average 85 g. out of a daily total of 110 g. For 5 days before the labelled yeast was given the patients received 1·83 g. unlabelled yeast with the noon meal, daily ; on the experimental day 2 g. of ^{15}N-labelled yeast was substituted. From 3 days before the administration of ^{15}N all urine and faeces were collected from all patients for analysis.

A mean absorption of 90·3 per cent. of the yeast protein was obtained for the 6 subjects. Achlorhydria, hypochlorhydria and age did not appear to depress the capacity to absorb a protein tracer during high protein intake. The need for direct evaluation of endogenous N was avoided through the use of a single dose of labelled protein.

G. F. Garton.

4670

COHN, T. D., LANE, M., ZUCKERMAN, S., MESSINGER, N. and GRIFFITH, A. (with ELKAN, B.) **Induced azotemia in humans following massive protein and blood ingestion and the mechanism of azotemia in gastrointestinal hemorrhage.** *Amer. J. Med. Sci.*, 1956, **231,** 394–401. [Jewish Hosp., Brooklyn, N.Y.] Interlingua summary.

Five healthy men were the subjects in 10 trials. In 2 sets of 3 trials 180 g. protein were given as diluted citrated human blood or as a protein concentrate, Protinal ; in 2 sets of 2 trials 100 and 140 g. were given as beefsteak and 230 and 262 g. as a mixture of beefsteak and concentrate. The blood was taken by stomach tube without ill effect. Urea in blood and N in urine were measured at intervals up to 24 hr. after the protein had been given.

In blood urea the changes were : with blood, increases in 5 hr. of 4, 5 and 7 mg. per 100 ml., equivalent to from 25 to 35 per cent. of fasting value, and return to that value within 24 hr. ; with protein concentrates corresponding results were in from 7 to 9 hr., 19, 20 and 21 mg., 100 to 119 per cent., but after 24 hr. fasting value had not been attained ; with beefsteak alone or with concentrate, results were in from 6½ to 10 hr. between 14 and 45 mg., 67 and 237 per cent., and again fasting value was not reached in 24 hr. Total N in urine in 24 hr. was, for protein concentrate,

about twice that for the equivalent amount of blood ; with the different amounts of beefsteak and concentrate it was directly proportional to the intake of N.

The finding that the protein of whole blood is absorbed less readily than that from the other sources is discussed in relation to the results of other workers on severe gastrointestinal haemorrhage and impairment of kidney function.

D. Harvey.

4671

PEARSON, E., SOROFF, H. S. and REISS, E. **Metabolic derangements in burns.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 223–228. [Surg. Res. Unit, Brooke Army Med. Centre, Fort Sam Houston, Tex.]

Balances of N, K, P, Mg, Na and Cl were studied in 7 burned patients. During the period of negative N balance which followed injury there were large losses of all the elements studied. Comparisons of the balances of N, P and K indicated that losses of protoplasm did not completely explain the changes, nor did the subsequent gains of N correspond with the theoretical gains calculated from K and P balance data.—F. C. Aitken.

4672

LEGUN, A. F. Vliyanie dlitel'nogo medikamentoznogo sna na azotistyi obmen i obmen kaliya i kal'tziya u bol'nykh yazvennoi boleznyu. [**Influence of prolonged induced sleep on nitrogen, potassium and calcium balances in ulcer patients.**] *Vop. Pitan.*, 1956, **15,** No. 3, 16–22. [Lab. Obmen. Veshchestv, Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

There were 2 groups of 5 men between 27 and 45 years old. Mineral and N balance was studied before, during and after treatment. For the 8 days of treatment sleep was prolonged with sedatives to about 20 hr. daily in the first and up to 14 hr. in the second group. The third period began on the twelfth day after the end of treatment. The diet was constant. The results for the first group only are given.

The N balance was studied before treatment in 4 subjects ; it was negative in 3 and 1 was in equilibrium. During treatment all 5 gained weight and were in strongly positive N balance, retaining from 4 to more than 8 g. daily. Appetite was improved considerably in only 1 patient. In the third period weight was maintained and N balance remained positive but retention was smaller, mean 1·6 g. daily, in 4 subjects. The increase in weight during treatment, which varied from 1·3 to 5·3 kg., was not due to retention of water, because an increased intake of water was followed by increased output in the urine.

Mean daily retention of K in the 3 successive periods was 0·7, 3·3 and 3·1 g., that of Ca 0·2, 0·8 and 0·6 g.—D. Duncan.

4673

MCNAIR, R. D., QUIGLEY, W. and O'DONNELL, D. **Protein nutrition in surgical patients. 2. A comparison of the nitrogen-sparing action of glucose, invert sugar and fructose.** *Ann. Surg.*, 1956, **143,** 448–451. [Dept. Pathol., 2. Providence Hosp., Detroit, Mich.]

It has been observed that infused amino acids leave the circulation much sooner than infused glucose and at about the same rate as infused fructose. This suggested that fructose infused with amino acids might have a greater N-sparing effect than infused glucose. This was not borne out by the results of intravenous feeding of 28 subjects with protein hydrolysate and glucose, invert sugar or fructose, for 1 to 3 days. Nitrogen balances were not significantly different in the 3 groups.—F. C. Aitken.

4674

DE VEGA RUIZ, T. Estudio del catabolismo proteico en los periodos pre y postoperatorios. Influencia de la hormona del crecimiento y de los frenadores del sistema hipofisis suprarenal. [**Protein breakdown before and after operations. Influence of growth hormone and of inhibitors of the pituitary adrenal system.**] *Cirug., Ginecol. Urol.*, 1955, **9,** 289–326. [Univ. Seville.]

Excretion of N in the urine was studied in patients after injury or before and after surgical procedures. The first study was on 4 groups of patients ; 26 had abdominal operations causing little trauma, 4 had more severe abdominal operations, 18 had minor and 14 major operations involving injury to bones. All these subjects, with one exception, showed increased loss of N after operation. In 8 out of 18 subjects in whom this aspect was studied the loss reached its peak on the third post-operative day. In 18 out of 19 subjects the return to normal N excretion was delayed beyond the fourth day. The amount of the increase was less than 50 per cent. of the pre-operative output in 11 subjects, 50 to 100 per cent. in 13 and more than 100 per cent. in 36. The proportion of subjects with an increase of more than 100 per cent. was highest in the groups which had the most severe trauma. The type of anaesthesia, spinal or general, had some effect, and losses of N tended to be large after general anaesthesia with ether and chloroform. [The possibility of correlation between the type of anaesthesia and the degree of surgical trauma is not discussed.] Rise of body temperature was often related to a large loss of N.

The second study was on 30 subjects treated after operation with a pituitary inhibitor, *p*-oxypropiophenone (Frenormón); they received in the first 3 days totals of from 0·8 to 1·6 g. The expected increase in loss of N was prevented in 5 of these patients, 2 after minor and 2 after major abdominal operations and 1 with a fractured forearm. [This study included no patient with major bone damage.] The mean loss of N was considered to be reduced by treatment with *p*-oxypropiophenone.

A further 25 patients were treated after operation with gonadotropic hormone. This prevented increase in loss of N in 8 subjects. The peak of loss was less uniform in this group and its timing ranged in 7 subjects from the first to the fifth day, and the total effect was not to improve loss of N except in those subjects in whom the increase was completely abolished.

Growth hormone, given to 15 patients, prevented increased loss of N in 4, but not in any of the 5 with major bone injury. The mean loss of N was reduced in this group and the phase of loss was shortened.

The results were confirmed in experiments with 21 rabbits subjected to abdominal surgery or bone trauma. Again, the best results were obtained with growth hormone.—D. Duncan.

4675

PLOUGH, I. C., IBER, F. L., SHIPMAN, M. E. and CHALMERS, T. C. **The effects of supplementary calories on nitrogen storage at high intakes of protein in patients with chronic liver disease.** *Amer. J. Clin. Nutrition*, 1956, **4**, 224–230. [Dept. Metabol., Med. Div., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington 12, D.C.]

Three patients with chronic liver disease, after a control period on a diet containing sufficient protein and energy to maintain positive N balance and a reasonably constant bodyweight, were given a supplement of 1000 Cal. in the form of fat, carbohydrate or both. The effects of the supplements on N balance were studied at protein intakes ranging from 1 to 4 g. per kg. bodyweight daily.

The amount of N spared ranged from 1·4 to 6·5 mg. per added Cal. In 2 patients fat and carbohydrate were equally effective, in the third carbohydrate was twice as effective as fat.

F. C. Aitken.

4676

BENDER, A. E. **Relation between protein efficiency and net protein utilization.** *Brit. J. Nutrition*, 1956, **10**, 135–143. [Bovril, Ltd., 148 Old St., London, E.C.1.]

The net protein utilisation and the protein efficiency ratio of 32 proteins and 5 amino acid mixtures were estimated with groups of 4 rats given a basal diet of potato starch 10, glucose 15, rice starch 55, margarine fat 15 and salt mixture 5 per cent., with supplements of all the known vitamins; the proteins and amino acids to be tested replaced the rice starch in such quantity that the experimental diet contained 1·4 to 1·6 per cent. N. The duration of each experiment was 7 or 10 days; the rats changed abruptly from stock to experimental diet and were killed at the end of the experimental period; liveweights were used to calculate protein efficiency ratios and dead weights to calculate the moisture content and hence the N content.

The protein efficiency ratios were correlated closely with food intake; the net protein utilisation was independent of food intake. Food intake was correlated with the nutritive value of the protein measured by net protein utilisation or protein efficiency ratio. For net protein utilisation the relation was $y^2 = 67x - 3891$, where y = net protein utilisation and x = food intake in g. per 100 g. bodyweight; for protein efficiency ratio the relation was $y^2 + 20y = 1{\cdot}55x - 135{\cdot}4$. The intake of diets containing amino acids was only half that of diets with protein of similar net protein utilisation, which depressed protein efficiency ratios, so that the relation between protein efficiency ratio and net protein utilisation found with proteins did not hold for the synthetic amino acid mixtures. The protein efficiency ratios were highly correlated with the net protein utilisation values. It was shown that net protein utilisation can be correlated with negative protein efficiency ratios, *i.e.*, loss of weight in g. per g. protein eaten.

G. F. Garton.

4677

CARPENTER, K. J. and ELLINGER, G. M. **Protein quality and "available lysine" in animal products.** *Poultry Sci.*, 1955, **34**, 1451–1452. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Since the ϵ-NH_2 group of lysine was thought to form a nutritionally unavailable complex when intact proteins are damaged during processing, the free NH_2 groups were estimated by reaction with dinitrofluorobenzene and available lysine values were then calculated for 18 products of animal origin. A significant correlation was found between available lysine and the gross protein values obtained by the method of Carpenter *et al.* (Abst. 1281, Vol. 26). The available lysine values were thought to be useful for the prediction of protein quality of animal products of the type investigated when biological tests are not possible.

T. D. Bell.

4678

HEINICKE, H. R., HARPER, A. E. and ELVEHJEM, C. A. **Protein and amino acid requirements of**

the guinea pig. 2. Effect of age, potassium and magnesium and type of protein. *J. Nutrition*, 1956, **58**, 269–280. [Dept. Biochem., Univ. Wisconsin, Madison.]

For part 1 see Abst. 3273, Vol. 26.

2. Four experiments are reported. In the first the synthetic diet, similar to that already described, had 24 per cent. casein ; it was given alone or with 0·5 per cent. L-arginine hydrochloride or 0·3 per cent. DL-methionine or both ; a fifth group had the diet with 35 per cent. casein. Control periods lasted for 5 weeks with these mixtures after which there was added to each 0·1 per cent. DL-tryptophan for 2 weeks, the same amounts of arginine and methionine for 1 week and with tryptophan for 12 days and finally 0·1 per cent. L-arginine hydrochloride for 10 days. In the control period, when additions were to the 24 per cent. casein diet, arginine greatly increased the rate of growth, methionine had little effect and together these amino acids had more effect than arginine alone. Only on the diet with 35 per cent. casein was growth satisfactory.

In the second experiment with the same guinea-pigs, now older, graded amounts of arginine, 0·1, 0·3 or 0·6 per cent., were added to the 24 per cent. casein diet ; growth was best at the intermediate level. When methionine was added in graded amounts with 0·3 per cent. arginine no benefit resulted.

In the third experiment levels of casein and of sucrose or dextrin were as in Abst. 3273, Vol. 26 and the effects were studied of adding extra K or Mg or both or of excluding both. In these last circumstances growth ceased ; it recommenced when one or the other was restored to the diet, but was satisfactory only when both were given.

In the last experiment different proteins were tested, 24 per cent. casein, 18 per cent. casein with 6 or 10 per cent. gelatine, or 24 per cent. soya bean protein. Growth was best with the soya protein ; the inclusion of gelatine improved growth slightly.

The findings are discussed.—D. Harvey.

4679

GESSERT, C. F. and PHILLIPS, P. H. **Protein in the nutrition of the growing dog. Adverse effects of some amino acid supplements in low-protein diets for growing dogs.** *J. Nutrition*, 1956, **58**, 415–421 ; 423–431. [Dept. Biochem., Univ. Wisconsin, Madison.]

(a) Eight pups, one from each of 8 litters, were assigned to each of 5 experimental groups. The diets of the groups contained 10·6, 12·8, 15·0, 17·2 and 19·4 per cent. protein. Each increment of protein over 10·6 per cent. was obtained by replacing sucrose by casein. The dogs were given the experimental diets for 14 weeks or more from the age of 6 or 7 weeks. Average gain in weight in 12 weeks increased with increase in protein content of diet up to 17·2 per cent. Efficiency of utilisation of diet increased rapidly from the 10·6 to the 12·8 per cent. protein level ; thereafter there was little increase in efficiency. One male pup weighed only 2·45 kg. after 16 weeks on the diet of lowest protein content and its female littermate weighed 10·05 kg. after 16 weeks on the diet of highest protein content, but the male achieved a weight of nearly 10 kg. when given the diet with 17·2 per cent. protein for the next 14 weeks.

The estimated amino acid contents of the 5 diets are tabulated and discussed in relation to the requirements of the dog for individual amino acids.

(b) Five groups of littermate pups were given a basal diet containing 10·6 per cent. protein. Average gain in weight in 10 weeks was poorer in an unsupplemented group than in a group which received a supplement of 10 per cent. casein. A group given a supplement of 0·4 per cent. L-lysine did not gain as much as the unsupplemented group and the gains of groups given 0·4 per cent. L-lysine with 0·3 per cent. DL-methionine, with or without 0·13 per cent. L-histidine, were little better than those of the unsupplemented group. In a second similar experiment a supplement of 0·15 per cent. DL-methionine, with or without 0·10 per cent. DL-tryptophan, depressed growth compared with that of an unsupplemented group. Addition of 0·15 per cent. DL-methionine with 0·13 per cent. L-lysine and with or without 0·10 per cent. DL-tryptophan substantially increased weight gain above that of the unsupplemented group.

F. C. Aitken.

4680

MEYER, J. H. **Influence of dietary fiber on metabolic and endogenous nitrogen excretion.** *J. Nutrition*, 1956, **58**, 407–413. [Dept Animal Husb., Univ. California, Davis.]

Four groups of 12 weanling rats were given a basal ration of sucrose 86·8, defatted whole egg protein 4, cottonseed oil 5, salts 4, vitamins 0·1 and choline 0·1 per cent. Three of the groups were given 5, 15 and 30 per cent. cellulose at the expense of the basal ration, so that the ratios of sucrose and fat to protein, vitamins and minerals remained constant. After 7 days on the diets, the faeces and urine were collected for 7 days and N was estimated.

There was no effect of fibre intake on excretion of endogenous N in the urine. Each increment of cellulose increased total faecal N excretion ; this relationship was examined and expressed graphically and by the regression equation

$$y = 3{\cdot}1 + 115{\cdot}45\ (1/x),$$

where y is metabolic N in mg. per g. faecal dry matter and x the percentage of indigestible dry matter in the diet.—G. F. Garton.

4681

RUMSFELD, H. W. (Jr.) **Role of dietary protein in normal rat proteinuria.** *Amer. J. Physiol.*, 1956, **184,** 473–478. [Dept. Biochem., Southwestern Med. Sch. Univ. Texas, Dallas.]

Eleven groups of 5 adult rats were given diets containing, respectively, 50 per cent. casein, 18 per cent. casein, 18 per cent. casein plus urea, 50 per cent. egg albumin, 50 per cent. fibrin, 50 per cent. casein and fibrin mixed, 50 per cent. casein and egg albumin mixed, 50 per cent. " synthetic " casein, 12 per cent. casein, 50 per cent. casein (other items different from those in diet 1), and 12 per cent. casein plus 12·5 per cent. urea. Urine was collected for estimation of urea, N.P.N., ammonia and protein N and for electrophoretic analysis ; blood samples were obtained for estimation of urea N.

When the casein intake was increased from 12 or 18 to 50 per cent. the amount of protein in the urine doubled ; the same effect was produced by the other proteins studied. The electrophoretic pattern of the protein in urine was not affected by the nature of the dietary protein. Urea when given by mouth or by injection caused an increase in protein in urine, similar in many respects to that produced by intact protein. Water loading experiments showed a much closer relation between urea and protein excretion than between protein excretion and urine volume.—G. F. Garton.

4682

FRITZ, I. **The effects of the adrenal cortex on the release of N^{15} from tissue proteins of rats previously fed N^{15}-glycine. The preferential catabolism of recently synthesized protein during starvation.** *Endocrinology*, 1956, **58,** 484–492 ; 493–500. [Dept. Dent. Res., Dent. Div., Army Med. Serv. Grad. Sch., Washington, D.C.]

(a) Rats given ^{15}N-glycine and then starved for up to 161 hr. excreted more ^{15}N in the urine when they received cortisone than did normal or adrenalectomised rats. Cortisone prevented the decrease of total protein N in the liver, enhanced the decrease in thymus, but had no effect on the heart, kidney and testis, which lost little protein during starvation. Neither cortisone nor adrenalectomy affected the rate of decrease of ^{15}N in tissue proteins. Cortisone was thought to mobilise the protein from the periphery to the liver faster than the liver could catabolise it.

(b) When normal rats were starved the ^{15}N concentrations of all tissue proteins, except incisor dentine (Fritz and Burnett, *J. Dent. Res.*, 1953, **32,** 647) and hair, failed to increase. The ^{15}N concentrations in the N.P.N. fractions of carcase, heart, diaphragm and biceps were always greater than those of the corresponding tissue proteins and decreased rapidly with time. All fractions obtained by differential centrifuging of liver from starved rats treated with cortisone retained more protein N than corresponding fractions from normal starved rats, but the ^{15}N concentrations of the fractions after 161 hours' fasting were not affected by cortisone. Recently formed protein was thought to be broken down preferentially.

A. Hepburn.

4683

CANNON, P. R., FRAZIER, L. E. and HUGHES, R. H. **The influence of cortisone upon protein metabolism.** *Arch. Pathol.*, 1956, **61,** 271–279. [Dept. Pathol., Univ. Chicago, Ill.]

Eight experiments were made with adult male rats. The method used was mainly one of repletion of animals which had been depleted of protein ; the standard repletion diet was of dextrin 69·5, maize oil 4, cellulose 7·5, K-free salt mixture 5·6, vitamin mixture 1·5, fibrin 15·07 per cent., choline 0·9 ml., water 11 ml., percomorph liver oil 0·45 ml. and KCl 0·1 per cent.

Using " catabolism " in a general sense, namely, in relation to a trend towards a negative N balance and an inhibition of tissue protein synthesis, it was evident from the experiments that cortisone acted as a catabolic agent. Inhibition was not modified by dietary supplements of ascorbic acid or certain of the B group vitamins, including cyanocobalamin. An increase of energy intake during protein repletion favoured weight gain, but carcase analysis indicated that this was due to increased deposition of tissue carbohydrate and fat, not to increased deposition of tissue N. No evidence was obtained that the K ion limited the inhibiting action of cortisone. Although cortisone acted to divert dietary protein from its usual role in the synthesis of depleted tissues, there was no evidence of toxicity such as might have been shown by loss of appetite.—G. F. Garton.

4684

HOUCK, C. R. **Sodium, potassium and nitrogen balances in chronic nephrectomized dogs.** *Amer. J. Physiol.*, 1956, **185,** 175–178. [Div. Physiol., Univ. Tennessee Med. Units, Memphis.]

4685

LEVERTON, R. M., JOHNSON, N., ELLISON, J., GESCHWENDER, D. and SCHMIDT, F. **The quantitative amino acid requirements of young women. 4. Phenylalanine, with and without tyrosine.**

LEVERTON, R. M., ELLISON, J., JOHNSON, N., PAZUR, J., SCHMIDT, F. and GESCHWENDER, D. **5. Leucine.** *J. Nutrition*, 1956, **58,** 341–353 ; 355–365. [Nebraska Agric. Exp. Stat., Lincoln.]

For parts 1 and 2 see Abst. 3538, Vol. 26.

4. The method was that described previously (Abst. 3538, Vol. 26). Ten college girls served as subjects. The daily N intake of each subject was 9·5 g. Phenylalanine intake was reduced from 1280 to 320, to 220, to 120 and to 70 mg. daily while tyrosine was kept constant at 900 mg. An intake of 220 mg. phenylalanine was the least amount which maintained all the subjects in N equilibrium, defined as the condition in which N excretion remains within 95 to 105 per cent. of the intake. When the subjects received other proportions of phenylalanine and tyrosine no clear-cut quantitative relation between them was found; a sparing action of tyrosine on phenylalanine requirement was evident.

A group of 8 subjects remained in N equilibrium on a ration which included 220 mg. phenylalanine, 900 mg. tyrosine and the minimum amounts of threonine, valine, tryptophan and leucine previously found in this series of experiments to be required by young women for maintaining N balance. In the presence of 900 mg. tyrosine, 220 mg. phenylalanine is tentatively suggested as the minimum daily requirement of young women.

5. The leucine requirement of 12 young women was studied as above. Leucine intakes of 1860, 710, 620, 480, 370, 270, 170 and 95 mg. daily were used.

The amount of leucine required to maintain N equilibrium ranged from 170 to 710 mg. daily. When 620 mg. leucine was included in a ration with minimum amounts of threonine, valine, tryptophan and phenylalanine given to 8 subjects they all remained in N equilibrium. The minimum daily requirement of L-leucine for young women is tentatively suggested to be 620 mg.—G. F. Garton.

4686

SCHÖNENBERG, H. Papierchromatographische Untersuchungen der Aminosäurenausscheidung im Urin gesunder Menschen. [**Investigation by paper chromatography of the amino acid excretion in the urine of healthy human beings.**] *Klin. Wochenschr.*, 1956, **34,** 442–446. [Kinderklin., Univ. Münster i. W.]

The distribution of amino acids in urine was investigated by a 2-dimensional paper chromatogram with phenol as solvent in the first phase and a mixture of collidine and lutidine in the second phase. Results from 100 patients in an asylum, 100 healthy students, 25 newborn infants and 75 older infants are tabulated. Glycine and serine were present in all the urines examined, and alanine, histidine and glutamic acid in over 90 per cent. of samples from adults, but in fewer from infants. Hydroxyproline was found only in infant urine. The possible use of paper chromatograms of urinary amino acids for diagnosis of metabolic disorders is suggested.—A. M. Copping.

4687

BERGER, H. Die Amino-Stickstoff-Ausscheidung im Harn in Abhängigkeit vom Lebensalter. (Ein Beitrag zur Physiologie der Aminoacidurie.) [**Excretion of amino acids in urine as related to age. Contribution to the physiology of urinary excretion of amino acids.**] *Ann. paediat.*, 1956, **186,** 338–361. [Kinderklin., Kinderspital, Univ. Basle.] English and French summaries.

Previous work (Abst. 3748, Vol. 24) had shown that the amount of amino N excreted in the urine in 24 hr. did not vary much from day to day in any one person, but did vary with age. To study this, α-amino N was estimated in 24-hr. urine, 400 samples from 340 healthy persons of all ages, by a modification of Folin's method, and in some samples total N.P.N. was estimated by the Kjeldahl method. The results are shown mostly in scatter diagrams.

Values for 50 normal newborn infants, mostly fed on mother's milk from the second day, rose fairly regularly from about 2·5 mg. in the first 24 hr. to about 10 mg. on the 7th day. Urine volume rose in much the same way, but they are not thought to be directly connected. Neither was related to bodyweight.

After the neonatal period, excretion of α-amino N rose from 10 mg. at 1 year to a maximum of about 200 mg. at puberty, fell to a plateau at about 130 mg. in the third decade and thereafter declined gradually. In old age there were great fluctuations even in the same person. As a percentage of total N.P.N., α-amino N fell from about 6 in the first week to under 2 at 1 year and remained so for the rest of life, except possibly at puberty and in old age. Relative to bodyweight, α-amino N, at first very low, rose rapidly to 10 mg. per kg. bodyweight and then declined gradually, with a slight rise at puberty and perhaps in old age.

The results are in fairly good agreement with comparable ones in the literature, but the peaks at puberty and in old age do not seem to have been reported before.

Total N.P.N. excreted per kg. bodyweight in 24 hr., apart from the first few months of life and a slight rise at puberty, was found to decline steadily with age, and it is suggested that amino N excretion, which bears a nearly constant ratio to it, runs parallel with the protein turnover. It also accords with textbook values for protein requirement relative to bodyweight, at different ages, except perhaps in old age.

When the absolute amount of amino N excreted was plotted against bodyweight, it was found that the greatest amounts were excreted not by the heaviest people, but by those of medium weight, 30 to 60 kg., and it is conjectured that in the heavy

" well fed " people the smaller excretion of amino N may be the sign of a smaller turnover of protein due to the sparing effect of the reserves of carbohydrate and fat.

The relation between surface area and excretion of amino N seemed to be almost linear ; between urine volume and excretion of amino N there was no consistent trend.—W. M. Deans.

4688

FISHER, I., GUTH, D., HIRSCH, W. and PHARAON, H. Zwei Fälle von Aminosäurendiabetes. [**Two cases of amino acid diabetes.**] *Helv. paediat. Acta*, 1956, **11**, 99–103. [Kinderabt., Hadassah Spital, Tel Aviv.] French, Italian and English summaries.

Two young children had renal glycosuria and cystinuria, respectively, and further investigation showed excessive loss of amino acids in the urine and disturbances of mineral metabolism. Both children were physically and mentally retarded. The rest of the family of one child also excreted excessive amounts of amino acids, and 2 brothers of the other child had cystine crystals in the urine. The condition is considered to be an inborn error of metabolism.—W. M. Deans.

4689

DALGLIESH, C. E. and TABECHIAN, H. **Comparison of the metabolism of uniformly ^{14}C-labelled L-phenylalanine, L-tyrosine and L-tryptophan in the rat.** *Biochem. J.*, 1956, **62**, 625–633. [Postgrad. Med. Sch., Ducane Rd., London, W.12.]

Fasted rats received by stomach tube phenylalanine, tyrosine or tryptophan uniformly labelled with ^{14}C and total radio-activity in respired CO_2, muscle, bone, skin and different organs was estimated. The activity in urine and faeces was small and was neglected.

The rate of production of $^{14}CO_2$ showed that all the amino acids were rapidly degraded to non-aromatic substances of high activity. Tyrosine was degraded about twice as fast as phenylalanine and tryptophan. The activity in the " non-protein aromatic " fraction of muscle, liver and gut, the tissues containing most activity, was low except after short intervals of time, but the activity of the " protein-bound " fraction increased with time. Tryptophan produced much greater activity in the gut than the other amino acids, and the ratio of activity in the gut to that in the blood protein was high. These results suggested that tryptophan remained longest in the gut wall. The degradation of tryptophan to non-nitrogenous substances is considered likely to occur via 3-hydroxyanthranilic acid.—A. Hepburn.

4690

LOFTFIELD, R. B. and HARRIS, A. **Participation of free amino acids in protein synthesis.** *J. Biol. Chem.*, 1956, **219**, 151–159. [Med. Labs., Collis P. Huntington Mem. Hosp. Harvard Univ., Massachusetts Gen. Hosp., Boston.]

L-Valine, L-*iso*leucine and L-leucine, all labelled with ^{14}C, were infused continuously into rats for 3 days. Saccharated iron oxide was injected after the beginning of infusion to stimulate formation of ferritin in the liver. After an interval the ferritin had the same radio-activity in its amino acids as the liver tissue. It was therefore concluded that ferritin was synthesised directly from free amino acids and not from other proteins. Unlabelled leucine infused 24 hr. after a large dose of ^{14}C-leucine produced intracellular leucine with a specific activity higher than the average activity of the total liver protein for at least 1 day. This showed that much of the free amino acids within liver tissue was derived from endogenous protein.—A. Hepburn.

4691

SÓS, J. and KEMÉNY, T. Die characteristischen Symptome des Isoleucin-, Lysin- und Methioninmangels bei Ratten und Hunden. [**The characteristic signs of *iso*leucine, lysine and methionine deficiency in rats and dogs.**] *Virchows Arch.*, 1956, **328**, 421–428. [Pathophysiol. Inst., Med. Univ., Budapest.]

See also Abst. 2012, Vol. 26.

The diets of rats contained 18 per cent. and those of dogs 15 per cent. total protein. For the control diet the protein was casein, for *iso*leucine deficiency blood protein, for lysine deficiency wheat gluten and for methionine deficiency gelatine. The degree of deficiency was 70, 70 and 85 to 90 per cent., respectively. The numbers of rats and dogs given the 4 diets in the above order were 20 and 2, 10 and 2, 20 and 3, 20 and 2. The dogs were all of one litter.

In lysine deficiency the rats failed to grow, and after about 20 weeks began to lose weight quickly and soon died. Deficiency of methionine had a much more acute course ; the rats lost weight from the start and died in about 2 months. The effect of *iso*leucine was intermediate. The rats deprived of lysine became ataxic and adopted a characteristic stance suggestive of damage to the brain.

The relative weights of different organs in the 3 types of deficiency were compared with those in controls. *Iso*leucine deficiency produced damage especially in the kidneys, where both glomeruli and tubules showed degenerative changes. The thyroid showed areas of increased and others of reduced activity. Slight parenchymatous degeneration appeared in liver and lungs.

Lysine deficiency damaged chiefly the liver, which showed advanced perilobular fatty degeneration. Most of the rats had chronic pneumonia. No clear lesion was found in the central nervous system. Methionine deficiency produced fibrocystic damage in the pancreas, then fatty degeneration, necrosis and fibrosis in the liver and emphysema and bronchiectasis in the lungs. Other organs were more or less damaged also.

In all 3 deficiencies the adrenals were 3 times as large as those of controls as a result of cortical hypertrophy.—D. Duncan.

4692

SHOSH, I. [Sós, J.] Sravnitelnoe izuchenie nedostatka nekotorykh aminokislot v pitanii. [**Comparative study of the deficiency of certain amino acids in food.**] *Gigiena Sanit.*, 1955, No. 8, 22–25.

See above Abst.

4693

STENRAM, U. **Nucleolar size in the liver of rats fed diets deficient in essential amino acids.** *Acta pathol. microbiol. scand.*, 1956, **38,** 364–374. [Dept. Histol., Univ. Lund, Sweden.]

Thirteen groups of 10 adult male rats after being starved for 5 days were fed for 3 days on diets containing 25 per cent. casein, no casein, histidine and the 8 essential amino acids with glycine to 25 per cent., the third diet with one of the essential amino acids or histidine omitted, or 25 per cent. glycine alone. Food intake was restricted to that of the group eating least. When lysine, *iso*-leucine, methionine, threonine, tryptophan or valine was omitted from the diet, nucleolar size, total nucleolar volume per nucleus and the ratio of total nucleolar volume per nucleus to nuclear volume of rat liver cells was significantly increased as compared with that of the groups given all the amino acids or casein. These results were verified with 43 female rats. The omission of histidine, leucine or phenylalanine had no effect, and when all 3 were omitted from the diet of 20 young male rats there was again no change.—A. Hepburn.

4694

BROWN, R. R. and PRICE, J. M. **Quantitative studies on metabolites of tryptophan in the urine of the dog, cat, rat and man.** *J. Biol. Chem.*, 1956, **219,** 985–997. [Cancer Res. Hosp., Med. Sch., Univ. Wisconsin, Madison.]

Procedures with ion exchange resins are described in detail for estimation in urine of kynurenic and quinaldic acids, 4-quinolone and its *N*-methyl derivative, anthranilic acid and its glucuronide, kynurenine and its acetyl derivative and *o*-aminohippuric acid. These and xanthurenic acid and *N*-methyl-2-pyridone-5-carboxamide were estimated in urine from 4 healthy men, 2 dogs, 2 cats and 5 rats before and after doses of L-tryptophan given, respectively, by mouth, stomach tube, mouth and intraperitoneal injection.

Cats differed from the other species in excreting almost none of these substances; *o*-aminohippuric acid alone appeared in measurable amount and only 0·07 per cent. of a dose of 4·9 m. moles of tryptophan was accounted for. The main metabolites in the other species were kynurenine and kynurenic acid with, in man, the pyridone. Xanthurenic acid appeared to some extent in urine from both man and rat, but was of little importance in that of the dog. 4-Quinolone and its *N*-methyl derivative were not detected in urine from any of the species.

The relation of these findings to the occurrence of cancer of the bladder, frequent in man and rare in cats, is discussed.—D. Harvey.

4695

KOTAKE, Y. (Jr.) and INOUYE, K. **Effect of tryptophan and anthranilic acid upon adrenalectomized rat. 1. The prolongation of life of adrenalectomized rat by the oral application of tryptophan and its metabolite, anthranilic acid.**

KOTAKE, YAHITO, INOUYE, K. and NAKAI, O. **2. Studies on the protein metabolism.** *J. Biochem., Tokyo*, 1955, **42,** 513–518; *Proc. Japan Acad.*, 1955, **31,** 745–749. [Biochem. Dept., Wakayama Med. Coll.]

1. Groups of from 3 to 7 rats, weighing from 140 to 290 g., fed on a semi-synthetic diet survived for from 4 to 10 days after removal of the adrenals, but 100 mg. tryptophan given by mouth at intervals afterwards prolonged survival to from 20 to 43 days, and a daily dose of 2·5 mg. anthranilic acid prolonged it to from 20 to 27 days. When 1 mg. nicotinic acid or 1 mg. vitamin C or 20 mg. L-methionine was given daily there was no influence on survival.

When 2·5 mg. anthranilic acid or 15 mg. tryptophan was given daily the liver glycogen of adrenalectomised rats remained almost normal, otherwise it fell considerably within 3 days.

2. In an experiment like the last, anthranilic acid or tryptophan maintained the creatinine content of the urine at almost the normal; in untreated rats it fell rapidly. Anthranilic acid prevented the fall in urea content of the urine and the increase in N.P.N. content of the blood which occur after adrenalectomy in untreated rats.

Histological examination of the livers of adrenalectomised rats, given and not given anthranilic acid, showed changes in the appearance of ribonucleic acid as stained with thionin, suggesting that after adrenalectomy the liver undergoes some

biochemical change adversely affecting protein metabolism, which can be prevented with anthranilic acid.—M. H. Pierce.

4696

WRETLIND, A. **The utilization of D-valine for growth of rats.** *Acta physiol. scand.*, 1956, **36,** 119–136. [Dept. Pharmacol., Karolinska Inst., Stockholm.]

A diet containing 2 per cent. D-valine and the essential amino acids in the racemic form did not support growth in normal rats or rats depleted of protein. The diet of White *et al.* (Abst. 3214, Vol. 23) containing all the L-amino acids except valine (methionine, threonine, alanine and serine were racemic) produced growth when D-valine was added. Systematic study showed that the conversion of D-valine into the L-form was inhibited by D-leucine.—A. Hepburn.

4697

PORTMAN, O. W. and MANN, G. V. **Further studies of the metabolism of taurine-S^{35} by the rat.** *J. Biol. Chem.*, 1956, **220,** 105–112. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

For previous work see Abst. 5250, Vol. 25.

Rats were given intraperitoneally taurine labelled with taurine-^{35}S and its fate was studied. In 16 adult rats the proportion of the dose which was recovered in urine in 24 hr. after the injection rose from a mean of 29·1 per cent. to 69·0 per cent. as the dose increased from 4·8 to 60·0 mg. taurine per kg. bodyweight.

Rats fed for 30 days on a diet containing 20 per cent. casein and 0·3 per cent. cystine excreted in 24 hr. 29·1 per cent. of a dose of 4·8 mg. taurine-^{35}S per kg. bodyweight, but rats given only 8 per cent. casein excreted only 3·4 per cent. of the injected taurine. When the diet with 8 per cent. casein was supplemented with 50 mg. cysteic acid injected intraperitoneally daily for 3 days before the taurine was given, excretion of taurine rose to 10·8 per cent. With the 20 per cent. casein diet, 5·0 per cent. cholesterol given for 30 days reduced excretion of injected taurine to 18·8 per cent., and bromobenzene injected at 400 mg. per kg. bodyweight for 3 days similarly reduced excretion of taurine to 18·3 per cent. Weanling rats given a diet with 12 per cent. casein excreted 2·8 per cent. of the injected taurine when no cystine was included in the diet, but 14·5 per cent. when the diet contained 0·3 per cent. cystine.

The distribution of ^{35}S in the tissues was studied in some of the rats 24 hr. after injection of taurine. Adult rats given the 8 per cent. casein diet incorporated almost twice as much injected taurine-^{35}S into liver and muscle as did rats given 20 per cent. casein and 0·3 per cent. cystine. Weanling rats given 12 per cent. casein incorporated less ^{35}S into liver and muscle when they had had cystine than when they had not. There was never measurable ^{35}S activity in cystine isolated from protein hydrolysates. In 2 rats protein-free extracts were prepared from kidney and liver and concentrated for column chromatography, which revealed most of the ^{35}S still in taurine.—D. Duncan.

4698

SÓS, J., CSALAY, L., FEHÉR, I., HARMOS, GY., KEMÉNY, T., PERÉNYI, L. and WEISZ, P. Untersuchungen mit den Antimetaboliten der Glutamin- und Asparaginsäure. [**Antimetabolites of glutamic acid and aspartic acid.**] *Acta physiol. hung.*, 1956, **9,** Suppl., 40–41. [Pathophysiol. Inst., Med. Univ., Budapest.]

4699

FISHER, H., SALANDER, R. C. and TAYLOR, M. W. **Growth and creatine biosynthesis in the chick as affected by the amino acid deficiencies of casein.** *J. Nutrition*, 1956, **58,** 459–470. [Dept. Poultry Husb., Rutgers Univ., New Brunswick, N.J.]

A basal ration of casein 25, maize oil 3, fibre 3, salt mixture 5·34, choline chloride 0·2 and cellulose 63·36 parts with vitamins was prepared. At the expense of cellulose, additions were made of, per cent., arginine 1, glycine 2, methionine 0·3, singly, in pairs or all three, or of creatine hydrate 0·8. These diets were given to chickens for 4 weeks from hatching. There were 2 control groups, one having the basal diet alone, the other a practical starter ration. There were 20 birds of each sex in each group. Weight was recorded and birds were killed at intervals of 4 days for estimation of creatinine in leg muscle. Data were analysed statistically.

Of the effects of amino acids given singly, in increasing rate of growth over that on the basal diet, only that of arginine was significant; in pairs they did better only when arginine was present and all 3 were no better than arginine and glycine. With the combination of arginine and glycine rate of growth was equal to that on the practical diet.

With all diets the level of creatine in muscle rose linearly with age over the 4-week period. In the groups given arginine and glycine, all 3 amino acids, creatine or the practical ration the rate of increase was greater than in the 6 other groups.

D. Harvey.

4700

FINLAYSON, J. S. and BAUMANN, C. A. **Role of urea in rat proteinuria.** *Amer. J. Physiol.*, 1956, **184,** 469–472. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Male rats were given a basal diet of extracted casein 12, salts 4, maize oil 5, cystine 0·2 and glucose monohydrate (cerelose) to 100 per cent., with vitamins A, D, E, K and those of the B group, either to appetite or for 2 hr. daily. Variations in the diet were made at the expense of the carbohydrate. Blood and urine were collected for analysis; a simplified method for the routine estimation of protein in rat urine by centrifuging is presented.

When urea was given to appetite it increased the output of protein in the urine, but the increase was usually less than when the same amount of N was given as casein. Urea given for 2 hr. daily produced a rapid increase in protein output which, for the rest of the day, followed neither the blood urea nor the intake of water. A mixture of amino acids, prepared to resemble the components of casein, increased protein output to the same extent as the same amount of N in urea, but less than the equivalent high-protein diet.—G. F. Garton.

See also Absts. 4133, 4154, 4172, 4256, 4322, 4352, 4365, 4417–19, 4434, 4455, 4466, 4501, 4572, 4728, 4763, 4768, 4769, 4793, 4803, 4805, 4841, 4851, 4852, 4854, 4905, 4906, 4968, 4987, 4988, 5075, 5103, 5257.

FATS AND OTHER LIPIDS

4701

SARZANA, G. La regolazione endocrina del ricambio lipidico. [**Endocrine regulation of the metabolism of lipids.**] *Quad. Nutrizione*, 1954, **14,** 109–142. [Ist. Fisiol. Umana, Univ. Palermo.]

A review.

4702

SCHRADE, W. Zur Regulation der Lipide des Blutes. [**Regulation of the lipids of blood.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 617–621. [1. Med. Klin., Univ. Frankfurt a.M.]

A review.

4703

LASCH, H. G. and SCHIMPF, K. Blutgerinnung und alimentäre Fettbelastung. [**Blood clotting and administration of dietary fat.**] *Deutsch. Arch. klin. Med.*, 1956, **203,** 146–151. [Med. Klin., Univ. Heidelberg.]

In 10 healthy subjects given 70 g. butter by mouth clotting time of blood fell and the effect reached its maximum in from 120 to 150 min. after the test meal; there was visible lipaemia, but no relation between clotting time and degree of lipaemia. Recalcification time was reduced and there was a parallel increase in prothrombin and in Factor VII, a decrease in antithrombin III and IV, and an increase in thrombokinase activity, which reached its maximum about 150 min. after the test dose. The influence of dietary fat on clotting time is discussed in relation to the prophylaxis and treatment of thrombosis with a diet low in fat.—L. Wills.

4704

BRONTE-STEWART, B., ANTONIS, A., EALES, L. and BROCK, J. F. **Effects of feeding different fats on serum-cholesterol level.** *Lancet*, 1956, **270,** 521–526. [Clin. Nutrit. Unit, Dept. Med., Univ. Cape Town.]

Two European men with initially high serum cholesterol and 5 Bantu men and 1 Cape Coloured man with initially low serum cholesterol were given diets to which several fats and oils were added, one at a time, usually in 100-g. amounts. The basal diet of the 2 Europeans included 50 g. fat daily, mainly of animal origin, and the diet of the 6 non-Europeans had a low fat content. Two of the non-Europeans were maintained on a diet poor in protein, and the protein given to a third non-European varied in amount. The cholesterol concentrations of serum and of serum lipoproteins were studied; so was the cholesterol content of the faeces.

Butter, beef dripping, beef muscle, eggs and hydrogenated groundnut oil caused increases in serum cholesterol. Marine animal oils decreased serum cholesterol, so did sunflower seed oil and a highly unsaturated fatty acid fraction from pilchard oil. Olive oil and groundnut oil did not raise serum cholesterol. Changes in protein intake did not appear to affect serum cholesterol.

A. K. Lough.

4705

KINSELL, L. W., FRISKEY, R. W., MICHAELS, G. D. and BROWN, F. R. (Jr.) **Effect of a synthetic triglyceride on lipid metabolism.** *Amer. J. Clin. Nutrition*, 1956, **4,** 285–286. [Inst. Metabol. Res., Highland Alameda County Hosp., Oakland, Calif.]

One patient aged 51 who had multiple fractures was given a chemically constant diet in which a synthetic triglyceride was the source of dietary fat; its composition was oleic acid 74, palmitic acid 19, stearic acid 5 and linoleic acid 2 per cent. The linoleic acid intake was about 2 g. daily. There was a prompt and profound fall of plasma cholesterol during administration of the synthetic fat. When 10 g. cholesterol, emulsified in the diet, was given, plasma cholesterol rose slightly. When cholesterol was withdrawn plasma cholesterol and

phospholipins fell. When coconut oil was substituted for the synthetic fat plasma cholesterol and phospholipins rose progressively.

G. A. Garton.

4706

DRYDEN, L. P., FOLEY, J. B., GLEIS, P. F. and HARTMAN, A. M. **Experiments on the comparative nutritive value of butter and vegetable fats.** *J. Nutrition*, 1956, **58,** 189–201. [Dairy Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

Groups of weanling rats were fed to appetite for several weeks on diets containing 4·7, 16·0, 30·7 and 40·0 per cent. of butterfat or maize oil. Growth, as indicated by weight gains, increased with increasing proportions of butterfat in the diet; similar but smaller increases in growth rate were observed with increasing proportions of maize oil. But only at the higher fat levels were the weight gains greater with the diets containing butterfat than with the diets containing maize oil. No additional effect was found when linoleate was added to butterfat.

In similar experiments no difference in the growth rate of young rats was found when they were fed on diets containing summer or winter butterfat.

Further feeding trials with diets containing Sulfathalidine (phthalylsulphathiazole) showed that butterfat and margarine as 28 per cent. of the ration increased weight gains of weanling rats more than did a similar diet containing maize oil, though this effect was seen only during the initial 3 weeks of the 8-week experiment. The effect was not apparent in the absence of Sulfathalidine.

G. A. Garton.

4707

BEST, C. H. **The lipotropic agents in the protection of the liver, kidney, heart and other organs of experimental animals.** *Proc. Roy. Soc.* [*B*], 1956, **145,** 151–169. [Dept. Physiol., Univ. Toronto.]

A lecture.

4708

DI LUZIO, N. R. and ZILVERSMIT, D. B. **Effect of choline, heparin and aureomycin on fatty livers of dogs.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 338–341. [Dept. Physiol., Univ. Tennessee, Memphis.]

Healthy dogs were kept for 3 weeks on a choline-deficient diet consisting of lard 38, sucrose 44, casein 8, cod liver oil 3 and salt mixture 5 parts. Seven animals were given a daily supplement of 1 per cent. choline chloride, 8 animals received 0·5 g. aureomycin twice daily and 9 were injected intramuscularly twice daily with heparin at the rate of 2 mg. per kg. bodyweight. At the end of the experiments liver lipids were extracted and phospholipins, total cholesterol, and triglycerides plus cholesterol ester fatty acids, the last designated "triglyceride" fraction, were estimated. Some liver slices were incubated with radio-active phosphate with and without the addition of choline, and the extent of phospholipin synthesis in 1 hr. was measured.

Supplementation of the diet with choline or daily injections of heparin reduced the amounts of liver triglycerides, but increased amounts of liver triglycerides were found in dogs which had received aureomycin. Neither choline, heparin nor aureomycin affected the values for liver phospholipins and cholesterol. More ^{32}P-labelled phospholipins were formed by liver slices when choline was added to the incubation medium if the slices were derived from the livers of choline-deficient dogs, but choline had little or no effect if the slices were from animals which had received choline.—G. A. Garton.

4709

HOCK, A., HUBER, G. and PILAR-DIETRICH, A. v. Chemische Veränderungen des Lebergewebes infolge alimentärer Schädigung und ihre Beeinflussung durch Leberextrakte. [**Chemical changes in liver tissue after damage by food and the effect of liver extract.**] *Hoppe-Seyler's Ztschr.*, 1956, **304,** 11–20. [Forschungslab. Zellfabrik, Waldhof.] English summary.

The experimental diet contained, per cent., casein 16, tocopherol-free lard 51, maize starch 30 and salt mixture 3, with vitamin B_1, riboflavin, pyridoxine, Ca pantothenate, nicotinamide, *p*-aminobenzoic acid, inositol, biotin, vitamin A and vitamin D. The 12 groups of rats, of both sexes, of mean weight initially 130 to 140 g., were fed for 60 days on a standard diet or the basal diet or the latter with different supplements. Groups contained from 13 to 64 rats. In 6 groups the supplement was a preparation of ox liver autolysed with yeast and then dried, or a fraction of this autolysate. At the end the rats were killed and their livers were analysed.

On the unsupplemented experimental diet the rats had fatty livers, with 60·8 per cent. fat in the dry matter. The deoxyribonucleic acid (DNA) content was 20 to 30 per cent. below that on the standard diet, but the ribonucleic acid (RNA) content was normal. Supplements of liver autolysate or fractions soluble in 60 per cent. methanol reduced the amount of fat almost to normal, failed to prevent the fall of DNA, and increased RNA. Subfractions of the methanol extract were ineffective; so was yeast extract. Folic acid, vitamin B_{12}, choline, methionine and cysteine in amounts equal to or exceeding those in the liver

autolysate were ineffective, so the value of the autolysate is not attributed to these substances. None of them prevented the low DNA content caused by the diet or raised RNA.—D. Duncan.

4710

HORN, R. G., BLOOD, F. R. and CONIGLIO, J. G. **Incorporation of C^{14}-acetate into intestinal fatty acids of rats with cannulated bile ducts.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 258–260. [Dept. Biochem., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

Five pairs of adult male rats were used; one animal of each pair had its bile duct cannulated, the other a sham operation. The rats were each given an intraperitoneal injection of ^{14}C-carboxyl acetate. Two pairs were killed 30 min. after the injections and the other 3 pairs 4½ hr. later; ^{14}C was estimated in samples of bile collected during the experiment from the latter animals. When the rats were killed the liver, bile and combined contents of caecum and intestine were taken for estimation of total fatty acids.

Cannulation of the bile duct did not impair the ability of intestinal contents to accumulate fatty acids labelled with ^{14}C. Total radio-activity of bile fatty acids was only 5 to 16 per cent. of that of the intestinal fatty acids. The intestinal fatty acids of cannulated rats had a greater specific radio-activity than those of sham-operated controls.

G. A. Garton.

4711

BRICE, E. G. and OKEY, R. (with STONE, M. M.) **The effect of fat intake on incorporation of acetate-2-C^{14} into liver lipide and expired carbon dioxide.** *J. Biol. Chem.*, 1956, **218,** 107–114. [Dept. Home Econ., Univ. California, Berkeley.]

Littermate male rats were fed on diets with 5 or 40 per cent. fat and equal in protein and salt per 100 Cal. One group were given the low-fat diet to appetite, the second group had the high-fat diet in quantities isocaloric with those eaten by the first group, and the third group had the high fat diet to appetite. After 3 weeks, acetate-2-^{14}C was injected intraperitoneally and respired CO_2 was collected. The rats were then killed and the radio-activity of cholesterol and fatty acids from liver was estimated.

A large proportion of the injected radio-activity was eliminated as CO_2 during the first hour after injection, but then the specific activity of the expired CO_2 dropped sharply and remained uniformly low for 24 hr. In the first hour the specific activity of the CO_2 was significantly higher in animals fed on the high-fat diet. The total output of CO_2 was apparently not affected by the fat intake, but the rats given the diet rich in fat eliminated more $^{14}CO_2$ in 12 hr. It is concluded that a high-fat diet results in increased oxidation of acetate, possibly with increased formation of acetate from fatty acids.

The livers of rats on the high-fat diet had a higher fat content, but the specific activity of the liver fatty acids was greater in the rats given the low-fat diet.—A. K. Lough.

4712

SILIDES, D. J. and MAYER, J. **Effect of hormonal and dietary treatments on lipogenesis from acetate in hereditarily obese hyperglycemic mice.** *Experientia*, 1956, **12,** 66–67. [Dept. Nutrit., Harvard Univ. Sch. Pub. Health, Boston.] German summary.

Hereditarily obese hyperglycaemic mice and non-obese littermates were caged individually and fed on Purina chow or on a high-fat diet. After an 18-hr. fast each mouse received intraperitoneally acetate carboxyl-^{14}C, preceded in different experiments by injections of insulin, insulin plus glucose, growth hormone or glucagon. The mice were killed 30 min. after the injection of acetate for estimation of the radio-activity of the fatty acids of liver and of carcase (defined as body lipids minus liver lipids). In experiments with growth hormone the animals were killed 3 or 12 hr. after the injection of acetate.

Insulin considerably decreased formation of fat from acetate in both obese and non-obese mice. Growth hormone decreased lipogenesis in obese mice, but significantly increased fat synthesis in non-obese animals; the effect of glucagon was similar. Depressed lipogenesis from acetate was found in obese and non-obese animals which had had the high-fat diet.—G. A. Garton.

4713

CLARK, R. and MALAN, J. R. **Alterations in the blood sugar and ketone levels caused by dosing acetate, propionate and butyrate into the rumen of the sheep.** *Onderstepoort J. Vet. Res.*, 1956, **27,** 101–109. [Onderstepoort Lab.]

Solutions of sodium acetate, propionate or butyrate alone or in combinations were given in 0·5 g. molar doses in a litre of water into the rumen of sheep. Propionate alone or in combination was the only salt that caused a rise in blood sugar. Butyrate by itself usually depressed blood sugar, but sometimes increased it. Acetate had little effect. Butyrate increased blood ketones, especially β-hydroxybutyrate, acetate caused a small and somewhat delayed rise in total blood ketones, but propionate had no effect. Butyrate also depressed circulating blood fat. When 5 mg. β-hydroxybutyric acid was injected blood sugar fell. Conversion of acetoacetic acid to β-hydroxybutyric acid was found in sheep's blood *in vitro*.

A. T. Phillipson.

4714

REISER, R. and REDDY, H. G. R. **The hydrogenation of dietary unsaturated fatty acids by the ruminant.** *J. Amer. Oil Chem. Soc.*, 1956, **33,** 155–156. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., College Station.]

Two adult goats were fed for 11 weeks on a diet of alfalfa meal with 10 per cent. cottonseed oil and another 2 for the same time on alfalfa meal with 10 per cent. linseed oil. Six hours after the last meal the goats were killed and the fatty acid compositions of samples of back fat and of the contents of the rumen, abomasum and caecum were compared with that of the feed.

The high levels of linoleic and linolenic acids in the diet were reduced to low levels in the rumen lipids, with concomitant increases in the amounts of saturated fatty acids ; the proportion of oleic acid in the rumen lipids was greater than in linseed oil and in one animal greater than in cottonseed oil.

The back fat of the animals given cottonseed oil contained more saturated fatty acids and less oleic acid than that of goats given linseed oil.

G. A. Garton.

4715

KANEDA, T., SAKAI, H. and ISHII, S. **Nutritive value or toxicity of highly unsaturated fatty acids. 2.** *J. Biochem., Tokyo*, 1955, **42,** 561–573. [Tokai Reg. Fish. Lab., Tokyo.]

Weanling rats, fed on a fat-deficient diet until they attained a constant bodyweight, were then given from 0·2 to 0·5 g. daily for 30 days of the lipid to be tested.

Auto-oxidised esters of linseed oil and some fractions prepared from them were toxic, but polymerised highly unsaturated fatty acids and peroxide-free products from auto-oxidised, unsaturated fatty acids were not, and had nutritive value. The liver and muscle of rats fed on auto-oxidised, unsaturated fatty acids contained large amounts of peroxide. The LD_{50} of total peroxide oxygen per kg. bodyweight for mice was calculated as being about 278 mg.

It is concluded that the most toxic product of auto-oxidised, unsaturated fatty acids is peroxide, which is produced at the beginning of auto-oxidation, and that its toxicity is due to injury to tissues.—M. H. Pierce.

4716

STARE, F. J. **Research in atherosclerosis.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 309–311. [Dept. Nutrit., Sch. Med., Harvard Univ., Boston, Mass.]

4717

SCHETTLER, G. Das Arteriosklerose problem. [**The problem of arteriosclerosis.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 526–532. [Med. Klin., Univ. Marburg a.d. Lahn.]

A review.

4718

CHAPMAN, I., GOLDBLOOM, A. A., MIRRER, G. and EIBER, H. B. **Autopsy correlation with clinically determined atherogenic index. 12. Newer clinical and laboratory studies in the aged.** *Arch. Pathol.*, 1956, **61,** 357–359. [New York Med. Coll., Metropolitan Med. Centre.]

12. Tissue examinations of the aorta and coronary arteries of 6 patients after death showed a complete lack of correlation between the degree of atherosclerosis and the atherogenic index found during life.—F. C. Aitken.

4719

SELLERS, E. A. and YOU, R. W. **Deposition of fat in coronary arteries after exposure to cold.** *Brit. Med. J.*, 1956, i, 815–819. [Dept. Physiol., Univ. Toronto.]

In rats fed on stock diet and kept in a cold room at 1° to 3° C. for 10 to 18 months, blood pressure measured directly under light anaesthesia was within the normal range. Histological study of 29 of the rats in the cold room and of 27 controls kept at 22° ± 2° C. showed that none of the controls, but more than half of the cold room rats, showed fatty infiltration of the coronary vessels. Kidneys, liver and adrenals were significantly heavier in rats exposed to cold, and kidney damage was almost always found in the exposed rats. Serum total lipids and free and bound cholesterol were significantly increased after a year or more in the cold.

Deposition of fat in the coronary vessels occurred in rats fed on a high-fat, high-cholesterol diet with 0·5 per cent. choline and exposed to cold for 6 weeks, but not when choline was omitted from the diet. Myocardial lesions occurred whether or not choline was present in the diet. At room temperature deposition of fat in the coronary vessels occurred in rats which failed to survive on a diet deficient in choline. In only one of the rats receiving choline at room temperature was lipid present in a coronary artery.—F. C. Aitken.

4720

THOMAS, W. A., O'NEAL, R. M. and LEE, K. T. **Thromboembolism, pulmonary arteriosclerosis, and fatty meals ; an experimental study of the effect of intermittent fatty meals on thromboembolic-induced pulmonary arteriosclerosis in rabbits.** *Arch. Pathol.*, 1956, **61,** 380–389. [Dept. Pathol., Sch. Med., Washington Univ., St. Louis, Mo.]

Three groups of rabbits were given intravenous injections of blood clot weekly for 6 weeks. One

group was given a feed of butter, another a feed of margarine and the third water through a stomach tube after each injection. Fibrous intimal thickening in the pulmonary arteries was present in all groups, but the frequency and severity of lesions were significantly greater in animals receiving fat. Small but definite quantities of fat were present in lesions in the pulmonary artery in almost half of the animals in all groups.—F. C. Aitken.

4721

BEVERIDGE, J. M. R., CONNELL, W. F. and MAYER, G. A. **Dietary factors affecting the level of plasma cholesterol in humans : the role of fat.** *Canad. J. Biochem. Physiol.*, 1956, **34,** 441–455. [Dept. Biochem., Fac. Med., Queen's Univ., Kingston, Ont.]

Three experiments were performed on male medical students and staff. In each study all the subjects had the same homogeneous diet for 8 days, after which they were divided into 5 groups comparable on the basis of blood cholesterol. One group was continued on the original diet for another 8 days ; the other 4 groups were given diets varying in the level and nature of the fat content. Protein supplied 16·9 per cent. of the total energy in all the experimental rations. Cholesterol was estimated in samples of heparinised plasma ; all blood samples were obtained before breakfast.

In the first experiment the 37 subjects ate a diet in which 58·5 per cent. of the energy was from maize oil ; during the initial 8-day period the average of the individual decreases in plasma cholesterol was 32 per cent. The group which continued on maize oil had a further, not significant decrease during the second 8-day period. The other 4 groups, given diets high in beef dripping, chicken fat, lard and butter, respectively, showed average individual increases in plasma cholesterol of 11·7, 12·7, 15·4 and 28·8 per cent.

In the second experiment the 49 subjects ate a fat-free diet for 8 days ; the average fall in plasma cholesterol was 22·2 per cent. Those continuing on the fat-free diet showed little further change, those given diets providing 20 and 60 per cent. of the energy as maize oil showed falls in plasma cholesterol of 6·9 and 15·2 per cent. and those given diets providing 20 and 60 per cent. of the energy as butterfat showed increases of 6·6 and 21·7 per cent.

In the third experiment the 36 subjects ate a diet in which butterfat provided 60 per cent. of the energy during the 8-day initial period. The plasma cholesterol remained almost constant, and did not change significantly in the subjects who continued on the same diet for a further 8 days. The composition of the fat in the diets of the remaining 4 groups, in terms of percentage of energy derived from butterfat and maize oil, respectively, was 45 : 15, 30 : 30, 15 : 45 and 0 : 60. The average decreases in plasma cholesterol were 3·9, 15·9, 27·1 and 32·0 per cent. Except for the smallest, all the changes were highly significant.—G. F. Garton.

4722

ROEN, P. B. **Reduction of serum lipids by dietary management. Report on 50 cases.** *Geriatrics*, 1956, **11,** 200–202. [Clin. Study Arteriosclerosis, Hollywood Presbyterian Hosp., Los Angeles, Calif.]

Fifty patients with total serum cholesterol levels of 210 to 600 mg. per 100 ml. were given a low-fat diet for 13 to 72 months. The average drop in serum cholesterol was 146 mg., ranging from 60 mg. in the patient with an initial level of 210 mg. to 345 mg. in the patient with an initial level of 600 mg. During the study patients maintained on the average 82 per cent. of their maximum drop in serum cholesterol.—F. C. Aitken.

4723

JOYNER, C. (Jr.) and KUO, P. T. **The effect of sitosterol administration upon the serum cholesterol level and lipoprotein pattern.** *Amer. J. Med. Sci.*, 1955, **230,** 636–647 ; 674. [Edward B. Robinette Found., Philadelphia, Pa.]

When β-sitosterol was given by mouth to hospital patients on unrestricted diets the serum cholesterol fell, whatever the initial value ; no significant change in bodyweight occurred and no untoward side effect was apparent. The smallest effective dose of β-sitosterol was > 10 g. daily for 4 weeks. The β-sitosterol also produced lower serum cholesterol in 2 patients on low-fat diet.

Electrophoretic studies of serum lipoproteins showed that the β-sitosterol brought about changes in the β-lipoproteins, but not in the α-lipoprotein fraction.—G. A. Garton.

4724

CANTONE, A. Azione antilipemica di un preparato mucinico dalla mucosa gastrica di maiale in conigli trattati con dieta ipercolesterolica. **[Effect of a mucin preparation from pig's gastric mucosa to depress blood lipids of rabbits given a diet high in cholesterol.]** *Bol. Soc. ital. Biol. sper.*, 1955, **31,** 838–840. [Ist. C. Erba Ric. Terap., Lab. Biol., Milan.]

Rabbits weighing about 2½ kg. were given for 2 weeks a diet without lipids. Two groups of 5 were then given for 6 weeks a normal diet with cholesterol daily by stomach tube ; one group received in addition, also by stomach tube, the mucin fraction obtained by acetone precipitation

of an acid extract from pig's gastric mucosa. Every week, fatty acids and free and total cholesterol were estimated in the blood plasma. All the mean values were lower for the group given the mucin fraction, and the differences were significant.—E. M. Hume.

4725

SWELL, L., BOITER, T. A., FIELD, H. (Jr.) and TREADWELL, C. R. **The absorption of plant sterols and their effect on serum and liver sterol levels.** *J. Nutrition*, 1956, **58**, 385–398. [Gen. Med. Res., Veterans Admin. Centre, Martinsburg, W. Va.]

Groups of rats were fed for 21 days on synthetic diets containing oleic acid 25, Na taurocholate 1 and soya bean sterols 2 per cent., together or in different combinations. The sterol intake was measured and faecal excretion was estimated.

When no fat was present in the diet soya bean sterols were recovered almost quantitatively from the faeces. When Na taurocholate or oleic acid was added to the diet 15·7 per cent. of dietary soya bean sterol was absorbed. When both oleic acid and taurocholate were present about 23 per cent. of the ingested sterol was absorbed.

Serum sterol values increased in all groups given the diets containing soya bean sterols with oleic acid or oleic acid and taurocholate, though there was no increase in the amount of sterols in the liver. No plant sterol could be detected chromatographically in the liver or serum sterols of animals given soya bean sterols. It is suggested that plant sterols were converted to cholic acid, cholesterol or a cholesterol intermediate in the intestine or liver.—G. A. Garton.

4726

OKEY, R. and LYMAN, M. M. **Protein intake and liver cholesterol : effects of age and growth of the test animal.** *J. Nutrition*, 1956, **58**, 471–482. [Dept. Home Econ., Univ. California, Berkeley.]

Groups of rats were fed from weaning on isocaloric diets containing 10, 15 or 30 per cent. protein, as a mixture of casein and egg albumin, and 1 per cent. cholesterol, together with fat, sucrose, salts and vitamins; control animals received the same diets without cholesterol. Animals in each group were killed after from 3 to 12 weeks on the diets for estimation of total liver lipids and liver cholesterol.

On the cholesterol-free diets some decrease in liver cholesterol was found with increasing proportions of dietary protein, but no significant change with age.

The greatest accumulation of liver cholesterol in the groups given cholesterol was found in those given the diet containing 15 per cent. protein for 7 to 8 weeks ; at 10 weeks liver cholesterol showed a decrease. Animals given the diet containing 30 per cent. protein showed the highest liver cholesterol values 3 weeks after weaning ; subsequently the values continued to decrease during the period of rapid growth. When the diet contained only 10 per cent. protein, growth rate of the rats was impaired and, though total liver fat was more than in animals given 15 per cent. protein, liver cholesterol did not accumulate proportionately G. A. Garton.

4727

DAM, H., KRISTENSEN, G., NIELSEN, G. K., PRANGE, I. and SØNDERGAARD, E. **Influence of various levels of peanut oil and cholesterol on cholesterol and polyenoic acids in tissues of chicks.** *Acta physiol. scand.*, 1956, **36**, 319–328. [Dept. Biochem., Polytec. Inst., Copenhagen.]

Sixteen groups each of 9 chickens were fed for 4 weeks from the 14th day after hatching on diets containing no groundnut oil, or 3, 10 or 20 per cent. without cholesterol, or with 0·1, 0·3 or 1·0 per cent. cholesterol. Cholesterol was then estimated in liver, heart, aorta, lungs, brain, spleen and adipose tissue, and polyethenoid fatty acids were estimated in the lipids of all these organs except spleen. The cholesterol content of liver, spleen, heart, aorta and lungs increased after both cholesterol and groundnut oil had been given. The greatest deposition of cholesterol in liver occurred when the diet contained 1 per cent. cholesterol and 20 per cent. groundnut oil. Liver cholesterol values on diets containing 0·1 per cent. or no cholesterol were greatest when the diet contained no groundnut oil. No change was found in the cholesterol content of brain.

Variations in the intake of cholesterol had little or no influence on the polyethenoid fatty acid content of the organs. With increasing amounts of groundnut oil, the di- and tetraethenoid fatty acid content of the lipids of liver, heart and lungs increased and the triethenoid fatty acid content decreased ; almost no change in the small amounts of penta- and hexaethenoid fatty acids was found. In brain, the triethenoid fatty acid content decreased, but the content of other polyethenoid fatty acids did not change. In adipose tissue the amount of diethenoid fatty acids increased ; no change in the amounts of the more unsaturated acids was found.—G. A. Garton.

See also Absts. 4498, 4541, 4572–74, 4595, 4617, 4618, 4624, 4665, 4751, 4779, 4810, 4814, 4890, 4961, 5219.

MINERALS

GENERAL

4728

PEDDIE, G. H., SPURR, C. L. and HOWARD, J. M. **Studies of calcium metabolism following surgical trauma.** *Ann. Surg.*, 1956, **143,** 452–458. [Dept. Surg., Baylor Univ. Coll. Med., Houston, Tex.]

The results of studies of Ca and P balances, serum Ca and P and pulse rate before and after operation in 5 patients are charted. One patient showed pronounced tachycardia which coincided with a fall of serum Ca of 3·7 mg. per cent. immediately after operation. This patient differed from the others in that the drop in serum Ca was sharper and the post-operative negative Ca balance was smaller. Data on Na, Cl, K and N balance, serum K and excretion of 17-hydroxycorticosteroids in this patient are charted also. The tachycardia and drop in serum Ca coincided with a rise in serum K. Balances of Na and Cl were positive and balances of K and N were negative after operation. There was a sharp, transient rise in excretion of 17-hydroxycorticosteroids in urine. Serum Ca rose to normal on the second day after operation and serum K and pulse rate began to fall. In this patient, as in the others, Ca balance became positive when food was given by mouth.—F. C. Aitken.

4729

DAVIES, H. E. F., JEPSON, R. P. and BLACK, D. A. K. **Some metabolic sequels of gastric surgery in patients with and without pyloric stenosis.** *Clin. Sci.*, 1956, **15,** 61–79. [Dept. Med., Univ. Manchester.]

Balances of Na, K and Cl and sometimes also of N, Ca, P and Mg were studied in 23 patients, 10 without pyloric stenosis and 13 with stenosis, 10 of whom had clinical signs and in the other 3 of whom it was found at operation. The diet was mainly milk with, for some, supplements of K and Na. Complete data are tabulated for the later patients, some having already been published (Black and Jepson, *Quart. J. Med.*, 1954, **23,** 267), and there was calculated for each ion the range within which 95 per cent. of values for retention might be expected normally to fall in patients who were without stenosis and who had undergone partial gastrectomy. Where, in a patient who had had stenosis, the value for an ion was greater than these limits, it was deduced that depletion had occurred. This criterion indicated that, of the 10 patients with clinical signs, 3 were depleted of Na, 5 of K and 4 of Cl ; of the 3 with no clinical sign, 1 was depleted of K. For the smaller numbers in whom the other elements were studied, 5 without and 6 with pyloric stenosis, the results showed that none was depleted of N or Ca ; there were doubts about the findings for P and Mg.

The relation between balances of Na, K and Cl and the occurrence of alkalosis is discussed.

D. Harvey.

4730

LEVEY, S., ABBOTT, W. E., KRIEGER, H. and DAVIS, J. H. **Metabolic alterations in surgical patients. 8. Studies involving iron and magnesium metabolism in patients with gastrointestinal drainage.** *J. Lab. Clin. Med.*, 1956, **47,** 437–443. [Dept. Surg., Sch. Med., Western Reserve Univ., Cleveland, Ohio.]

For part 3 see Abst. 5217, Vol. 25.

8. Three of the 4 patients had pyloric obstruction requiring gastric suction and, subsequently, operation. The fourth had intestinal ileus which responded to intestinal intubation without operation. All were fed intravenously. Balance studies were made on several days before and after operation in the first 3 patients and on 6 days in the fourth. In general patients were in positive Fe balance throughout and, except for the fourth patient and for one of the others after operation, Fe loss in gastric drainage exceeded the combined loss of Fe in urine and faeces. Two patients were in positive Mg balance throughout. In the others Mg balance was sometimes negative, sometimes positive, depending apparently on the intake. An intake of over 100 mg. Mg daily was associated with a positive balance.

F. C. Aitken.

See also Abst. 4671.

CALCIUM AND PHOSPHORUS AND STRONTIUM

4731

MORATA GARCÍA, F., ESPINAR LAFUENTE, M. and ORTIZ DE LANDÁZURI, E. Efecto de la sobrecarga de calcio sobre el metabolismo del fosforo en normales y en circunstancias patologicas. [**Effect of a test dose of calcium on the metabolism of phosphorus in normal and pathological conditions.**] *Rev. clín. española*, 1956, **60,** 87–94. [Clín. Méd., Univ. Granada.] English, German and French summaries.

The calcium load test consisted in administration by intravenous drip lasting 4 hr. of 1 litre of 0·9 per cent. saline with 15 mg. ionic Ca or 168 mg. calcium gluconate per kg. bodyweight. Blood Ca and P were studied, and excretions of Ca and P were followed in 3 periods, up to 4 hr., 4 to 6 hr. and 6 to 24 hr. after the beginning of the infusion. Inulin clearance was estimated also. For control observations the subjects received on the day before the Ca load a similar test, but with saline

alone. The subjects were kept at rest. There were 7 normal subjects, 1 with idiopathic hypoparathyroidism and 3 with renal sclerosis.

In normal subjects the Ca load produced in the first 6 hr. much greater diuresis than saline alone, but the amount of urine secreted in 24 hr. was similar. Serum Ca did not change with saline injection, but during infusion of Ca it rose from the mean initial value of 10·6 mg. per 100 ml. to 14, falling in the next 2 hr. to 11·9 and after 24 hr. to 10·8. Serum inorganic P also rose during the infusion from 3·8 to 4·7 mg. per 100 ml. and then fell to 4·6 at 6 hr. and 3·1 at 24 hr. Excretion of Ca in the urine was 0·19 mg. per min. on the control day and 0·47 mg. per min. when Ca was given, and 403 mg. of the 770 mg. infused was excreted. Excretion of P was 1·10 mg. per min. on the control day and fell to 0·83 when Ca was given; during the infusion and in the next 2 hr. the rate of excretion rose, but from 6 to 24 hr. it was considerably below that on the control day. The glomerular filtration rate was on the average 117 ml. per min. in the first 6 hr. when saline was given, 130 ml. per min. in the first 4 hr. and 121 ml. in the next 2 with Ca.

In the subject with parathyroid insufficiency serum Ca initially and after 4, 6 and 24 hr. on the day when Ca was given was 7·8, 11·8, 10·6 and 8·6 mg. per 100 ml. and serum P 5·8, 6, 6·55 and 4·99 mg. per 100 ml. Output in urine was 0·06 mg. Ca per min. on the control day and 0·28 mg. when Ca was given; 316 mg. of the 750 mg. infused was recovered. Excretion of P was increased from 0·59 to 0·81 mg. per min. on the day when Ca was given, but was low in the period from 4 to 6 hr.

In the 3 subjects with renal sclerosis the values for serum Ca on the day of experiment were, respectively, 8·7, 12·4, 12·5 and 9·5 mg. per 100 ml.; 9·7, 13·8, 13·4 and 16·6; and 10·2, 15·4, 20·2 and 15·6. Corresponding values for P were 7·75, 7·79, 7·85 and 7·77; 4·9, 5·5, 5·87 and 5·55; and 2·7, 2·5, 2·1 and 2·2 mg. per 100 ml. Thus the behaviour of serum P was particularly variable. Ca excretion in the urine rose so slightly after the test load that only 6 per cent. of the dose was recovered in 24 hr. Excretion of P increased in the first subject and decreased in the other 2. Glomerular filtration rate was always low, but tended to rise when Ca was given.

The significance of the results is discussed.

D. Duncan.

4732

NORDIN, B. E. C. and FRASER, R. **A calcium-infusion test. 1. Urinary excretion data for recognition of osteomalacia.**

FINLAY, J. M., NORDIN, B. E. C. and FRASER, R. **2. "Four-hr. skeletal retention" data for recognition of osteoporosis.** *Lancet*, 1956, **270**, 823 – 826; 826 – 830. [Hammersmith Hosp., London.]

1. Patients to be tested are kept on a low-calcium diet, with 100 to 150 mg. Ca and 500 to 700 mg. P daily, for 3 days before and during the test. Urine is collected from 6 a.m. on the third day to 6 a.m. on the fourth day and then in 4-hr. portions till 6 a.m. on the fifth day. Calcium gluconate, 15 mg. Ca per kg. bodyweight in 500 ml. physiological saline, is given between 10 a.m. and 2 p.m. on the fourth day. Blood is taken at the beginning and end of the infusion and at 6 p.m. on that day and 10 a.m. next day.

Results are presented for 98 subjects: 21 apparently normal, 12 with osteomalacia and steatorrhoea, 17 with steatorrhoea but no clear evidence of osteomalacia, 18 with osteoporosis and 30 with disorders likely to involve disease of the bone. All those with steatorrhoea excreted less excess Ca in 12 hr. from the commencement of the infusion than did the normal subjects; those with osteoporosis excreted normal or only occasionally greater than normal amounts. Of the 30 possibles, 10 excreted less than normal, 6 for known reasons.

2. Since the 12 hr. excretion of Ca failed to distinguish patients with osteoporosis from the normal subjects, excess Ca circulating in the extracellular space was computed and "4-hr. skeletal retention" derived by subtracting from the amount infused that which could be accounted for in extracellular fluid at the end of the infusion or in urine representing the 4 hr. infusion. The extravascular fluid was assumed to be 15 and the intravascular fluid 5 per cent. of bodyweight and the level of Ca in extracellular fluid to be that in an ultrafiltrate of serum.

In 10 normal subjects the 4-hr. skeletal retention was between 48·6 and 61·8, mean 55·2 per cent. of that infused; 8 patients with osteomalacia retained more, 5 of 7 with steatorrhoea without obvious bone disorder retained more, and 11 out of 15 with osteoporosis retained less than the normal subjects. These and 14 patients with miscellaneous disorders are discussed. Since in osteoporosis Ca in skeleton at 4 hr. and in urine at 12 hr. did not represent as high a proportion of the whole as in normal subjects, either skeletal deposition was slow or Ca was lost in faeces. The test is believed to be applicable to diagnosis of osteoporosis.

In an appendix a method for calculating ultrafiltrable Ca, instead of estimating it, is described and shown to give results in good agreement with measurements in almost all patients.—I. Leitch.

4733

MORGAN, H. G., MITCHELL, R. G., STOWERS, J. M. and THOMSON, J. **Metabolic studies on two infants with idiopathic hypercalcaemia.** *Lancet*,

1956, **270,** 925–931. [Dept. Pathol., Univ. St. Andrews.]

When intakes of Ca and vitamin D were restricted and 25 mg. cortisone was given daily by mouth, Ca in blood fell and there was clinical improvement in both infants. Before treatment, absorption of Ca and P was high. Cortisone more than doubled excretion of Ca and P in faeces, and reduced the amounts retained. Disodium ethylenediamine-tetra-acetic acid given before cortisone to one infant reduced blood Ca but was toxic. Diet histories of both infants showed substantial amounts of vitamin D from cod liver oil and fortified foods. Excessive intake of or hypersensitivity to vitamin D are possible causes of hypercalcaemia in infants, and it is suggested that re-assessment of the degree of fortification of infant foods is needed.—F. C. Aitken.

4734

WOODS, K. R. and ARMSTRONG, W. D. **Action of parathyroid extracts on stable bone mineral using radiocalcium as tracer.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 255–258. [Dept. Physiol. Chem., Med. Sch., Univ. Minnesota, Minneapolis.]

Seventy-two days after a group of 23 rats had received injections of radio-active calcium, one leg was amputated and the specific activity of Ca in the epiphyses and diaphyses of the humerus was estimated. At this stage daily injections of parathyroid hormone, or of saline in control animals, were begun, and the rats were killed up to 13 days after the beginning of hormone treatment. After death specific activities of the remaining humerus from each animal were estimated. During the 13 days of treatment Ca was estimated in urine.

There was no difference between the specific activities of epiphyses and diaphyses of any humerus and no change in specific activity of the bone Ca of either control or treated animals during the 13 days of injection. But parathyroid hormone caused a large increase in excretion of radio-active Ca, showing that parathyroid hormone was able to release Ca from the stable fraction of bone salt. The absence of difference between the specific activities of control and treated rats indicated that parathyroid hormone affects the labile and stable fractions of bone equally.—R. Hill.

4735

TARJÁN, R. Einfluss der Ernährung auf das Knochensystem. 3. Experimentelle Untersuchung der Zitronensäurewirkung. [**Effect of nutrition on the bones. 3. Experimental study of the effect of citric acid.**] *Acta physiol. hung.*, 1955, **8,** 119–126. [Inst. Ernährungswiss., Budapest.] Russian summary.

3. Methods and basal diet have been described earlier (Tarján *et al.*, *Acta physiol. hung.*, 1954, **5,** 313 ; 463). The diet was normal in protein and vitamins ; P was held constant and Ca was varied. There were 4 groups of 12 male rats, 4 weeks old. Groups 1 and 2 had 0·28 per cent. Ca and groups 3 and 4 0·96 per cent. Ca, with Ca : P ratios of 0·72 and 2·5, respectively ; rats in groups 2 and 4 had 1 g. cod liver oil weekly [1 ml. in table 1], those in group 1 had 0·56 per cent. sodium citrate mixed with the feed daily and those in group 3, 0·90 per cent. The animals were weighed and X-rayed weekly ; half were killed in the 11th week, the rest in the 17th week.

There was little difference in weight gain, though after the 10th week the rats given citrate did slightly better than those given cod liver oil. At both 11 and 17 weeks the femurs of those given citrate were mechanically stronger, both absolutely and relatively to bodyweight, and contained more ash, except for the high-Ca group at 11 weeks ; there was little difference in the percentage of Ca in the ash.

It was concluded that the regular consumption of an amount of citric acid roughly equivalent to the Ca content of the diet gave satisfactory growth even when the diet was mildly rachitogenic.

There is a brief summary of the literature.

W. M. Deans.

4736

SATO, T. **Effects of parotid gland extract (Parotin) upon the calcification of rabbit dentine and bone.** *Gunma J. Med. Sci.*, 1955, **4,** 333–340. [Dept. Maxillo-Stomatol., Sch. Med., Gunma Univ., Maebashi.]

A purified extract of parotid gland given by vein to rabbits was found to have effects similar to those produced by the crude extract (see Abst. 817, Vol. 24). A smaller amount, 1 mg., compared with 5 mg. per kg. bodyweight for the crude extract, accelerated calcification and growth of dentine and growth of bone.—D. Harvey.

4737

MATSUDA, N. **On effects of a submaxillary gland extract upon calcification figure of rabbit dentine and bone. 1. Effects of a submaxillary gland extract upon serum Ca and the formation of rabbit dentine and bone.** *Gunma J. Med. Sci.*, 1955, **4,** 317–324. [Dept. Maxillo-Stomatol., Sch. Med., Gunma Univ., Maebashi.]

1. The methods of study were those of Sato (Abst. 817, Vol. 24). With single injections into rabbits of the following amounts per kg. bodyweight given by vein the effects were : 10 mg., inhibition of calcification of dentine and fall in serum Ca ; 5 mg., temporary inhibition and later acceleration of calcification with rather less change in serum Ca ; 3, 1 or 0·5 mg., rate of calcification

increased with least change in serum Ca ; 0·3 mg., results inconsistent. With injection of 0·5 mg. repeated on each of 3 successive days growth and calcification of dentine and growth of bone were accelerated. With hypodermic injections, 5 mg. per kg. accelerated calcification. In animals from which parotid and submaxillary glands had been removed a smaller amount, 0·1 mg. per kg., by vein was effective.—D. Harvey.

4738

MATSUDA, N. **On the effect of an extract from saliva upon calcification and development of hard tissue.** *Gunma J. Med. Sci.*, 1956, **5,** 51–60. [Dept. Maxillo-stomatol., Sch. Med., Gunma Univ., Maebashi.]

Experiments similar to those in the preceding abstract were made with an extract from pooled human saliva. A single injection of the crude form, 0·5 mg. per kg. bodyweight given by vein to rabbits, accelerated rate of calcification but not rate of growth of dentine. With the purified form amounts of 5, 1·0 or 0·5 mg. per kg. increased the rate of calcification but with 30 mg. per kg. calcification was inhibited. When 0·3 mg. of the purified form was injected on each of 3 successive days, rates of formation of both dentine and bone were increased. Similar results were obtained with crude extracts prepared from saliva of cat, dog, ox and rabbit.—D. Harvey.

4739

WEIDMANN, S. M. **Studies on the skeletal tissues. 4. The renewal of inorganic phosphate in bones of various species of small mammal as a function of time.** *Biochem. J.*, 1956, **62,** 593–601. [Biol. Res. Unit, Dent. Sch., Univ. Leeds.]

For part 3 see Abst. 4704, Vol. 23.

Radio-active phosphorus, 33 μC. per kg. bodyweight, was injected into mature rabbits, cats and rats, which were killed up to 30 days later for estimation of ^{32}P in different parts of the skeleton.

The uptake of ^{32}P by cortical and cancellous tissue of long bones was much more rapid in the rat and rabbit than in the cat, and slightly more rapid in the rat than in the rabbit. This was particularly evident during the first hours after injection. No decrease in the amount of ^{32}P was found during the 30 days of experiment except in the cancellous tissue of the rat.

Regional differences in activity of cortical bone were large ; the activity of inner layers was greatest and that of middle layers least. The differences became slowly smaller, indicating transference towards inner layers. This movement of ^{32}P was accompanied by a decrease in the activity of readily soluble phosphate from the inner layers of cortical bone.

In cancellous tissue ^{32}P became equally distributed between readily soluble and residual phosphate 9 days after injection.—R. Hill.

4740

LAX, L. C., SIDLOFSKY, S. and WRENSHALL, G. A. **Compartmental contents and simultaneous transfer rates of phosphorus in the rat.** *J. Physiol.*, 1956, **132,** 1–19. [Banting and Best Dept. Med. Res., Univ. Toronto, Ont.]

Rats fasted for 24 hr. were given injections of ^{32}P and killed up to 410 min. later.

From the specific activities of separate body organs and tissues, calculations of phosphorus transfer between the tissues and the plasma pool were made. Values in μg. per min. ranged from 153·0 for bone and teeth to 0·24 for brain. The net amount of P within each organ or tissue was calculated also.—R. Hill.

See also Absts. 4321, 4322, 4347, 4348, 4611, 4672, 4772 4810, 4846, 4893, 5115.

MAGNESIUM

4741

HEGSTED, D. M., VITALE, J. J. and MCGRATH, H. **The effect of low temperature and dietary calcium upon magnesium requirement.** *J. Nutrition*, 1956, **58,** 175–188. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Growth studies were made on a total of 286 rats ; the number in a group varied from 4 to 10 in the different experiments. The variables were Mg intake, from 3 to 100 mg. per 100 g. diet, Ca content of the diet, 200, 600 or 1800 mg. per 100 g., and environmental temperature, either 55° $\pm$ 2° F. in the cold room or 78° $\pm$ 2° F. in the warm room. The animals received a diet of purified casein 20, glucose 71·5, maize oil 5, cod liver oil 1, salt mixture without Ca and Mg 2·25, cystine 0·25 and choline chloride 0·3 per cent. ; vitamins of the B group were added.

The amount of Mg required to promote equal gains in weight was about 4 times as much at the environmental temperature of 55° F. as at 78° F. Since the maximum rate of gain was less at the lower temperature, the difference in the amount required for maximum gain was less, 25 mg. per 100 g. diet at 78° F. and 50 mg. at 55° F. High Ca intakes were detrimental at low Mg intakes ; in some experiments high Ca intake apparently accentuated injury by cold.

Balance studies were made on 12 adult female rats given the diet containing 50 mg. Mg and 600 mg. Ca per 100 g. ; food intakes were estimated daily and urine and faeces were collected every 3 or 4 days. During the first week the rats were in the warm room ; they were then put in the cold room and collections were continued for 4 weeks. The data obtained showed that Mg balance was

primarily related to Mg intake and that the amount of Mg required to maintain balance was greater in the cold room.—G. F. Garton.

See also Absts. 4678, 4730, 4973, 4979.

SODIUM, POTASSIUM, AND SODIUM CHLORIDE

4742

Ross, E. J. **Total exchangeable sodium in hypertensive patients.** *Clin. Sci.*, 1956, **15**, 81–91. [Med. Unit, University Coll. Hosp. Med. Sch., London, W.C.1.]

Total exchangeable Na was measured with ^{24}Na, total body water with antipyrine and extracellular water with thiosulphate in 10 adults with normal blood pressure and in 37 patients with high blood pressure, essential or considered to be of renal origin.

In some patients total exchangeable Na was within the normal range, in others it was well above normal. In 10 severely hypertensive patients with high total exchangeable Na, total body water and plasma Na were almost normal and most of the extra Na was intracellular or in bone.

When the patients were graded according to the severity of changes in the fundus, there was some positive correlation between high total exchangeable Na and the severity of the hypertension, but scatter was wide.

Two patients with malignant hypertension and initially high exchangeable Na had both adrenals removed. One patient responded with a return to normal of both blood pressure and exchangeable Na. The other failed to respond in either way.

In 3 patients whose Na intake was restricted and of whom 2 were given cation-exchange resins blood pressure fell, but there was little change in exchangeable Na.—D. Duncan.

4743

Edelman, I. S. and Sweet, N. J. **Gastrointestinal water and electrolytes. 1. The equilibration of radiosodium in gastrointestinal contents and the proportion of exchangeable sodium (Na_e) in the gastrointestinal tract.**

Nadell, J., Sweet, N. J. and Edelman, I. S. **2. The equilibration of radiopotassium in gastrointestinal contents and the proportion of exchangeable potassium (K_e) in the gastrointestinal tract.** *J. Clin. Invest.*, 1956, **35**, 502–511; 512–521. [Dept. Med., Univ. California Sch. Med., San Francisco.]

1. Forty rabbits of both sexes were fed on stock pellets to appetite or starved for up to 44 hr. before death. Each received an intraperitoneal injection of 100 to 150 μC. $^{24}NaCl$ in isotonic NaCl at *p*H 7. Urine and faeces were collected for 20 to 26 hr. and the rabbits were then killed and the contents of the digestive tract were recovered from separate segments.

Total exchangeable Na was calculated to be $46{\cdot}0 \pm 2{\cdot}0$ m. equiv. per kg. bodyweight. Of this $14{\cdot}2 \pm 2{\cdot}4$ per cent. was in the digestive tract, $10{\cdot}2 \pm 2{\cdot}1$ per cent. of it in the proximal half of the large intestine. Equilibrium of ^{24}Na between the digestive tract and the body was complete within 24 hr. after injection. Fasting did not affect the results.

The contents of the digestive tract were collected after death from 13 human subjects without oedema or organic gastro-intestinal disease. The interval after death was from 6 to 22 hr., and was not found to be related to the amount of Na recovered. Of the total exchangeable Na calculated according to age, sex and bodyweight, on the average 1·6 per cent., 0·54 m. equiv. per kg. bodyweight, was found in the digestive tract. Almost half was in the small intestine. It cannot be assumed that these values would be found in life.

2. The plan of the study was similar to that described above; 44 rabbits received 250 to 350 μC. $^{42/43}KCl$ intraperitoneally.

Equilibrium between the specific activities of digestive tract contents and the body had not been attained after 20 to 24 hr., but seemed to be complete after 40 hr. The mean total exchangeable K was $50{\cdot}7 \pm 4{\cdot}0$ m. equiv. per kg. bodyweight, and $7{\cdot}2 \pm 2{\cdot}2$ per cent. of this was found in the contents of the digestive tract.

In the same 13 human subjects described above, 1·0 per cent. of the predicted total exchangeable K was in the contents of the digestive tract, or one-third of the total extracellular K.

D. Duncan.

4744

Prudden, J. F., Danzig, L. E. and Stirman, J. A. **The effect of acute potassium depletion on the functional compartmentalization of water.** *Surg. Gynecol. Obstet.*, 1956, **102**, 553–564. [Surg. Res. Unit, Brooke Army Med. Centre, Fort Sam Houston, Tex.]

Acute depletion of exchangeable K was brought about in dogs by dialysis in the Kolff Brigham artificial kidney against a K-free bath. The bath used in the control group was similar, except that K was added in physiological quantity. The controls showed a tendency towards depletion of the extracellular compartment with good preservation of intracellular water volume. The K-depleted dogs lost considerably more of their total body water; interstitial fluid and intracellular water were lost; plasma volume tended to increase. Exchange of intracellular K for Na resulted in greater acceleration of the rates of water equilibration than could be accounted for through diminution in total body water.

The results are discussed in relation to the etiology of "chronic shock" in man.

F. C. Aitken.

See also Absts. 4608, 4672, 4678, 4684.

HALOGENS

4745

LIKINS, R. C., MCCLURE, F. J. and STEERE, A. C. **Urinary excretion of fluoride following defluoridation of a water supply.** *Pub. Health Rep., Washington,* 1956, **71,** 217–220. [Lab. Oral Biol. Chem., Nat. Inst. Dent. Res., Pub. Health. Serv.]

Since March 1952 treatment of the communal water supply at Bartlett, Texas has reduced the F content from 8 to about 1 p.p.m. From the population, 116 boys and men who had used the water for from 2 to 50 years before its defluoridation were chosen. They were arranged in age groups by years from 7 to 16 and by decades from 20 to over 70 years. Fluorine was estimated in pooled samples of urine from the groups and the contents are tabulated for 0, 1, 5, 9, 20, 39, 47 and 113 weeks after defluoridation began.

Throughout the period the concentration of F in urine continued higher than in drinking water; the mean amounts for the children and adults were, in p.p.m., 6·5 and 7·7 initially and 2·2 and 2·5 at 113 weeks (*cf.* Abst. 585, Vol. 15). There was some evidence that in the first 20 weeks the rate of decrease in concentration was slower for children than for adults. It is suggested that in adults the change may have been in the surface-bound and more readily exchangeable F and, in the children, in the cycle of resorption and deposition associated with growth of bone.—D. Harvey.

4746

HERMAN, J. R. **Fluorine in urinary tract calculi.** *Proc. Soc. Exp. Biol. Med.,* 1956, **91,** 189–191. [Bronx Hosp., New York 56.]

Calculi from 10 patients were analysed for Ca, F, NH_4, Mg, oxalate, phosphate, urate and carbonate. In 8 of the 10 samples F was found; the amounts were parallel to those of Ca. Highest values were for a patient with a history of urolithiasis recurring for 17 years; one laboratory found 1790, the other 1560 p.p.m. F. In general, amounts of F were greatly in excess of those reported in the literature for human tissues.

D. Harvey.

4747

LEONE, N. C., GEEVER, E. F. and MORAN, N. C. (with BUTLER, W. M. (Jr.), WATTS, J. S. and GEISER, P. B.) **Acute and subacute toxicity studies of sodium fluoride in animals.** *Pub. Health Rep., Washington,* 1956, **71,** 459–467. [Dept. Med. Invest., Nat. Insts. Health, Pub. Health Serv.]

The toxicity of NaF was measured when it was given to 20 dogs in the following ways and to numbers of animals indicated: to 5 by continuous infusion until death occurred; to 9 also by infusion but in fractions of the acute lethal dose; to 2 by intravenous injection daily; to 4 in single doses by mouth; there were 7 untreated dogs as controls. The effects were studied also in mice given fluoride by mouth or intravenously.

With the first method 5·4 mg. F was injected per min. and for 4 dogs the mean acute lethal dose was 36·0 ± 0·5 mg. per kg. bodyweight. The fifth animal was given F in lower concentration, 1·1 mg. per min., and was excluded from consideration. With amounts above 15 mg. per kg. pulse pressure fell and when they reached between 20 and 30 mg. per kg. systolic and diastolic blood pressure also fell, at first slowly and then rapidly. For the second group infusion at the same rate, 5·4 mg. per min., was stopped when the amounts had reached 15, 20 or 25 mg. per kg.; the LD_{50} dose causing death within 36 hr. was concluded to be 20 mg. per kg. The dogs in the third group got 5 mg. F per kg. daily by vein for 23 days and remained in good health. In the fourth group single doses by mouth of 38, 81, 260 and 3100 mg. per kg. caused vomiting, but in from 18 to 24 hr. recovery was complete. In 11 of the dogs, 3, 7 and 1 in groups 1, 2 and 4, respectively, Ca was estimated in blood; it fell slightly in 9 of them. The LD_{50} doses for mice were, by mouth, 46·0 ± 1·6 mg. and intravenously 23·0 ± 0·9 mg. F per kg. The obvious pathological changes seen in all animals dying within 36 hr. were generalised hyperaemia and acute focal haemorrhages; there was no histological evidence of change in brain, heart, liver, kidney, lung, digestive tract or bone marrow.

It is concluded that relatively large amounts of F are required to produce acute toxic changes and that, since cumulative effects did not appear in dogs given intravenous doses daily for 3 weeks, small amounts may be given by that route to human subjects for study of F metabolism in man.

D. Harvey.

4748

MÜHLEMANN, H. R. and SCHNEIDER, R. Die mitotische Aktivät des Schilddrüsenepithels der Ratte bei Verabreichung von fluoridiertem Trinkwasser. [**Mitotic activity of the thyroid epithelium in the rat given fluoride in the drinking water.**] *Schweiz. med. Wochenschr.,* 1956, **86,** 625–627. [Histol. Abt., Zahnärztl. Inst., Univ. Zürich.] English summary.

Male white rats were kept under standardised conditions of light, heat and diet; no colchicine was given. Thirty-six of them were killed by decapitation after 3 weeks, half in the morning and half in the late evening. After 10 days 5 groups

of 8 rats for 7 days before decapitation were given NaF in the drinking water to yield concentrations of F of 0·5, 1·0, 2·0, 4·0 and 80 mg. per litre. The rats were fed on biscuits containing 0·2 mg. I per cent. All the rats given supplements were killed in the morning. In the rats not given supplements the mean number of mitotic figures in the thyroid epithelium was significantly greater in the rats killed in the morning than in those killed at night. There was no significant difference in the number of mitotic figures between the thyroids of rats given no supplement and killed in the morning and of rats given F, and there was no correlation between the number of mitotic figures and the concentration of F in the water.—L. Wills.

4749

ZIPKIN, I. and SCOW, R. O. **Fluoride deposition in different segments of the tibia of the young growing rat.** *Amer. J. Physiol.*, 1956, **185,** 81–84. [Nat. Inst. Dent. Res., Nat. Insts. Health, Bethesda, Md.]

Two groups, each of twelve 20-day-old rats, were anaesthetised and a stainless steel pin was inserted into the middle third of the left tibia. One group was given 21 intraperitoneal injections of 0·5 ml. of a solution of NaF containing 300 p.p.m. F.; each rat was injected on weekdays only for 31 days. Distilled water and a stock diet containing 1 p.p.m. F were available to all rats to appetite. The gain in length at each end of the tibial diaphysis was estimated at intervals throughout the experiment. After 31 days the rats were killed and the tibiae were removed and divided into 4 segments, of which 3 contained portions of the diaphysis. The oven-dry, fat-free weight, ash and F content of the segments were estimated.

The intraperitoneal injections of NaF had no noticeable effect on the longitudinal growth rate or mass of the tibial segments. The ash content of the diaphyseal segments also was unaffected. The percentage of F in the proximal diaphyseal segment was similar to that in the middle diaphyseal segment, but 35 per cent. less than that in the proximal epiphysis.—G. F. Garton.

4750

BERSON, S. A. **Pathways of iodine metabolism.** *Amer. J. Med.*, 1956, **20,** 653–669. [Radioisotope Serv., Veterans Admin. Hosp., Bronx, N.Y.]

A review with 161 references.

4751

SANDERS, A. P., ISLEY, J. K., SHARPE, K., BAYLIN, G. J., SHINGLETON, W. W., HYMANS, J. C., RUFFIN, J. M. and REEVES, R. J. **Radioiodine recovery in feces following an I^{131} labeled fat test meal.** *Amer. J. Roentgenol.*, 1956, **75,** 386–389. [Dept. Radiol., Sch. Med., Duke Univ., Durham, N.C.]

The subjects were 24 adults free of digestive disorder and 25 patients with known gastrointestinal abnormalities such as chronic pancreatitis, cancer of the pancreas with and without obstruction, ileitis, sprue, Whipple's disease, cystic fibrosis, and vagotomy and gastric resection. Lugol's solution, 20 drops given with the test meal, effectively blocked the accumulation of radio-active iodine by the thyroid. A fat test meal labelled with ^{131}I and containing barium was given to each subject. All stools passed during the next 48 hr. were collected and ^{131}I was estimated as a percentage of the ingested dose of 25 μC.

The average total recovery in normal subjects was 0·6 per cent., with a standard deviation of 0·4 and a range of 0 to 1·4 per cent. In the test group the values were strikingly higher and similar to recoveries of faecal fat estimated in fat balance studies. One patient with sprue had 66·5 per cent. of the dose in the faeces and another with regional ileitis had 33·4 per cent.

It is suggested that the technique may serve as a new clinical laboratory test for steatorrhoea.

B. W. Simpson.

4752

SINGH, B. P. and BENNETT, L. R. (with ANDERSON, L. and KRIMS, E.) **Protein-bound iodine and radioactive iodine (I^{131}) uptake studies in the normal menstrual cycle.** *Amer. J. Obstet. Gynecol.*, 1956, **71,** 839–841. [Dept. Obstet. Gynaecol., Univ. California Med. Centre, Los Angeles.]

Repeated estimations of serum protein-bound iodine and uptake of ^{131}I were made in 10 normal young women. There was no variation with phase of the menstrual cycle.—A. M. Thomson.

4753

ROCHE, M., DE VENANZI, F., SPINETTI-BERTI, M., GERARDI, A., MENDEZ-MARTINEZ, J., and FORERO, J. **Iodine metabolism in a region of endemic goiter.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 661–664. [Inst. Invest. Med., Fund. Luis Roche, Plaza Morelos, Caracas.]

The 21 subjects lived in regions of endemic goitre in the Venezuelan Andes at an altitude above 4000 ft.

They were given 50 μC. of ^{131}I in 10 ml. saline injected intravenously. The thyroid radio-activity was counted 3 and 30 min. later. Blood was obtained after 5, 10 and 30 min. and urine after 35 min. Thyroid clearance was calculated. Renal clearance was calculated by dividing the average plasma content by the urine concentration. Conversion ratio was established by counting the

radio-activity in 3 ml. plasma. Saliva was obtained without stimulation and the ^{131}I was estimated. In urine, I was estimated chemically.

The 24-hr. thyroid ^{131}I uptake was slightly high and thyroid clearance rate was very high, which meant that there was increased avidity for I in the thyroid. The conversion ratios and the 24-hr. protein-bound ^{131}I were high. I in urine was somewhat low, but clearance was normal, showing that in these regions people do not conserve I through renal mechanisms. Salivary radio-activity was low.

It is suggested that as the subjects had thyroids which were barely palpable, or palpable but not readily visible, the increased extraction of I by the thyroids and the faster rate of I turnover compensated to a certain extent for the deficiency in the food and water.—B. W. Simpson.

4754

SLOVITER, H. A. and MOREL, F. **Localization of radioactive organic and inorganic iodine compounds in the posterior hypophysis of the rabbit.** *Arch. Biochem. Biophys.*, 1956, **62,** 217–221. [Dept. Biochem., Univ. Pennsylvania, Philadelphia.]

Male rabbits weighing about 2 kg. were fed on a low-iodine diet of oats and distilled water for 2 weeks or longer before subcutaneous injection of 0·5 mC. carrier-free $Na^{131}I$ per kg. bodyweight. After 48 hr. blood was drawn from the ear vein. The rabbit was then killed; the pituitary was removed, divided into anterior and posterior parts and weighed. The radio-activity of organic and inorganic fractions was measured in the anterior and posterior pituitaries and in plasma of 7 rabbits.

There was a greater concentration of radio-active inorganic and organic iodine compounds in the posterior pituitary than in the plasma. It is suggested that the inorganic I compounds found in the posterior pituitary may split off from the organic compounds found there.—B. W. Simpson.

See also Absts. 4853, 5070.

IRON AND COPPER

4755

STURGEON, P. **Studies of iron requirements in infants and children. 2. The influence on normal infants of oral iron in therapeutic doses.** *Pediatrics*, 1956, **17,** 341–348. [Child Hosp., Sch. Med., Univ. S. California, Los Angeles.] Spanish and Interlingua summaries.

For part 1 see Abst 3208, Vol. 24.

2. Ferrous sulphate providing 90 mg. elemental iron in 3 doses daily for 6 weeks was prescribed for 40 infants. Of these 11 were eliminated either because they did not return for examination or because, on the evidence of the mothers, they had not taken at least half of the prescribed amount of Fe. Six were considered separately because the original Hb levels were below 9 g. per 100 ml. In the remaining 23 infants the mean Hb level was significantly higher at the end of the 6 weeks than initially. Red cell count, mean cell volume, mean cell Hb concentration, serum Cu, free erythrocyte protoporphyrin, serum Fe and total Fe-binding capacity were not significantly altered. In the 6 anaemic infants the response to Fe followed the usual pattern seen in anaemic adults.

F. C. Aitken.

4756

KALDOR, I. **Studies on intermediary iron metabolism. 7. The effect of splenectomy on the absorption and storage of iron in experimental anaemia. 8. The fate in mice of injected saccharated oxide of iron.** *Austral. J. Exp. Biol. Med. Sci.*, 1955, **33,** 637–643; 645–649. [N.S.W. Red Cross Blood Transfusion Serv.]

For part 6 see Abst. 5365, Vol. 25.

7. Groups of 10 intact rats and of 11 with spleens removed were given no treatment, or were made anaemic by repeated injections of phenylhydrazine for 4 months, or were similarly injected with phenylhydrazine and given a solution of ferrous ammonium sulphate as drinking fluid.

All the rats were injected every 3 weeks with neoarsphenamine against *Bartonella muris* and all were killed a month after the end of treatment with phenylhydrazine.

In operated rats the liver stored as much excess Fe as was stored by the spleen in intact rats. It was therefore concluded that the spleen has no part in the increased absorption of Fe during anaemia produced by phenylhydrazine.

8. There were 3 groups of mice initially about 60 days old and weighing 20 g. Sixteen mice received in 5 days 3 doses of 0·2, 0·2 and 0·4 mg. Fe as Ferrivenin by injection into the tail vein, 20 mice had the same doses intraperitoneally and 16 had no injection. Injected mice were killed 1, 2, 4 and 10 weeks after the last injection, controls were killed before and 11 weeks after the others were injected. Tissues were analysed for Fe.

Hb values declined by about 2 g. per 100 ml. in all 3 groups during the experiment. Liver Fe content doubled and spleen Fe rose slightly in untreated mice. In mice given Fe by vein the liver and spleen after 1 week contained 9 to 10 times as much Fe as in controls, and after 10 weeks liver Fe was still 4 times and spleen Fe 7 times that in controls. In mice given Fe intraperitoneally, liver Fe was doubled after a week and continued to rise slowly throughout the experiment, and the spleen gained an even smaller proportion of Fe. Microscopic deposits of precipitated Ferrivenin remained on the peritoneal membranes of mice in this group even after 10 weeks.

D. Duncan.

4757

SCHWIETZER, C. Die Beeinflussung der Eisenresorption durch Polyphosphate. [**Effect of polyphosphates on absorption of iron.**] *Biochem. Ztschr.*, 1956, **328,** 35–38. [Abt. Physiol., Max von Pettenkofer Inst., Berlin-Dahlem.]

Fully grown dogs differing in weight and breed were given a titbit of raw meat mixed with finely powdered ferrous ammonium sulphate to give from 1 to 2·5 mg. Fe per kg. bodyweight and 2 g. polyphosphate (sodium tripolyphosphate, $Na_5P_3O_{10}$, sodium tetrapolyphosphate, $Na_6P_4O_{13}$, Graham salt, $(NaPO_3)_n . H_2O$ or Kurrol Salt, $(KPO_3)_n . H_2O$). In each of 8 tests 2 dogs had this mixture and 2 littermate controls had the meat and Fe without polyphosphate. Serum Fe was estimated in venous blood taken before and 2 hr. after feeding.

The results showed that tripolyphosphate was without effect, 2 g. tetrapolyphosphate would bind about 17 mg. Fe and 2 g. Graham salt or Kurrol salt about 30 mg. Possible reasons for the failure of the long-chain polyphosphates to bind more Fe are suggested.—W. M. Deans.

4758

PINNIGER, J. L. and HUTT, M. S. R. **The distribution and fate of iron injected intravenously into rabbits.** *J. Pathol. Bacteriol.*, 1956, **71,** 125–134. [Louis Jenner Lab., St. Thomas's Hosp., London.]

After intravenous injection of saccharated iron oxide into rabbits the iron was stored initially by the reticulo-endothelial system, mainly in the spleen, liver and bone marrow. After a short interval Fe appeared in the parenchymatous cells of the liver. When an iron-dextran compound was injected Fe appeared almost immediately in liver cells. A total of 1 g. saccharated Fe was given in several doses twice weekly without ill effect. This is equivalent in a patient to 30 g. Fe, which would require 300 injections of the usual dose of saccharated iron oxide or 120 injections of the iron-dextran compound into a subject who already had normal Fe stores. In rabbits higher doses caused kidney damage but no fibrosis of the liver.

It is suggested that repeated doses of the iron-dextran compound over a period of years might be used to initiate experimental haemochromatosis, since the Fe appears immediately in the liver parenchyma.—F. C. Aitken.

4759

KIESER, C. Der Einfluss von Normalkost und Aderlässen auf die diätetische Hämosiderose weisser Ratten. [**Effect of normal diet and bleeding on haemosiderosis of dietary origin in albino rats.**] *Ztschr. ges. exp. Med.*, 1956, **127,** 103–112. [Pathol. Inst., Univ. Zürich.]

There were 4 groups each of 10 rats weighing from 120 to 200 g. The control group received a normal diet. The experimental diet of cooked maize grits with 2 per cent. ferric citrate was given for 26 weeks to the other 3 groups. After this one group and half the controls were killed. The other 2 groups received normal diet for the next 26 weeks, and rats of 1 group and the remaining controls were bled, from 0·5 to 2·5 ml. blood being taken every 2 weeks. At the end all were killed.

The experimental diet was badly accepted. The rats became thin and listless, with rough coats. The incisors became loose and in some rats fell out, so that the rats starved to death soon after. Because of this the stock biscuits had to be soaked in the second part of the experiment. Eleven rats died in the first 26 weeks and the survivors weighed on the average only 60 g. They improved when the stock diet was restored.

The rats killed after 26 weeks on the maize and Fe diet had almost no visible body fat. The liver and spleen were structurally normal except for heavy deposits of haemosiderin which gave them a chocolate brown colour macroscopically and a dark blue colour in sections stained with Turnbull's blue. The portal lymph nodes, kidneys, adrenal, and duodenal wall also contained haemosiderin. In the rats killed after 6 months on experimental and 6 months on normal diet there was little haemosiderin in the liver except for clumps in histiocytes, and the parenchymal cells stained pale blue with Turnbull's blue. The spleen contained about a third as much haemosiderin as in rats killed immediately after having the experimental diet, and other tissues had little haemosiderin. In the rats similarly fed, but bled, only traces of haemosiderin remained in scattered deposits.

Thus haemosiderosis produced by diet does not damage the tissues, and the haemosiderin can readily be removed from the tissues and used for formation of Hb when this is necessary.

D. Duncan.

4760

VIVANTE, A. **Reduction of normal and excessive liver iron by the administration of αα′-dipyridyl and other agents in the rat.** *Arch. internat. Pharmacodyn.*, 1956, **105,** 241–251. [Inst. Pharmacol., Univ. Rome.]

In 2 experiments the basal diet for rats was a mixture of barley meal 60, whole wheat flour 30, fishmeal 5, fresh brewer's yeast 5 and cod liver oil 2 parts. In the first it was given to 4 groups of 10 animals, alone or with a 1 : 1 mixture of gallic and tannic acids at the rate of 2 per cent., with a

1 : 4 mixture of $CaHPO_4$ and Na_2HPO_4, also at 2 per cent., or with 0·05 per cent. $\alpha\alpha'$-dipyridyl. At the beginning the rats weighed, on the average, 100 g. ; weight changes and Fe in liver were estimated after 5 weeks. The means for Fe in liver, in μg. per 100 mg. dry matter and for the groups in the above order were 74, 70, 77 and 59. In the second experiment there were 4 rats of average weight 90 g. in each of 4 groups and the additions were, respectively, 2 per cent. gallic or tannic acid, 2 per cent. phosphate mixture and 0·05 per cent. dipyridyl. Weight changes and Hb (Sahli) were measured over the same length of time. Differences in Hb in this experiment and in the gains in weight in both experiments were slight.

In a third test a pellagra-producing diet, 80 parts maize grits and 20 parts lard, was given alone to a control group and with 2 per cent. ferrous sulphate alone or with 0·05 per cent. dipyridyl to 2 experimental groups [the second group is said on p. 245 to have had dipyridyl alone]. After 5 weeks the means for Fe content of livers of 10 rats in each group were, in that order, 95, 181 and 136 μg. per 100 mg. dry matter.

Of the substances tested $\alpha\alpha'$-dipyridyl forms the most stable compound with ferrous iron and is the most effective in preventing deposition of Fe in the liver of rats. The possibility of its being used in treatment of haemochromatosis in man is suggested.—D. Harvey.

4761

BUTLER, E. J. and NEWMAN, G. E. **The urinary excretion of copper and its concentration in the blood of normal human adults.** *J. Clin. Pathol.*, 1956, **9,** 157–161. [Dept. Biochem., Radcliffe Infirmary, Oxford.]

The copper content of human urine and blood was studied by an absorptiometric procedure involving selective extraction of Cu from acid digests by dithizone.

The output of Cu in urine in 12 healthy adults ranged from 3·9 to 29·6 μg. in 24 hr., mean 18·0. The Cu concentration of the urine ranged from 2·9 to 29·9 μg. Cu per litre, mean 15·4. Blood Cu of these subjects ranged from 66·2 to 84·9 μg. per 100 ml., mean 76·6. Diurnal variations in the urinary Cu output of 3 subjects were studied ; in each, Cu excretion was highest between midday and 4 p.m.

The values obtained for Cu excretion and blood Cu in the human adult by other workers are higher and more variable than those reported above. This may be due to failure to exclude contamination with Cu during sampling and analysis.

C. F. Mills.

4762

MILLS, C. F. **The dietary availability of copper in the form of naturally occurring organic complexes.** *Biochem. J.*, 1956, **63,** 190–193. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

With rats deficient in Cu the stable complexes of Cu obtained by passing an aqueous extract of herbage through a cation-exchange resin produced a greater physiological response (see Abst. 2097, Vol. 26) than equivalent amounts of Cu ions. The greater storage of Cu in the rat liver was confirmed with ^{64}Cu. It is suggested that Cu may pass through the intestinal mucosa in the form of such complexes.

See Absts. 298, Vol. 25 ; 4298, 4299, Vol. 26.

A. Hepburn.

4763

GALLAGHER, C. H., JUDAH, J. D. and REES, K. R. **The biochemistry of copper deficiency. 1. Enzymological disturbances, blood chemistry and excretion of amino-acids. 2. Synthetic processes.** *Proc. Roy. Soc.* [*B*], 1956, **145,** 134–150 ; 195–205. [Dept. Morbid Anat., University Coll. Hosp. Med. Sch., London.]

1. Young rats were reared without access to the mother's food and were given only mother's milk and later cow's milk treated with H_2S. At 23 days of age they were caged individually in glass and Perspex cages, kept free of contact with all metal, and fed on liquid whole milk treated with H_2S and supplemented with Fe, Mn, vitamins of the B group, E and A. Control rats received the same diet with a supplement of 50 μg. Cu daily ; one group was restricted in intake so that they lost weight as did rats severely depleted of Cu. Enzyme activity in the tissues was usually studied when the rats had been depleted for 10 to 13 weeks and had liver Cu contents of 2 to 4 μg. per g. dry weight and Hb concentrations of 5 to 6 g. per 100 ml. blood. Corresponding values for control rats were 14 to 17 μg. and 9 to 10 g.

Liver slices from deprived rats were normal in respiration, oxidative phosphorylation, anaerobic glycolysis, catalase, diphosphopyridine nucleotide (DPN)-cytochrome *c* reductase and diaphorase, transmethylase, *iso*citric dehydrogenase, malic dehydrogenase and glutamic dehydrogenase, except that in extreme deficiency *iso*citric dehydrogenase was increased and DPN-cytochrome *c* reductase was decreased. Cytochrome oxidase in liver was severely impaired even after 4 weeks of depletion and later was almost absent. Impairment was delayed in kidney and brain. Liver biopsy experiments showed that cytochrome oxidase was quickly restored when Cu was given to deprived rats. Haem α, which is probably the prosthetic group of cytochrome oxidase, was severely depleted or absent. Haem α injected intraperitoneally for 24 days did not increase cytochrome oxidase in a rat with advanced Cu deficiency.

Succinoxidase activity in liver was reduced by about 40 per cent. in Cu deficiency, but succinic dehydrogenase was normal.

Mitochondria from deficient rats were particularly prone to lose their enzyme activity on storage (" ageing "), and possible reasons for this are discussed.

Serum protein, Mg, Ca, Na, K and inorganic phosphate and excretion of amino acids in urine of deprived rats were normal.

2. Incorporation of ^{32}P as inorganic phosphate into the phospholipins and phosphatides of liver mitochondria *in vitro* was greatly reduced when the livers were from Cu-deficient rats. After intraperitoneal injection of ^{32}P into 2 normal and 2 Cu-deficient rats the latter incorporated only one-third of the normal amount of ^{32}P into liver phospholipins and phosphatides, but in brain mitochondria there was no difference. As phosphorylation of glycerol was normal and rates of synthesis of long-chain fatty acids were identical in deficient and control rats, it was concluded that the defect of phospholipin synthesis in Cu-deficient rats is in the process of attachment of fatty acids to α-glycerophosphate.

Synthesis of ribonucleic acid *in vivo* was not less in 2 Cu-deficient than in 2 control rats. There appeared to be no general decrease in incorporation of glycine-^{14}C into protein, but some deficient rats incorporated less into plasma proteins. The haem-copper complex became labelled with glycine-^{14}C at the same rate in control and deficient rats, but the deficient rats had only 5·2 g. Hb per 100 ml. blood against 9·9 g. in controls, so synthesis of protohaem must have been halved. The anaemia is ascribed to failure of blood formation, not to excessive destruction.

Possible relation between the disturbances of synthesis of phospholipins and cytochrome oxidase activity and their relevance to demyelination of the central nervous system are discussed.

D. Duncan.

4764

BUSH, J. A., JENSEN, W. N., ATHENS, J. W., ASHENBRUCKER, H., CARTWRIGHT, G. E. and WINTROBE, M. M. **Studies on copper metabolism. 19. The kinetics of iron metabolism and erythrocyte life-span in copper-deficient swine.** *J. Exp. Med.*, 1956, **103,** 701–712. [Dept. Med., Coll. Med., Univ. Utah, Salt Lake City.]

For parts 16–18 see Absts. 3381–83, Vol. 26.

19. The diet and management of the pigs were described earlier (Abst. 2024, Vol. 23). Three Cu-deficient pigs received ^{59}Fe as chloride and its metabolism was compared with that in 18 normal pigs (Abst. 3377, Vol. 26).

Half the injected ^{59}Fe disappeared from the plasma in 0·28 hr., compared with 1·19 hr. in normal pigs. Rate of turnover of plasma iron was 1·76 mg. per kg. bodyweight daily and only 71 per cent. of the injected dose was incorporated into red cells, though the rate of incorporation was 1·24 mg. per kg. bodyweight daily, against 1·01 mg. in normal pigs. Red cell turnover of Fe was 1·18 mg. per kg. daily, against 0·59 mg. in normal pigs. The mean life span of red cells was only 13 days, 63 days in normal pigs. Labelled red cells from Cu-deficient pigs had a half-life of 9 days in other Cu-deficient pigs, 13 days in normal pigs. The corresponding half-lives of cells from normal pigs were 16 and 17 days, and cells from Fe-deficient transfused into Fe-deficient pigs had a half-life of 18·8 days.

Red cells of normal pigs were able to take up ^{64}Cu as cupric acetate both *in vivo* and *in vitro*. It is suggested that Cu is an essential component of the red cell in pigs and that deficiency of Cu limits both the survival of the red cells and their production in bone marrow.—D. Duncan.

See also Absts. 4177, 4584, 4730, 5101.

OTHER MINERALS

4765

BURNS, M. J. and SALMON, W. D. **Effect of dietary cobalt on growing chicks and rats.** *J. Agric. Food Chem.*, 1956, **4,** 257–259. [Dept. Animal Husb. Nutrit., Alabama Polytech. Inst., Auburn.]

The growth of day-old chicks was significantly increased when 6 to 12 mg. Co per kg. was added to a semi-synthetic diet containing 5 per cent. fat and all known vitamins except vitamin B_{12}. When the fat content of the diet was increased to 20 per cent., 12 mg. Co per kg. depressed growth and increased the incidence of perosis, and the effect was aggravated when vitamin B_{12} was added at 30 μg. per kg. to that diet.

When 12 mg. Co per kg. was added to a diet deficient in folic acid, choline and vitamin B_{12} there was no stimulation of growth in rats. When folic acid at 2 mg. per kg. was given with 12 mg. Co per kg. an increase in growth was obtained equivalent to about half that obtained from 30 μg. vitamin B_{12} per kg. Folic acid alone gave no stimulation during the 28 days of experiment. The choline, methionine and fat contents of the diet did not influence the utilisation of Co by the rat.—C. F. Mills.

4766

WILLIAMS, M. A. and VAN REEN, R. (with GILE, J.) **Molybdenum toxicity in the rat.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 638 – 641. [McCollum-Pratt Inst., Johns Hopkins Univ., Baltimore, Md.]

Rats were given a basal diet containing, per cent., casein 20, glucose 69, maize oil 6·6, salt mixture 4, choline chloride 0·1, maize oil containing vitamins A and D and α-tocopherol 0·3. Vitamin B_1, riboflavin, nicotinic acid, pyridoxine, Ca pantothenate, biotin, folic acid, menadione, vitamin B_{12} and 4·0 mg. Cu per 100 g. diet were added. In the first experiment 8 rats received 0·08 per cent. Mo added as sodium molybdate and 8 others were pair-fed with the basal diet for 6 weeks. This amount of Mo failed to produce severe poisoning, and in the second experiment levels of 0·08, 0·12 and 0·14 per cent. Mo were given.

In the second experiment growth was retarded more with each increase in the dose of Mo. Some rats had diarrhoea, but none died. Food intake was depressed within 2 days after Mo was introduced, especially at 0·12 and 0·14 per cent. The Mo did not affect the ability of rats to acetylate a dose of 2·5 mg. *p*-aminobenzoic acid or to excrete hippuric acid after injection of benzoic acid. When the rats were killed alkaline phosphatase activity in the liver was increased in rats given Mo, but the 2 larger doses depressed alkaline phosphatase activity in the kidney and intestine.—D. Duncan.

4767

HUNT, J. N. **The influence of dietary sulphur on the urinary output of acid in man.** *Clin. Sci.*, 1956, **15,** 119–134. [Dept. Physiol., Guy's Hosp. Med. Sch., London, S.E.1.]

The *p*H of urine from adult human subjects receiving diets with alkaline ash, a milk diet or a diet containing large quantities of lettuce, did not tend to rise, and the amount of acid, $H^+ + NH_4^+$, was about equal to the amount of sulphate in the urine. The *p*H of urine from one subject on a diet devoid of animal products except butter rose to 7·12 after 7 days. One of 2 subjects on a Vegan diet twice gave urine with a *p*H of more than 7. These three excreted small amounts of acid and sulphate in the urine. When 3 other subjects received supplements of S as methionine or fillet steak the output of acid and sulphate in the urine increased. One of those given methionine as a supplement to a diet low in P excreted a relatively small amount of titratable H^+. The amount of H^+ appeared to be determined by the availability of dietary P as a buffer in urine. The amount of Ca in the urine increased with the titratable H^+.

In 8 subjects the urinary sulphate assumed to be equivalent to the amount of S oxidised in the body and the sole source of acid contributed only 61 to 10·6 per cent. of the actual acidity. This difference in acidity was apparently not due to excretion of sulphate into the gut and was not entirely due to amino acids or organic acids.

A. Hepburn.

4768

BÉLANGER, L. F. **Autoradiographic visualisation of the entry and transit of S^{35} methionine and cystine in the soft and hard tissues of the growing rat.** *Anat. Rec.*, 1956, **124,** 555–579. [Dept. Histol., Sch. Med., Univ. Ottawa.]

Nine littermate rats 8 days old received 5 μC. DL-methionine-^{35}S per g. bodyweight by subcutaneous injection and were killed after 1, 2, 6, 24, 48 or 96 hr. Seven similar rats received DL-cystine-^{35}S and were killed after 2 and 6 hr., 1, 2, 6 and 28 days. Autoradiographs were made from sections of tissues.

Skin and hair showed considerable uptake of ^{35}S from both amino acids; so did the mucosa of the palate. Enamel took up methionine but not cystine. Other strongly active tissues were bone, the exocrine part of the pancreas, the glands of the stomach and intestine, and the adrenal cortex. Diffuse activity was present in the liver, the white pulp of the spleen and haemopoietic bone marrow. Changes in activity of different tissues with time between injection and death are described in detail. There are 22 photographs.—D. Duncan.

4769

CHAPEVILLE, F., FROMAGEOT, P., BRIGELHUBER, A. and HENRY, M. Utilisation des sulfites par l'animal supérieur. [**Utilisation of sulphites by higher animals.**] *Biochim. biophys. Acta*, 1956, **20,** 351–354. [Serv. Biol., Comm. Energie Atomique, Gif-sur-Yvette.]

Rabbits either eviscerated or with their digestive tracts sterilised by washing with Tyrode solution received injections of radio-active Na_2SO_3 or Na_2SO_4. Sulphite was found to be used for synthesis of cystine, but sulphate was not. From a comparison of radio-activity it was concluded that cystinesulphinic acid was a precursor of cystine and taurine.—A. Hepburn.

4770

WASE, A. W. **Absorption and distribution of radio-tungstate in bone and soft tissues.** *Arch. Biochem. Biophys.*, 1956, **61,** 272–277. [Div. Biol. Chem., Hahnemann Med. Coll., Philadelphia, Pa.]

Radio-active tungsten as tungstate, injected intraperitoneally into mice, became widely distributed through the body and was excreted rapidly via the digestive tract. More was accumulated and retained by bone than by other tissues.

The pattern of loss of tungsten from bone suggested that it existed in at least 2 phases, one of which was removed from bone more rapidly than the other.—R. Hill.

See also Absts. 4697, 4895.

ACID BASE EQUILIBRIUM

4771

BONTING, S. L. and JANSEN, B. C. P. **The effect of a prolonged intake of phosphoric acid and citric acid in rats.** *Voeding*, 1956, **17,** 137–148. [Netherlands Inst. Nutrit., Univ. Amsterdam.]

Diets containing 0·40 or 0·75 per cent. H_3PO_4 or 1·20 per cent. citric acid had no harmful effect on rats, as shown by growth, reproduction, blood analysis, gross and microscopic appearance of the organs and teeth, mineral and N metabolism and tissue composition in 2 successive generations. Rats receiving H_3PO_4 retained more P and excreted more P in the urine. The acid was neutralised by the excretion of ammonia by the kidneys, a phosphate shift resulting in an increased titratable acidity and a decreased *p*H of the urine and by the excretion of more acid calcium phosphate in the faeces. All extra citric acid was metabolised.—A. Hepburn.

4772

O'DELL, B. L., VANDEPOPULIERE, J. M., MORRIS, E. R. and HOGAN, A. G. **Effect of a high phosphorus diet on acid-base balance in guinea pigs.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 220–223. [Dept. Agric. Chem., Univ. Missouri, Columbia.]

Growth studies were made on guineapigs fed to appetite for 8 weeks. The basal diet consisted of acid-washed casein 30, sucrose 47, cellu flour 15, soya bean oil 4 and salts 4 per cent., with vitamins A, C, D, E, K and those of the B group; it contained about 0·4 per cent. P and 0·9 per cent. Ca. Additions were made to the diet at the expense of sucrose to give P contents of 0·9 and 1·7 per cent.; Mg was added as MgO, K and Na as acetates and Ca as $CaCO_3$. The diets were analysed for Ca, Mg, Na, K and P; the Cl and S contents were calculated. Blood samples were taken for estimation of plasma CO_2 capacity and P content; *p*H and ammonia were estimated in urine.

The high-P diets produced poor growth, metastatic calcification and death; effects on blood and urine included a fall in *p*H of urine, a decrease in plasma CO_2 capacity and an increase in blood inorganic P. The addition of cations gave a more alkaline urine; a combination of Na or K and Mg had the best effects. The high sensitivity of the guineapig to an acid diet is attributed to the fact that only a negligible amount of ammonia is produced by the kidneys.—G. F. Garton.

See also Absts. 4729, 4767.

METABOLISM OF WATER

4773

BREBNER, D. F., KERSLAKE, D. M. and WADDELL, J. L. **The diffusion of water vapour through human skin.** *J. Physiol.*, 1956, **132,** 225–231. [R.A.F. Inst. Aviation Med., Farnborough, Hants.]

Two nude human subjects were supplied with oxygen through a closed circuit system mounted on the platform of a continuously recording balance. With the weight loss from the respiratory tract accurately estimated and weight loss from constantly sweating areas excluded by covering them with sheets of polyvinyl chloride it was shown that the rate of loss of water was a simple function of the gradient in vapour pressure from saturation at about skin temperature to ambient water vapour pressure.—A. Hepburn.

4774

SCHMIDT-NIELSEN, B., SCHMIDT-NIELSEN, K., HOUPT, T. R. and JARNUM, S. A. **Water balance of the camel.** *Amer. J. Physiol.*, 1956, **185,** 185–194. [Dept. Zool., Duke Univ., Durham, N.C.]

Studies were made on, in all, 26 camels and 1 donkey. Twelve camels from the slaughterhouse were used for estimations of body water and its distribution, assay of pituitary antidiuretic hormone and histology of kidneys, digestive tract and skin; 12 were allowed to graze and urine was collected at intervals and analysed; and 2 camels and the donkey were hand fed and subjected to more intensive experiment. The diet was chiefly of dates and hay, sometimes with added salt or protein as groundnuts [details are not given and salt is not mentioned in relation to water balance].

Both experimental camels and the donkey continued to eat when deprived of water until 20 to 25 per cent. of bodyweight had been lost, when appetite gradually declined. "Expenditure" of water, or water "used for maintenance" in excess of the water formed by oxidative metabolism, was at a much lower rate in the camel, 1 per cent. of bodyweight daily, than in the donkey, 2·5 per cent. of bodyweight daily. Hence, to reach the same degree of desiccation took 2·5 times as long in the camel as in the donkey. Expenditure rose with temperature and was

higher when water was freely available than when it was withdrawn. Camels used more water when shorn; the coat protected against heat. Urine flow varied with the diet, but in relation to bodyweight was about 3 times as great in the donkey as in the camel. Water in faeces per 100 g. dry matter was low. Water evaporated, estimated as expenditure less water in urine and faeces, increased with temperature and with water supply.

The camel expends water faster than it is formed by oxidation in the body, so it is never independent of a supply of water. When not working, in cool weather, it could theoretically go without water for 30 or 40 days. One was deprived of water for 17 days in the sun in summer without ill effect.—I. Leitch.

4775

ANDERSSON, B. and MCCANN, S. M. **The effect of hypothalamic lesions on the water intake of the dog.** *Acta physiol. scand.*, 1956, **35,** 312–320. [Dept. Physiol., Kgl. Veterinärhögsk., Stockholm.]

Lesions were made electrically in the hypothalamus of 15 dogs. Before operation all the dogs drank between 20 and 25 ml. water per kg. bodyweight daily. After operation the water intake was significantly reduced in 6, and 3 of these drank no water for 9 to 14 days, despite normal food intake and progressive dehydration. They readily drank milk or broth. Four of the 6 dogs partly recovered their appetite for water later. The electrolyte balances were not greatly affected, except in 1 dog which retained Na and Cl for 3 weeks. Diabetes insipidus occurred in 2 dogs, but was not related to absence of drinking. Four of the 15 dogs, predominantly those with the largest lesions, died soon after operation. In the dogs which survived and showed absence of drinking, the "drinking area" of the hypothalamus seemed to be similar to that in the goat (Abst. 3887, Vol. 25).—D. Duncan.

4776

IRÁNYI, M., KOVÁCH, A. G. B. and RÓHEIM, P. Salz- und Wasserwahl im ischämischen Schock. [**Choice of salt and water in ischaemic shock.**] *Acta physiol. hung.*, 1956, **9,** Suppl., 30–31. [Physiol. Inst., Med. Univ., Budapest.]

See also Absts. 4139, 4542, 4744.

METABOLISM OF OTHER SUBSTANCES

4777

ROGERS, L. L., PELTON, R. B. and WILLIAMS, R. J. **Amino acid supplementation and voluntary alcohol consumption by rats.** *J. Biol. Chem.*, 1956, **220,** 321–323. [Biochem. Inst., Univ. Texas, Austin.]

4778

ROGERS, L. L., PELTON, R. B. and WILLIAMS, R. J. **Voluntary alcohol consumption by rats following administration of glutamine.** *J. Biol. Chem.*, 1955, **214,** 503–506. [Biochem. Inst., Univ. Texas, Austin.]

4779

NICHOLS, C. W. (Jr.), SIPERSTEIN, M. D., GAFFEY, W., LINDSAY, S. and CHAIKOFF, I. L. **Does the ingestion of alcohol influence the development of arteriosclerosis in fowls?** *J. Exp. Med.*, 1956, **103,** 465–475. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Experiments with 224 cockerels lasted 12 months. Some birds were supplied with 15 per cent. ethanol solution or wine containing 12 per cent. ethanol for drinking and others were supplied with the same energy intake from extra food.

Critical statistical analysis showed that arteriosclerosis, naturally occurring or produced by injections of stilboestrol, and lipid infiltration of blood vessels were not affected by alcohol.

A. Hepburn.

4780

FREEMAN, S., KANABROCKI, E. L. and INMAN, C. W. **The influence of diet and of exogenous glucuronolactone or glucuronate upon the urinary and serum glucuronic acid of adult human subjects.** *J. Lab. Clin. Med.*, 1956, **47,** 583–591. [Dept. Biochem., Northwestern Univ. Med. Sch., Chicago, Ill.]

In 9 normal subjects studied for 5 consecutive days average excretion of glucuronic acid was 449 ± 43 mg. in 24 hr. In 4 of 5 subjects there was evidence of diurnal variation, the rate being lowest between 10 p.m. and 7 a.m. The amount in urine was unaffected by intake of protein; on the average it was 439 mg. with 0·7 g. protein per kg. bodyweight and 462 mg. with 1·7 g. When glucuronolactone, 0·1 g. per kg., was ingested the percentage of glucuronic acid excreted was 12·7 in normal men, and in 2 patients, one with stone in the kidney and the other with osteoporosis, the percentages were 9·9 and 7·1. When a healthy subject took up to 10 times that amount there was little change in excretion, maximum 17·6 per cent.

In some tests the derivatives were given by vein. With glucuronolactone, 0·1 g. per kg. bodyweight, the concentration of glucuronic acid in serum rose,

about half appeared in the urine, but in 7 hr. the concentration in urine was back to normal. When calcium glucuronate was injected the amount excreted in the urine was greater, 87 per cent.

The results are discussed.—D. Harvey.

4781

ROVATI, A. L. Influenza di diete diverse sull' escrezione di acido glucuronico. [**Influence of different diets on the excretion of glucuronic acid.**] *Bol. Soc. ital. Biol. sper.*, 1955, **31**, 974–976. [Ist. Farmacol., Univ. Pavia.]

Urine was collected from 20 rats weighing about 215 g., fed successively on a stock diet and on dried milk. The content of total N in the 2 diets was about the same. Analysis of 138 samples of urine showed that the content of total and of conjugated glucuronic acid was significantly greater when the diet was milk powder. After injection of glucuronic acid lactone or glucose or ascorbic acid or pyruvate, there was an increase in the amount of total or conjugated glucuronic acid in the urine only with the stock diet and glucuronic acid lactone.—E. M. Hume.

4782

PATTERSON, E. L., BROQUIST, H. P., SALTZA, M. H. v., ALBRECHT, A., STOKSTAD, E. L. R. and JUKES, T. H. **Observations on the urinary excretion of thioctic acid.** *Amer. J. Clin. Nutrition*, 1956, **4**, 269–274. [Sect. Nutrit. Physiol., Res. Div., American Cyanamid Company, Lederle Labs., Pearl River, N.Y.]

Thioctic acid (6 : 8-dithiooctanoic acid) and thioctic acid monoxide are equally active for *Corynebacterium bovis* and *Streptococcus faecalis*. The activity of fresh human urine when estimated with *C. bovis* was 10 to 180 times as much as with *S. faecalis*, but with urine stored several days at 4° C. both organisms gave values similar to those obtained with *C. bovis* and fresh urine. In fresh urine thioctic acid activity is in an unidentified form, which changes during storage to thioctic acid. The unidentified form of thioctic acid was found in the urine of several species. When DL-thioctic acid (also known as DL-lipoic acid) was administered to rabbits, rats and human subjects the percentage recovered in the urine was 0·6 to 10, all in the form of the unidentified conjugate. Examination of the organs of rabbits showed no evidence of storage of injected DL-thioctic acid.

Vitamin B_1 given with the DL-thioctic acid did not influence the rate of excretion or the amount of thioctic acid excreted by men.—F. C. Aitken.

4783

WICK, A. N. and JOSEPH, L. **The fate of ingested polyoxyethylene (20) sorbitan monostearate in rats.** *Food Res.*, 1956, **21**, 250–253. [Scripps Metabol. Clin., La Jolla, Calif.]

For previous work see Abst. 3295, Title 4767, Vol. 23.

After rats were given by stomach tube polyoxyethylene (20) sorbitan monostearate (Tween 60) labelled with ^{14}C in the polyol moiety, 6 to 10 per cent. of the ^{14}C was recovered in the urine, 2 to 7 per cent. in the expired CO_2 and 67 to 93 per cent. in the faeces. Total recovery ranged from 82 to 102 per cent. Only negligible amounts were found in lymph.—A. Hepburn.

4784

BORNMANN, G., LOESER, A., MIKULICZ, K. and RITTER, K. Über das Verhalten des Organismus bei Einwirkung verschiedener Weichmacher. [**Reaction of the organism to the effect of several plasticisers.**] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1956, **103**, 413–424. [Pharmakol. Inst., Univ. Münster.]

A full account is given of acute, subacute (6-week) and chronic (1-year) experiments, including a reproduction test, mainly with rats, about 1400 in all, but a few with rabbits and dogs, on the toxicity of 5 plasticisers, namely, benzyloctyladipate, dibutylphthalate, Mesamoll, di*cyclo*hexylphthalate and PW 63/51, used in the manufacture of plastic wrappings for foods. The substances were given dissolved or suspended in olive oil, by stomach tube.

The toxicity of all was very slight, that of Mesamoll and PW 63/51 least. Since 3 of the rats given dibutylphthalate in the 1-year experiment were found to have sarcoma, it is considered that further tests with this substance are essential.

W. M. Deans.

METABOLISM OF CELLS, TISSUES, ETC.

GENERAL PHYSIOLOGY

4785

MOYSON, F. Limitations de l'emploi des coupes tissulaires pour l'étude des phénomenes métaboliques. [**Limitations in the use of tissue slices in the study of metabolic phenomena.**] *Experientia*, 1956, **12**, 103–104. [Lab. Animal Morphol., Univ. Libre, Brussels. English summary.

When cylinders of liver 1 mm. in diameter were incubated for 60 min. with glycine-1-^{14}C and then sectioned it was found that the basophilia

characteristic of ribonucleic acid had disappeared from all the cells except a layer 3 to 5 cells deep on the outside. Autoradiographs showed that only these outer cells had taken up the labelled glycine. Thus tissue slices give results valuable only qualitatively in metabolic studies.

D. Duncan.

4786

LOCKER, A. and SPITZY, K. H. Die Atmung von Zellen und Geweben *in vitro* als physiologische Methode und als Modellvorgang. [**Respiration of cells and tissues *in vitro* as a physiological method and "model" process.**] *Ztschr. ges. exp. Med.*, 1956, **127,** 1–15. [1. Med. Klin., Univ. Vienna.]

In the study of tissue respiration homogenates have recently been used in preference to slices. It is doubtful whether results with homogenates should be taken as representing processes in intact, living tissues; since the cells are ruptured, the results may more nearly approximate maximum possible performance within the cell (*Ztschr. ges. exp. Med.*, 1951, **118,** 155). To investigate this further, liver slices from normally fed rats and rats fasted for 48 hr., and leucocytes from untreated patients with lymphatic or myeloid leucaemia were used, in Krebs bicarbonate Ringer medium with or without 200 mg. glucose per cent., or later, for the endogenous respiration of leucocytes, with 50 mg. glucose per cent. Oxygen consumption in each system showed a gradual fall which could be related to the failure of supply of energy in the cell, the supply of glucose in the medium, and, in the liver, the amount of injury to surface cells. Respiration with carbohydrate as basis continued in liver for about 20 hr., in leucocytes for 17 to 20 hr.; with fat as basis for 140 hr. in liver, 81 or 62 hr. in lymphatic and 35 hr. in myeloid cells. On account of the irreversible fall of respiration, and the changes, *e.g.* swelling, of the tissue cells, experiments with tissue slices are to be regarded as "model" experiments only; those with leucocytes are more nearly related to natural events.—I. Leitch.

4787

DICK, D. A. T. **Growth and function of the foetal liver.** *J. Embryol. Exp. Morphol.*, 1956, **4,** 97–109. [Dept. Anat., Univ. Glasgow.]

Weight of liver declines relative to bodyweight in the mammalian foetus. To discover whether the change is due to the shift of blood formation from liver to bone marrow, or to a reduction of true hepatic tissue, 51 sheep foetuses from 28 to 530 mm. forehead-rump length were taken from ewes of "many different breeds". Livers were prepared and hepatic cell nuclei were counted by techniques described.

At 35 days, liver weight was 11 per cent. of bodyweight; at term (150 days) only 3 or 4 per cent. At these times hepatic cells per 100 g. bodyweight, called relative hepatic cell populations, were 16×10^8 and 6×10^8, showing that there is a decrease in true hepatic tissue as well as in haemopoietic tissue. When age-specific growth rates were computed they were found to be linearly related to relative hepatic cell populations. On the assumption that growth of liver is related to functional demands on it, the decline of hepatic cells relative to bodyweight may connote a decline of demand associated with decline of specific growth rate or an increase of functional capacity of the individual cell, possibilities which may be put to the test.—I. Leitch.

4788

SMITH, R. E. **Quantitative relations between liver mitochondria metabolism and total body weight in mammals.** *Ann. N.Y. Acad. Sci.*, 1956, **62,** 403–421. [Dept. Physiol., Med. Sch., Univ. California, Los Angeles.]

Adult rats, rabbits, sheep and steers were starved for 15 to 18 hr. and then killed. The livers were chilled and exsanguinated by perfusion with 0·16 *M* KCl at 0° to 5° C. and homogenates were prepared in KCl solution. Respiration was studied in a Warburg apparatus with whole homogenate or the mitochondrial fractions prepared by centrifuging. Mitochondrial counts were made on the fraction with a bacterial counting chamber and phase contrast microscope.

The numbers of mitochondria per g. dry liver decreased progressively with increasing size of the species, though the decrease from sheep to steer was not significant. The apparent dry mass of the individual mitochondrion increased somewhat with increasing size of animal; the differences between successive species were not significant, but those between rat and sheep or between rat or rabbit and steer were significant. Utilisation of oxygen, expressed as Q_{O_2}, decreased with increasing body size, but utilisation of oxygen per mitochondrion did not vary significantly. It is therefore concluded that Q_{O_2} of the homogenate is more closely dependent on the number than on the size of the mitochondria. The mass of mitochondria bears the same quantitative relation to total metabolism as to total body size, and the relative amounts of mitochondria in a given tissue may prove to be decisive for the regression of utilisation of oxygen on total body size for the species.

D. Duncan.

4789

O'CONNOR, R. J. **Observations on the nature of the relationship between cell division and carbohydrate metabolism.** *J. Embryol. Exp. Morphol.*, 1954, **2,** 26–37. [John Burford Carlill

Pathol. Labs., Westminster Sch. Med., Horseferry Rd., London, S.W.1.]

Metabolism was studied in liver tissue from chicken embryos at different stages of incubation from about 5·5 to 10 days. Total acid production and rate of utilisation of glucose were estimated by methods described, and mitotic activity was estimated histologically.

Before the stage when glycogen appeared, at about 6·9 days of incubation, the estimated rate of acid production from glucose, the rate of utilisation of glucose and the mitotic activity declined in much the same way. When glycogen appeared mitotic activity almost ceased to decline, but acid production and utilisation of glucose disappeared.

The implications of the findings are discussed.

D. Duncan.

4790

GRAY, D. E. and DELUCA, H. A. **Use of desoxyribonucleic acid as a reference standard in metabolic experiments.** *Amer. J. Physiol.*, 1956, **184,** 301–303. [Dept. Biochem., Univ. W. Ontario, London.]

Formation of glycogen, uptake of glucose and consumption of oxygen by diaphragms taken from rats fed on a diet containing 5 per cent. protein were greater than in diaphragms from rats given 22 per cent. protein. When expressed as metabolism per cell, calculated from the content of deoxyribonucleic acid phosphorus, this difference disappeared. The mass of the diaphragm cell decreased on the low-protein diet even when both groups had an equal energy intake, and the number of cells in a given weight of tissue increased.

A. Hepburn.

4791

SCHMIDT, C. G. Über das Cytochromsystem der Leber bei kurzfristigem Hunger. [**The cytochrome system in the liver after a short fast.**] *Klin. Wochenschr.*, 1956, **34,** 457–461. [Physiol. Chem. Inst., Univ. Münster.]

Adult rats on a mixed diet high in carbohydrate with addition of greens and carrots were fasted for from 12 to 18 hr. before they were killed for estimation of cytochrome *c*, cytochrome oxidase and nucleic acids in the liver. After a short fast no significant change from normal values for nucleic acids occurred, but the cytochrome *c* and cytochrome oxidase activity of liver cells from fasting rats was twice that of material from non-fasting rats. The findings are discussed with reference to exchange and synthesis of respiratory enzyme systems.—A. M. Copping.

4792

ARRIGO, L. Meccanismo di azione del fattore lipotropo pancreatico: comportamento del consumo di ossigeno del fegato steatosico di ratto. [**Mechanism of action of lipotropic substances from the pancreas: behaviour of oxygen consumption of fatty liver from the rat.**] *Quad Nutrizione*, 1954, **14,** 165–176. [Ist. Naz. Nutriz. C.N.R.] Summaries, French, p. 192, English p. 194, German p. 196.

Rats of both sexes, 4 to 5 months old, were fed on about 15 g. daily of a mixed diet slightly low in protein. Ten rats on this diet were considered as normal, 12 received a series of injections of CCl_4 and 30 received both CCl_4 and " protective " injections of pancreatic lipotropic factor (Arrigo and Montini, *Quad. Nutrizione*, 1954, **13,** No. 1/2). The rats were then killed and oxygen consumption of liver tissue was studied by the Warburg method.

The Q_{O_2} of fatty liver from rats treated with CCl_4 was not significantly above normal whether expressed on weight of tissue or N content. The Q_{O_2} of liver from rats treated with both CCl_4 and pancreatic lipotropic factor was significantly above normal, and almost identical values were obtained when the pancreatic extract was added to normal liver tissue. The liver tissue metabolised butyrate and caprylate, the latter more rapidly, except that liver from rats treated with CCl_4 alone metabolised caprylate poorly. Utilisation of both butyrate and caprylate was best in liver from rats given pancreatic extract and then in normal liver with added pancreatic extract.

The protective effect of pancreatic lipotropic substance on the liver was demonstrated chemically and histologically.—D. Duncan.

4793

ARATA, D., SVENNEBY, G., WILLIAMS, J. N. (Jr.) and ELVEHJEM, C. A. **Metabolic factors and the development of fatty livers in partial threonine deficiency.** *J. Biol. Chem.*, 1956, **219,** 327–333. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Groups of weanling male rats had a basal diet deficient in threonine, with or without a supplement of threonine. They were killed at intervals up to 15 days and the oxygen uptake of liver homogenates was measured with or without the addition of diphosphopyridine nucleotide (DPN).

Endogenous oxidation in homogenates from rats given threonine increased immediately and rapidly after weaning, but in rats deprived of threonine there was a delay of up to 10 days, followed by a sharp rise. Addition of DPN gave a constant degree of stimulation of endogenous oxidation in homogenates from rats given threonine, and a significantly greater stimulation in those from threonine-deficient rats. Accumulation of fat in the livers occurred in rats on the basal diet alone, but not when threonine was supplied.

It is concluded that impaired production of DPN and defective metabolism of endogenous DPN in liver are largely responsible for accumulation of fat in the liver in threonine deficiency.

A. K. Lough.

4794

ESCHBACH, W. and NEGELIN, E. Über den Stoffwechsel des Endometriums. [**Metabolism of the endometrium.**] *Arch. Gynäkol.*, 1955–56, **187,** 337–343. [Inst. Med., Deutsch. Akad. Wissensch., Berlin-Buch.]

Studies *in vitro* are described of respiratory metabolism and glycolysis of human endometrium over the menstrual cycle. Activity declines over the cycle and, in relation to oxygen consumption, glycolysis is high, so that about one-third of glycolysis is anaerobic.—I. Leitch.

4795

DOMONKOS, J. and HUSZÁK, I. Wirkung des *p*H auf den Glukosestoffwechsel überlebender Gewebe. [**Effect of p_H on glucose metabolism of surviving tissues.**] *Acta. physiol. hung.*, 1956, **9,** Suppl., 10–11. [Hirnforschungsinst., Szeged.]

4796

DUNCOMBE, W. G. and GLASCOCK, R. F. **Studies on the metabolism of mammary tissues *in vitro*. 1. Oxidation of acetate and glucose by slices of lactating rat mammary gland. 2. Oxidation of acetate and glucose by slices of lactating sheep mammary gland.** *Biochem. J.*, 1956, **63,** 326–332; 332–336. [Nat. Inst. Res. Dairying, Univ. Reading.]

1. Mammary tissue was obtained from rats between the thirteenth and fifteenth days of their first lactation.

When acetate was metabolised alone the carboxyl C atom was always oxidised more rapidly than the methyl atom, in ratios of between 1·27 and 1·54 to 1. When glucose was added the rate of oxidation of both C atoms was reduced, but the methyl atom was more affected, so that the ratio rose to between 1·72 and 2·93. When pyruvate replaced glucose the ratio rose similarly, but the total rate of oxidation of the acetate was not consistently affected. Diphosphopyridine nucleotide (DPN) did not significantly affect the oxidation of acetate when glucose was present. Nicotinamide increased the rate of oxidation of both C atoms, but not the ratio. The results agree with the hypothesis that the enzyme systems catabolising glucose and oxidising acetate compete for DPN. They are discussed in relation to the work of Strisower *et al.* (*J. Biol. Chem.*, 1952, **198,** 115).

When glucose and acetate were present together, the total C of glucose was oxidised 40 times as fast as that of acetate. The C_1 atom of glucose was oxidised about 10 times as fast as the methyl C of acetate. It is concluded that most of the C_1 atoms which appear as CO_2 are not oxidised along the glycolytic pathway. If they are oxidised directly, pyruvate would not be expected to reduce the rate of oxidation of C_1 atoms; the reason why it does so is being studied.

2. Mammary tissue was obtained from ewes after 20 to 27 days of their first lactation.

The rate of oxidation of the total C of glucose was depressed when pyruvate was added, but oxidation of the C_1 atom was not affected. Acetate considerably increased the rate of oxidation of both total C and C_1 atoms of glucose. When acetate was the basic substrate, addition of glucose increased the rate of oxidation of both carboxyl and methyl C atoms in the same ratio. Pyruvate depressed the oxidation of both C atoms of acetate, especially that of the methyl group, so that the ratio was increased.

The results are contrasted with those obtained with rat tissue. Acetate was oxidised several times as fast by sheep as by rat.—D. Duncan.

4797

NAKADA, H. I. **The metabolism of fructose by isolated rat diaphragms.** *J. Biol. Chem.*, 1956, **219,** 319–326. [Scripps Metabol. Clin., La Jolla, Calif.]

Isolated rat diaphragms took up and oxidised fructose, more in the presence of insulin, less in the presence of glucose or glucosamine. Formation of glycogen from fructose was much reduced in the presence of glucose; fructose was thought in these circumstances to form fructose-1-phosphate.

The direct contribution of fructose to energy metabolism of muscle cells is insignificant.

D. Duncan.

4798

NAKADA, H. I. and WICK, A. N. **Galactose metabolism by the isolated rat diaphragm.** *Amer. J. Physiol.*, 1956, **185,** 23–26. [Scripps Clin., La Jolla, Calif.]

Insulin increased the uptake of galactose by rat diaphragm *in vitro*, but the increase was not closely related to the concentration of galactose in the medium. Galactose did not affect the oxidation or uptake of glucose, though glucose reduced the oxidation of galactose. Glucose caused much greater reduction in both oxidation and uptake of fructose, but galactose hardly affected metabolism of fructose.

In 2 hr. diaphragm tissue took up about two-thirds as much galactose as glucose. When the diaphragm tissue was divided into fractions, much of the radio-activity of the glucose was found in glycogen, CO_2, hexose phosphates and "protein", but the activity from galactose was almost all in

free sugar, and its distribution was not affected by the presence of KF, to inhibit phosphorylation.

The differences in behaviour of glucose and galactose are discussed.—D. Duncan.

4799

OMACHI, A. and LIFSON, N. (with MICHEL, S. L. and SWANSON, J. A.) **Metabolism of isotopic lactate by the isolated perfused dog gastrocnemius.** *Amer. J. Physiol.*, 1956, **185,** 35–40. [Dept. Physiol., Univ. Minnesota, Minneapolis.]

Isolated gastrocnemius muscles of dogs were perfused with the animals' own blood, to which isotopic lactate was added in the course of experiments. CO_2 was collected from the closed circuit. Contraction of the muscle was produced by electrical stimulation of the sciatic nerve.

When resting muscles were given lactate labelled with ^{13}C in the carboxyl group, up to 12 and 13 per cent. of the respired CO_2 was derived from that lactate. When contracting muscles were given similar lactate the proportions were 27 and 29 per cent., and when contracting muscles were given lactate labelled in the α, β positions they were 25 and 27 per cent. Although the rate of production of CO_2 was several times as great in active as in resting muscle, the increase in utilisation of labelled lactate was even greater.

Evidence for conversion of lactate to glycogen was found in only 3 of 14 preparations studied; all 3 were resting muscles given α,β-labelled lactate with insulin and moderate amounts of glucose. All the detectable ^{13}C was in C atoms 1, 2, 5 and 6 of the hexose units of glycogen. No labelled glycogen was found in resting muscle given carboxyl-labelled lactate or in stimulated muscle.

D. Duncan.

4800

MARTONOSI, A., SZABÓ, É. P. and ISSEKUTZ, B. (Jr.) Wirkung des Insulins auf die Osmoregulation überlebender Gewebe. [**Effect of insulin on the osmotic regulation of surviving tissue.**] *Acta physiol. hung.*, 1956, **9,** Suppl., 21–22. [Physiol. Inst., Med. Univ., Szeged.]

4801

MÜLLER, W. A. Die Bildung des Eiweisses in der Zelle. [**Formation of protein in the cell.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 532–534. [Max Planck Inst. Biochem., Univ. Tübingen.]

A review.

4802

NIKLAS, A. and OEHLERT, W. (with ROESCH, R.) Autoradiographische Untersuchung der Grösse des Eiweiss-stoffwechsels verschiedener Organe, Gewebe und Zellarten. [**Autoradiographic study of protein turnover in different organs, tissues and types of cell.**] *Beitr. pathol. Anat.*, 1956, **116,** 93–123. [Med. Klin., Univ. Cologne.]

The animals were healthy adults fed on normal diets until 12 hr. before experiment; there were 5 rats, 6 mice and 1 rabbit. Each received by stomach tube sulphur amino acids labelled with ^{35}S, produced by growing *Torula utilis* in media with labelled sulphate. The yeast itself was given, or else a hydrolysate, or ^{35}S-methionine was isolated and given alone. The doses were about 10 mC. for rats, 1 mC. for mice and 40 mC. for the rabbit. The animals were killed at different times after the dose was given and tissues were fixed. Sections were made and autoradiographs indicated the distribution of ^{35}S. The method of estimating it in relation to the whole body or tissue is explained.

The tissues are divided into 4 groups according to the intensity of accumulation of labelled methionine and cystine. The greatest accumulation was in cells secreting protein, the gastric chief cells, pancreatic glandular epithelium and serous salivary glands, and also in ganglion cells, the adrenal cortex, the chorioid plexus and the reticulo-endothelial cells. The second group included crypt cells of the intestine, the stratum germinativum of the skin, hair follicles, spermatogonia, follicle and lutein cells of the ovary, epiphyseal cartilage, and also the liver and renal cortex. The third group was surface epithelia. The fourth group, muscle, connective tissue and skeletal tissues, accumulated ^{35}S at about one-fiftieth of the rate of the first group. The order of grouping corresponds closely with the values in the literature for ribonucleic acid content of tissues, and confirms the concept of Caspersson ("Cell Growth and Cell Function", Norton, N.Y., 1950) that protein turnover is proportional to the ribonucleic acid content of the cell.—D. Duncan.

4803

PRUDDEN, J. F., YOUNG, M. K. and STIRMAN, J. A. **Studies on growth hormone. 1. The effects of growth hormone and insulin upon the synthesis of protein in perfused livers.** *J. Lab. Clin. Med.*, 1956, **47,** 370–385. [Surg. Res. Unit, Brooke Army Med. Centre, Fort Sam Houston, Tex.]

1. Whole rabbit livers removed under surgically aseptic conditions were perfused with a mixture of equal parts of defibrinated rabbit blood and a solution containing electrolytes and 12 amino acids. The perfusate was isosmotic with rabbit plasma. The experiments are described in detail and results are tabulated and shown in graphs.

Addition of growth hormone to the perfusate considerably increased the synthesis of liver protein, and plasma protein was drawn upon for this. Insulin caused a high uptake of plasma

protein by the liver and increased production of urea, not so much of liver protein. It is concluded that the growth hormone produced a shift in equilibrium away from polypeptides and towards amino acids. Insulin increased glycogen formation and improved the maintenance of liver lipids.

The significance of the findings is discussed.

D. Duncan.

4804

DISCHE, Z., BORENFREUND, E. and ZELMENIS, G. **Proteins and protein synthesis in rat lenses with galactose cataract.** *Arch. Ophthalmol.*, 1956, **55,** 633–642. [New York.]

The net synthesis of soluble proteins in the lenses of 9-week-old rats was completely inhibited after 3 weeks on a diet containing galactose, and protein precipitable after oxidation with ferricyanide accumulated. The synthesis of insoluble protein was not greatly reduced.—A. Hepburn.

4805

WEILL, J. D., LEDIG, M. and MANDEL, P. Effet du jeune protéique prolongé sur la répartition des ribonucléotides nucléiques dans diverses fractions cyptoplasmiques du foie de rat. [**Effect of prolonged protein fast on the distribution of nucleic ribonucleotides in different cytoplasmic fractions of rat liver.**] *Biochim. biophys. Acta*, 1956, **20,** 430–431. [Inst. Chim. Biol., Fac. Méd., Strasbourg.]

The livers from rats which had lost 30 to 45 per cent. of their bodyweight as a result of prolonged deprivation of protein and had been killed after fasting for 18 hr. were fractionated by centrifuging. The distribution of ribonucleotides in the light mitochondria and the supernatant fluid from depleted rats did not differ from that in normal rats. In the microsomes uridylic and cytidylic acids were below normal and guanylic acid was significantly above normal in depleted rats. For earlier work see Abst. 2375, Vol. 20.—A. Hepburn.

4806

SINGER, T. P. and KEARNEY, E. B. **Intermediary metabolism of L-cysteinesulfinic acid in animal tissues.** *Arch. Biochem. Biophys.*, 1956, **61,** 397–409. [Inst. Enzyme Res., Univ. Wisconsin, Madison.]

4807

MAKINO, K., SATOH, K. and JOH, Y. **Conversion of kynurenamine to kynurine by mouse liver homogenate.** *J. Biochem., Tokyo*, 1955, **42,** 555–558. [Dept. Biochem., Jikei Med. Sch., Tokyo.]

4808

SPIRO, M. J. and MCKIBBIN, J. M. **The lipids of rat liver cell fractions.** *J. Biol. Chem.*, 1956, **219,** 643–651. [Dept. Biochem., State Univ. New York Coll. Med., Syracuse.]

4809

WEBSTER, G. R. **The chemistry and metabolism of the lipids of the nervous system.** *Guy's Hosp. Rep.*, 1956, **105,** 80–92. [Dept. Chem. Pathol.]

A review, with references.

4810

MARTINO SAVINO, F. Intervención del riñon estudiada con el fósforo radiactivo, en el metabolismo de las grasas y en la formación de las hormonas córticosuprarrenales. [**Participation of the kidney, studied with radioactive phosphorus, in fat metabolism and the formation of adrenocortical hormones.**] *Rev. clín. española*, 1956, **60,** 166–169. [Hosp. Central Cruz Roja, Madrid.] English, German and French summaries.

^{32}P was injected intravenously into 5 cats at 1 μC. per g. bodyweight as disodium phosphate. The animals were killed from 1 hr. to 15 days later and tissues were examined for radio-activity. In decreasing order of activity were the kidney, adrenal cortex, liver, spleen, pancreas and muscles, skin, brain and heart and pituitary.

Autoradiographs were made from kidneys and adrenals. The distribution of ^{32}P was mainly in the kidney cortex. The radio-activity was not removed by washing in running water for 12 hr. or by incubation with hyaluronidase, trypsin or papain, but disappeared when the kidney was treated with fat solvents. It is considered that P in the kidney is mostly in lipids. The high concentration in the adrenal cortex suggests the the strong relation between the two tissues and it is thought that the kidney may form steroid hormones or their precursors.

It is considered that the kidney plays an important part in intermediate metabolism of lipids and that its enormous oxygen consumption may be used in oxidising fats and in producing heat.

D. Duncan.

4811

NICHOLLS, D., HEAGY, F. C. and ROSSITER, R. J. **Phosphorus metabolism of the adrenal gland of the rat. Effect of exposure to a cold environment for eight days on the amounts of P^{32}-labelling of phospholipid and ribonucleic acid.** *Canad. J. Biochem. Physiol.*, 1956, **34,** 543–553. [Dept. Biochem., Univ. W. Ontario, London.]

4812

KLINE, D. L. and DELUCA, H. A. **Phospholipid metabolism in liver slices. Labelling of phospholipids with acetate-1-C^{14}.** *Canad. J. Biochem. Physiol.*, 1956, **34,** 429–440. [Dept. Biochem., Univ. W. Ontario, London.]

Liver slices were obtained from male rats and guineapigs which had been fed on a diet containing carbohydrate 53, protein 20, and fat 3·5 per cent. The slices were incubated with acetate-1-^{14}C at 37·5° C. for 4 hr. in Krebs Ringer bicarbonate buffer; lipids were then extracted, fractionated and assayed for ^{14}C.

The optimum *p*H for labelling of phospholipins and fatty acids of the acetone-soluble lipids was 6·8 to 7·4 and for cholesterol 6·6 to 6·8. No incorporation of acetate into lipids was found when nitrogen was employed as the gas phase. When glucose was added to the incubation medium the labelling of phospholipins and acetone-soluble lipids increased slightly. Incorporation of ^{14}C into all lipid fractions was less when cyanide, fluoride, iodoacetate or 2 : 4-dinitrophenol was added to the medium. Malonate inhibited the incorporation of ^{14}C-acetate into cholesterol, but did not affect the labelling of phospholipins. When acetate-1-^{14}C was replaced by glycine-2-^{14}C, glycerol-1-^{14}C or fructose-1-^{14}C, phospholipins were labelled; formate-^{14}C, lactate-1-^{14}C and glucose-^{14}C did not serve as precursors of phospholipins. No substrate, other than acetate, was incorporated into cholesterol to any significant extent.

G. A. Garton.

4813

GASTEVA, S. V. Obmen fosfora fosfolipinov i nukleoproteidov mozga u predstavitelei raznykh klassov pozvonochnykh. [**Phosphorus exchange of brain phospholipins and nucleoproteins in representatives of different classes of vertebrates.**] *Dokl. Akad. Nauk SSSR*, 1956, **106**, 873–876. [Lab. Sravnitel'n. Biokhim., Inst. Fiziol. I.P. Pavlova, Akad. Nauk SSSR.]

The content of phospholipins, nucleic acids and phosphoproteins and rate of phosphorus exchange in the central nervous system were studied with radio-active phosphorus. Subcutaneous injections of ^{32}P in sodium phosphate solution, 0·5 mC. per kg. bodyweight, were given to carp, perch, frog, tortoise, hen, pigeon, white rat and dog. The animals were killed 12 hr. after the injection and forebrain, cerebellum, brain stem and spinal cord were studied.

The quantity of phospholipins and their distribution in the brain were similar in all animals. An increase of phospholipins in the caudal direction was found, from 1000 to 1500 μg. P per g. in the forebrain to 2500 to 3000 μg. per g. in the spinal cord. The quantity of phospholipins in tortoise and frog brain was slightly less than in other animals.

The ribonucleic acid (RNA) fraction was evenly distributed in the brain and was found in similar quantities in different species. In all animals cerebellum was found to have 3 to 4 times as much deoxyribonucleic acid (DNA) as other parts of the brain, which had about the same amount; the range of variation for all animals and all parts of the brain was from 15 to 40 μg. P per g. tissue.

In rate of phosphorus exchange the animals could be clearly differentiated into 2 groups, cold-blooded and warm-blooded. In cold-blooded animals the rate of exchange of phospholipins is 0·5 to 1·5 per cent. in 12 hr.; in warm-blooded it is 5 to 10 times as great. For cold-blooded animals minimum values were found in fish and maximum values in summer frog. Among warm-blooded animals minimum values were found in dog, maximum in birds. In birds and mammals the greatest rate of exchange of phospholipins was found in cerebellum. In all animals the rate of exchange in spinal cord was lower than in brain. The rate of exchange of RNA is also different in cold- and warm-blooded animals. There was no difference among warm-blooded animals, but among the cold-blooded values for frogs were 2 to 2·5 times greater than for fish and values for tortoise were only slightly greater than for frogs. There was no difference between parts of the brain. In 12 hr. the DNA fraction exchanges about 1 per cent. in cold-blooded and 3 to 5 per cent. in warm-blooded animals. Among warm-blooded animals the rate of exchange is greatest in spinal cord.

From 30 to 50 per cent. of phosphoprotein was exchanged in 12 hr. in cold-blooded and 100 per cent. in warm-blooded animals.—F. Billewicz.

8414

BERRY, W. K. **Phospholipid metabolism of skin.** *Nature*, 1956, **177**, 789–790. [Chem. Defence Exp. Establishment, Porton, Wilts.]

Portions of minced abdominal skin of rats were incubated at 34° C. with glucose or other substrates and 5 μC. $H_3{}^{32}PO_4$. At the end of 0·5, 1, 2, 3 or 4 hr. of incubation, lipids were extracted from the tissue and the specific radio-activity of the lipid P was estimated.

The specific radio-activity of the lipid P increased with time. As a percentage of that found after 3 hours' incubation in the presence of glucose the specific activity in the presence of succinate was 72, with glycerol 68, L-malate 45, DL-lactate 52, acetate 53, oleate 31, palmitate 44, stearate 42 and glucose plus iodoacetate 11; without added substrate it was 69.—G. A. Garton.

4815

FLECKENSTEIN, A., JANKE, J. and DAVIES, R. E. (with HARTZ, W. and RICHTER, H.) Der Austausch von radioaktivem Phosphat mit dem α-, β- und γ-Phosphor von ATP und mit Kreatinphosphate bei der Kontraktur des Froschrectus durch Acetylcholin, Nicotin und Succinylbischolin. [**Exchange of radio-active**

phosphate with the α-, β- and γ-phosphorus of ATP and with creatine phosphate during the contraction of frog rectus muscle induced by acetylcholine, nicotine and succinyl-bis-choline.] *Arch. exp. Pathol. Pharmakol.*, 1956, **228**, 596–614. [Pharmakol. Inst., Univ. Heidelberg.] English summary.

4816

VÁGÓ, E. and MAGYAR, I. Beziehungen des Kohlenhydrat- und Kaliumstoffwechsels in der Leber von tetrachlorkohlenstoffvergifteten Hunden. [**Relation between carbohydrate metabolism and potassium metabolism in the liver of dogs poisoned with carbon tetrachloride.**] *Acta physiol. hung.*, 1956, **9**, Suppl., 37–38. [1. Med. Klin., Budapest.]

4817

MAROTTA, U. and MONACELLI, R. Permeabilità al potassio della membrana del globulo rosso. [**Permeability of the red cell membrane to potassium.**] *Rend. Ist. Super. Sanità, Rome*, 1955, **18**, 1295–1297. French, English and German summaries.

4818

SUTHERLAND, V. C., HINE, C. H. and BURBRIDGE, T. N. **The effect of ethanol on cerebral cortex metabolism *in vitro*.** *J. Pharmacol. Exp. Therap.*, 1956, **116**, 469–479. [Dept. Pharmacol., Univ. California Sch. Med., San Francisco.]

See also Absts. 4157, 4480, 4763.

GROWTH AND METABOLISM OF TUMOUR CELLS

4819

PRÉKOPA, Á., ROSDY, B., SZÖŐR, Á. and TANKO, B. Vergleichende Untersuchungen des Stoffwechsels karzinomatöser und normaler Gewebe. [**Comparative studies on the metabolism of cancerous and normal tissue.**] *Acta physiol. hung.*, 1956, **9**, Suppl., 14–15. [Biochem. Inst., Med. Univ., Budapest.]

4820

BURKE, W. T. and MILLER, L. L. **Biochemical changes during experimental carcinogenesis. 1. Amino acid metabolism in perfused livers of rats with cirrhosis and azo dye-fed rats.** *Cancer Res.*, 1956, **16**, 330–337. [Dept. Radiation Biol., Sch. Med. Dent., Univ. Rochester, N.Y.]

1. Rats in 3 groups were fed on a commercial diet, a synthetic diet to which was added per kg. 600 mg. 3′-methyl-4-dimethylaminoazobenzene or a diet to produce liver cirrhosis (Title 458, Vol. 11). The experimental diets were given for from 60 to 90 and from 150 to 200 days, respectively. After the rats had fasted for 18 hr. livers were perfused, by the technique already described (Abst. 3438, Vol. 24), with rat blood to which had been added mixtures of 8 essential and 11 non-essential amino acids, glucose and DL-lysine-HCl-6-^{14}C. Estimations were made of urea in blood and free α-amino acids in blood and liver, and ^{14}C was measured in CO_2 formed and in CO_2 derived during oxidation of protein precipitated from liver and plasma.

From their morphological structure the livers of rats getting the benzene derivative were concluded to be pre-cancerous; there was no evidence of formation of true hepatoma. Fatty infiltration had occurred in the cirrhotic livers.

Production of urea and clearance of α-amino acids from blood in 6 hr. by the pre-cancerous livers were about half the amounts by the normal livers; for the cirrhotic livers they were much less. Changes in the same directions took place in the oxidation of radio-active lysine. The proportions of lysine incorporated in liver and plasma proteins were greater in pre-cancerous than in normal animals; in those with cirrhosis incorporation was increased only for liver proteins. The final concentration of free amino acids was higher in pre-cancerous and cirrhotic than in normal livers.

The findings are discussed. Disturbance of metabolism of amino acids is thought to be the most likely explanation and is to be the subject of further study.—D. Harvey.

4821

BABSON, A. L. **The rate of loss of labeled plasma proteins from the circulation of tumor-bearing rats.** *Biochim. biophys. Acta*, 1956, **20**, 418. [Radiation Res. Lab., Coll. Med., State Univ. Iowa, Iowa City.]

Labelled plasma, globulin or albumin was obtained from rats injected with leucine-^{14}C or tyrosine-^{14}C and infused into normal rats or rats with tumours. The radio-activity disappeared from the circulation twice as quickly in cancer-bearing as in normal rats, and it is suggested that plasma protein was being synthesised twice as fast in rats with tumours.—A. Hepburn.

4822

GUTMANN, H. R., FILBIN, D. and PETERS, J. H. **The action of 2-acetylaminofluorene on growth and liver composition of rats on low and adequate dietary sulfur.** *Cancer Res.*, 1956, **16**, 240–245. [Radioisotope Unit, Vèterans Admin. Hosp., Minneapolis, Minn.]

Weanling female littermate rats initially 20 or 29 days old were pair-fed as described earlier (Gutmann and Peters, *Cancer Res.*, 1953, **13**, 895), for 100 or 119 days. The basal diet with 11 per cent. casein was given alone or with 0·5 per cent.

2-acetylaminofluorene, extra casein to make 20 per cent., 0·25 per cent. DL-methionine, 0·2 per cent. L-cystine or 0·13 per cent. glycine or any of the latter with acetylaminofluorene.

Acetylaminofluorene with the 11 per cent. casein basal ration retarded growth by 26 per cent. in 119 days, but did not retard growth with 20 per cent. casein. Methionine, cystine or glycine did not prevent retardation of growth. The value of the extra casein is therefore not due to S amino acids. The liver was always enlarged when acetylaminofluorene was given, but especially with the higher protein intake or the supplements of cystine and methionine. Liver fat was significantly increased in all the experimental groups except the group with 20 per cent. casein, but was never more than 5 per cent. Glycogen was increased considerably and protein somewhat less.

D. Duncan.

See also Abst. 4784.

METABOLISM OF GROWTH, REPRODUCTION AND SENESCENCE

GROWTH

4823

FRACCARO, M. **A contribution to the study of birth weight based on an Italian sample.** *Ann. Human Genetics*, 1956, **20,** 282–298. [Galton Lab.]

This study, based on data from the University of Pavia maternity clinic, provides comparisons with the English study of Karn and Penrose (Abst. 5193, Vol. 21). The Italian babies were smaller and had shorter gestation, older mothers of higher parity, and higher mortality. In most respects, the trends and correlations resemble the findings of Karn and Penrose. The suggestion, attributed to Penrose, is made that the weight of the foetus may determine the length of gestation; this may account for the decline of the birthweight curve after term and the relatively short gestation in twin pregnancies. The influence of differential mortality at different birthweights on "natural selection" is discussed in mathematical terms. [As with many other studies based on hospital records, the data presented have to be taken at their face value. For example, gestation periods up to one year are introduced without comment. The effect of socio-medical selection for admission to hospital and social differences between the Italian and the English series are not considered.]

A. M. Thomson.

4824

HOLFELDER, G. Körpergewichte von Säuglingen einer Grossstadt. (Untersuchungen an den Geburtsjahrgängen 1951–1953 der Stadt Frankfurt am Main.) [**Bodyweight of infants in a city. Studies of children born in the years 1951 to 1953 in the city of Frankfurt am Main.**] *Ztschr. Kinderheilk.*, 1956, **78,** 35–46. [Stadtgesundheitsamt, Frankfurt a.M.]

In all, there were nearly 50,000 weighings of 8347 infants (4252 boys, 4095 girls) at welfare clinics, nearly half the infants born in Frankfurt during the 3 years. Infants with any record of health disturbance, including digestive disturbances and infections, were excluded. For the first half-year weights are given weekly, for the second monthly; the numbers in each age group ranged from about 450 to 1000 or more. The mean weights at birth and 1 year for boys and girls were 3423, 3270 g. and 10,348, 9718 g. Average birthweight was doubled in the 17th and 18th weeks, respectively.

For closer study the infants were divided into 4 groups: those under 2500 g. at birth; those exclusively breast fed for 12 weeks and those not seen as late as this but exclusively breast fed when last seen; those partly breast fed, either wholly for a shorter time or partly all along; and those artificially fed and those for whom information on mode of feeding was lacking.

Infants of low birthweight were still behind at 1 year, by about 1000 g., but they doubled their birthweights early, in the 10th and 11th weeks.

No significant difference in weight was found between groups fed in different ways (the data are not reproduced). But the percentages discarded because of health disturbance differed: breast-fed, boys 1·02, girls 1·57; not breast-fed, 3·41, 4·37; partly breast-fed intermediate.

The weights for boys and for girls are plotted with those of Fierlings (*Thesis*, Greifswald, 1939), Hardtke (*Thesis*, Breslau, 1940, boys only), Gollnik (*Thesis*, Breslau, 1941, girls only), von Pirquet (*Ztschr. Kinderheilk.*, 1913, **6,** 253), Schlesinger (Abst. 3365, Vol. 3) and Stuart (in Mitchell and Nelson's "Textbook of Pediatrics", 5th ed., Saunders, Philadelphia, 1950). For boys the results surpass all the others, except von Pirquet's for the first few weeks, though they are generally only 200 to 300 g. higher than von Pirquet's. The lowest results are those from Breslau; those from the United States lie in the middle. Girls on the whole showed the same trends but the locality differences were smaller. None of the other authors found so early a date for the doubling of the birthweight.

Comparison of the breast-fed and artificially fed infants with those reported on earlier (not repro-

duced in detail) showed that the increase in weight gain was most striking in artificially fed infants and in breast-fed infants after the period of exclusive breast feeding.

The finding are considered to be against the idea of acceleration of growth in the first year of life.

W. M. Deans.

4825

LENZ, W. Die Bedeutung mütterlicher Faktoren für die Entstehung des Zwergwuchses. [**Significance of maternal factors in the origin of dwarfing.**] *Ztschr. Kinderheilk.*, 1956, **78,** 47–59. [Kinderklin., Univ. Hamburg, Eppendorf.]

Search of the records of the Eppendorf Klinik since 1951 revealed 23 children with pituitary dwarfism uncomplicated by thyroid defect, congenital malformation or other disorder, and 44 undersized children. When the ages of their mothers at their births were compared with those of mothers of 4000 unselected children, with an age distribution similar to that of the mothers of all children born in Hamburg in 1946–54, it was found that a significantly higher proportion of the mothers of the dwarfs and of the undersized were aged 30 or over, with a peak between 35 and 39 years. This was still true when the 2 classes were combined and first, second, third, and fourth and higher births were compared. When the mothers were classified in 5-year age groups an independent effect of parity of 4 or over was seen above the age of 25. Of 30 brothers or sisters of dwarfs, 22 were within the normal range of height. The social environment was on the whole satisfactory, never really bad, though some of the children who were merely undersized came from large families in poor surroundings.

Contrary to the findings of some authors on sporadic or endemic cretinism, 30 children with thyroid defects had mothers with an age distribution not significantly different from that of the control sample.

The results are discussed in conjunction with the literature on dwarfism and effects of high age of mother and high parity on the growth of children. It is emphasised that almost all children of elderly mothers are normal. The conclusion is that pituitary dwarfism cannot always be ascribed to heredity and its causes must lie in the intrauterine environment.

In a note added in proof it is admitted that in Hamburg the average age of mothers was higher during the war than before or after. This does not affect the findings, but may have something to do with the increased incidence of congenital malformations during and just after the war, generally ascribed to poor diet and mental strain.

W. M. Deans.

4826

SUÁREZ, M. Diagnóstico causal de la deficiencia de crecimiento en talla. [**Diagnosing the cause of lack of growth in height.**] *Rev. española Pediat.*, 1956, **12,** 201–216. [Clín. Paediat., Univ. Santiago de Compostela.] French, English and German summaries.

From the literature and from personal observations a classification is made of the conditions which cause retarded growth or true dwarfing in children.—D. Duncan.

4827

NEALE, A. V. **Hormones and disturbances of growth in childhood.** *Practitioner*, 1956, **176,** 641–651. [Dept. Child Health, Univ. Bristol.]

4828

KIMBALL, E. R. **The pediatrician examines the mother and child: introducing a chart to record growth and performance.** *J. Amer. Med. Assoc.*, 1956, **160,** 1033–1039. [Dept. Paediat., Northwestern Univ. Med. Sch., Chicago, Ill.]

4829

CRAIG, J. and CLARK, N. S. **The physiology of the first year of life.** *Practitioner*, 1956, **176,** 343–351. [Dept. Child Health, Univ. Aberdeen.]

4830

THOMSON, J. **Growth increment in the fourth year.** *Med. Officer*, 1956, **95,** 303–304. [Dept. Child Life, Univ. Edinburgh.]

A group of 40 boys and 35 girls, part of the group examined at 4 years old (Abst. 5416, Vol. 25), were weighed and measured for crown-heel and crown-rump length and pelvic intercristal width at 3 and 4 years of age. Mean measurements at 3 years were greater for boys than for girls. All fourth year mean increments were greater for girls than for boys. The crown-heel increment showed least and intercristal width increment most variability in both sexes.—F. C. Aitken.

4831

FRIED, R. and MAYER, M. F. **Grid technique as tool for improving health services to institutionalized children: a ten-year experience.** *J. Amer. Med. Assoc.*, 1956, **161,** 1–5. [Jewish Child. Home, Cleveland, Ohio.]

For an earlier report see Title 4868, Vol. 18. The grid method has been found useful for following the growth of children in a home for those with emotional disturbance. Five case histories illustrate the possible effects of emotional disturbance on growth.—W. M. Deans.

4832

TRULSON, M. F., COLLAZOS C., C. and HEGSTED, D. M. **Growth and development of Peruvian children. 1. Carquin and San Nicholás.** *Pediatrics*, 1956, **17**, 510–523. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston.] Spanish and Interlingua summaries.

1. Weight and height of 109 children were measured and X-ray studies of hand and wrist were made. Compared with standards for North American children the Peruvian children were, in general, below normal for age, especially in height. Developmental age (Wetzel) and skeletal age were retarded in relation to chronological age. As indicated by partial correlation coefficients skeletal age was not closely related to height, weight or developmental age. The diet and clinical status of children in these communities were reported earlier (Abst. 2269, Vol. 24; 1090, Vol. 25).

F. C. Aitken.

4833

BENJAMIN, K. M. Wuchsform und Blutkreislauf. [**Growth form and circulation of the blood.**] *Helv. paediat. Acta*, 1956, **11**, 24–44. [Tel Aviv.] French, Italian and English summaries.

By growth form the author means not constitutional type (leptosome or pyknic), but body build assessed by the ratio of cube root of weight to height. The " corpulence index " ranges from 138 for the infant to 105 for the adolescent of about 14 and is on the average 112 for a well proportioned adult.

Most of the paper deals with haemodynamics in relation to body build and with the adaptation of the circulation to different stages of development. The plump body build of the infant favours a uniform supply of blood, for nutrition and growth, the slim body build of the adolescent or adult favours rapid shifts of blood (adaptation for hunting and flight). A few pages are devoted to the relation between size and activity or muscular efficiency in the child and adult and in different species. The textbook statement that the greater activity or muscular efficiency of the smaller creature is explained by its relatively greater surface area and an energy exchange proportional to this is wrong. Kleiber (Abst. 4658, Vol. 17) has shown that the energy exchange rises as the 3/4 power of the weight, that is, faster than the surface (2/3 power of the weight). The smaller creature uses relatively less energy, because of the more favourable ratio of muscle strength to load borne. In the adult as compared with the child, this is partly counterbalanced by the greater proportion of muscle in the body.—W. M. Deans.

4834

BLODGETT, F. M., BURGIN, L., IEZZONI, D., GRIBETZ, D. and TALBOT, N. B. **Effects of prolonged cortisone therapy on the statural growth, skeletal maturation and metabolic status of children.** *New Engl. J. Med.*, 1956, **254**, 636–641. [Dept. Paediat., Harvard Med. Sch., Boston, Mass.]

Growth in height of children with adrenocorticovirilism, hypopituitarism, Addison's disease or allergy was inhibited by cortisone. Growth was suppressed in hypopituitarism by 4 to 20 mg. cortisone per sq. m. body surface daily and in allergy by 45 mg. In adrenocorticovirilism 35 mg. reduced growth to normal and 35 to 50 mg. tended to reduce rate of growth in height and skeletal maturation to below normal. Except in hypopituitarism, children whose growth was depressed showed a spurt when cortisone intake was reduced below the levels associated with inhibition of growth. Biochemical and electrocardiographic findings were normal except in 3 patients in whom treatment with cortisone was suddenly discontinued because of acute febrile illness.

F. C. Aitken.

4835

SUÁREZ, M., LAMEIRO, A. and TEIJEIRA, J. El crecimiento en Galicia. 1. Talla en varones de 20 años. [**Growth in Galicia. 1. Height of men 20 years of age.**] *Rev. española Pediat.*, 1956, **12**, 169–175. [Clín. Pediat., Univ. Santiago de Compostela.] French, English and German summaries.

1. Height and chest girth were measured in 2652 men aged 20 years in Galicia. The mean height was 164 cm., S.D. $\pm$ 6, and 1957 subjects were within the range from 158 to 170 cm. The mean chest girth was 86·3 cm. and the mean for the 216 men 164 cm. tall was 86·7 cm. There was less dispersion of heights, and in particular there were fewer tall men, than in the general population of Spain.—D. Duncan.

See also **Abstracts. 4616, 4787, 4955, 5015, 5109.**

REPRODUCTION AND LACTATION: MAMMALS

4836

GREEP, R. O. **Reproduction.** *Annu. Rev. Physiol.*, 1956, **18**, 433–456. [Harvard Sch. Dent. Med., Boston, Mass.]

4837

VEREL, D., BURY, J. D. and HOPE, A. **Blood volume changes in pregnancy and the puerperium.** *Clin. Sci.*, 1956, **15**, 1–7. [Med. Unit, London Hosp.]

In 13 pregnant and 8 non-pregnant women simultaneous estimations of red cell volume and plasma volume were made with ^{32}P-labelled red cells and Evans Blue. The ratio of body haematocrit to venous haematocrit showed a much wider range in the pregnant women, 0·87 to 1·08, than

the more constant ratio of 0·9 to 0·95 found in non-pregnant women ; the estimation of blood volume from the measurement of either red cell or plasma volume may therefore involve considerable errors during pregnancy.

An increase in plasma volume above normal was found in all the pregnant subjects, but only in 2 was the red cell volume increased above normal non-pregnant limits.

Blood loss of 5 subjects at delivery was measured accurately by estimating shed Hb. Twelve hours after delivery there was a marked fall in red cell volume not explained by the puerperal blood loss ; in one woman 520 ml. of red cells had been removed from the circulation.—F. E. Hytten.

4838

STARK, G. and JUNG, W. Phosphatasen in der Placenta und ihren einzelnen Zellfraktionen. [**Phosphatases in the placenta and its cell fractions.**] *Arch. Gynäkol.*, 1955–56, **187,** 398–405. [Frauenklin, Univ. Mainz.]

Homogenates and cell fractions, namely, nuclei, mitochondria, and cytoplasm plus microsomes, from 50 fresh mature human placentae were tested for phosphatase activity at *p*H 5·6 and 9·8, and so were maternal and cord blood. Activity was highest in the mitochondria ; next came cytoplasm plus microsomes. The differences between the fractions were much greater for alkaline than for acid phosphatase. The activity of placental homogenate was about 50 times that of serum from maternal or cord blood.—W. M. Deans.

4839

HOLMBERG, N. G., KAPLAN, B., KARVONEN, M. J., LIND, J. and MALM, M. **Permeability of human placenta to glucose, fructose, and xylose.** *Acta physiol. scand.*, 1956, **36,** 291–299. [Södra Barnbordshuset, Wenner-Gren Res. Lab., Stockholm.]

In an unstated number of vaginal hysterotomies the rates of transfer across the placenta of glucose, fructose and xylose were calculated. The age of the foetus ranged from 15 to 22 weeks. The sugar was injected into a maternal vein and samples were taken from another vein and from the umbilical vein simultaneously 3 to 8 min. later. In other experiments sugars were injected directly into the foetal circulation.

The results are expressed as " apparent net transfer rates " and show that the transfer of glucose and xylose from mother to foetus was of the same order as that found for the guineapig and the sheep. The rate for fructose was much less.

F. E. Hytten.

4840

CHINARD, F. P., DANESINO, V., HARTMANN, W. L., HUGGETT, A. St. G., PAUL, W. and REYNOLDS, S. R. M. **The transmission of hexoses across the placenta in the human and the rhesus monkey** (*Macaca mulatta*). *J. Physiol.*, 1956, **132,** 289–303. [Dept. Embryol., Carnegie Institution of Washington, Baltimore, Md.]

The passage of glucose and fructose across the placenta was studied in 11 women and 9 monkeys. Foetal blood samples were taken at caesarean section, with the women under local anaesthesia, by delivering a loop of cord through a small uterine incision, and from the interplacental arteries in the monkeys. High blood values for glucose and fructose, average 90 mg. per 100 ml., were induced in the women, and ^{14}C-labelled glucose and fructose were administered to the monkeys.

" Glucose appears to pass freely across the primate placenta in both directions." The primate foetus appears to have very little blood fructose normally, up to 5 mg. per 100 ml., although in 4 samples it was between 10 and 20 mg. per 100 ml.

Fructose appears readily in the foetal circulation after infusion into the mother. It is suggested that the same carrier system operates for both sugars and that they can compete for it.

F. E. Hytten.

4841

HAYASHI, T. **Uric acid and endogenous creatinine clearance studies in normal pregnancy and toxemias of pregnancy.** *Amer. J. Obstet. Gynecol.*, 1956, **71,** 859–870. [Dept. Obstet. Gynaecol., Sch. Med., Temple Univ., Philadelphia, Pa.]

Single or consecutive estimations of uric acid clearance and blood uric acid were made on 181 pregnant women ; in 143 of them, endogenous creatinine and uric acid clearances were studied simultaneously. Patients omitted breakfast on the morning of test and drank 200 ml. water every half-hour to promote flow of urine. Urine was collected by indwelling catheter. The maximum renal clearances were usually calculated, and results were not adjusted for bodyweight or surface area.

In normal pregnancy (women admitted to the clinic for conditions which should not disturb renal function), averages for the periods before and after the 32nd week were : uric acid clearance, 18·4 and 13·0 ml. per min. ; endogenous creatinine clearance, 129 and 108 ml. per min. ; blood uric acid, 3·2 and 3·0 mg. per 100 ml. In pre-eclampsia, the corresponding values were 4·8 and 6·5, 63 and 99, 7·5 and 6·0. In essential hypertension they were 14·5 and 14·2, 114 and 128, 3·7 and 4·1. In essential hypertension with superimposed pre-eclampsia most averages were intermediate, and in unclassified " toxaemia " (excessive weight gain attributed to abnormal retention of fluid)

they resembled, on the whole, the averages for essential hypertension. The ranges were wide, so that the studies had limited prognostic or diagnostic value; but in pre-eclamptic patients on whom repeated studies were made, both uric acid and creatinine clearance remained low until pregnancy terminated, even with clinical improvement. A sudden decrease in these clearances was of some value in predicting pre-eclampsia in previously normal women and in those with fluid retention. In essential hypertension, creatinine clearance remained high during the last few weeks before delivery, instead of falling as in normal pregnancy or when pre-eclampsia became superimposed. It is suggested that the parallel changes in creatinine and uric acid clearances point to decreased glomerular filtration, rather than increased tubular reabsorption, as the cause of low uric acid clearance in pre-eclampsia.—A. M. Thomson.

4842

HEROLD, L. Kalium-Natriumuntersuchungen in Blut und Gewebe, ein Beitrag zur Frage der Transmineralisation in der Gestationsperiode. **[Studies on potassium and sodium in the blood and tissues; a contribution to the problem of transmineralisation during pregnancy.]** *Arch. Gynäkol.*, 1955–56, **187**, 388–397. [Geburtsh.-Gynäkol. Abt., Städt. Krankenhaus Düsseldorf, Benrath.]

By " transmineralisation " is meant a change in the distribution of electrolytes. Analyses were made of samples of smooth muscle from uteri removed from women of reproductive age, from uteri of normal pregnant women at caesarean section, and in the 9th or 10th month from one subject with pre-eclampsia and two with eclampsia; and of venous blood serum taken from the same subjects. The results were per cent. for 18 non-gravid women, serum K 20·5 ± 0·88 mg. and Na 314·8 ± 8·43 mg.; uterus muscle K 305·5 ± 11·63 mg. and Na 161·8 ± 8·88 mg. For women in late pregnancy the corresponding values were 20·2 ± 0·79 mg. and 273·1 ± 7·63 mg.; 238·6 ± 9·34 mg. and 206·3 ± 6·78 mg. Corresponding K : Na ratios were for serum 0·0653 and 0·0725 and for uterus muscle 1·885 and 1·157.

In 20 non-pregnant and 25 pregnant other women average serum and red cell values were: non-pregnant K 20·6 and Na 318·5, pregnant 20·3 and 276·8; non-pregnant K 421·3 and Na 116·7, pregnant 391·9 and 139·9 mg., and K : Na ratios were in serum 0·0652 and 0·0726 and in red cells 3·604 and 2·807.

For the toxaemic women the changes were in the same direction and greater than in the normal pregnant.

These changes are towards the values found in the foetus, infant and young child and it is suggested that such values for Na and K and the greater water content of the body are characteristic of higher metabolic levels and growth processes.—I. Leitch.

4843

PERRY, J. S. **Fecundity and embryonic mortality in pigs.** *J. Embryol. Exp. Morphol.*, 1955, **2**, 308–322. [Lab. Agric. Res. Counc., Compton, Berks.]

A study was made of 863 pigs, mostly sows discarded on account of " age, sterility, low fertility, poor milk supply or some other disability, or to make room for another animal in the breeding stock ". In most of them, in terms of ova shed, there was no evidence of infertility. They were thought to be representative of pig populations in general.

" Reliable " counts of corpora lutea were got from 352 pigs. The most frequent number in sows, for 2 ovaries, was 20, the spread from 10 to 38, the number increasing with age. For 27 gilts (non-parous pigs) the average was 13·6.

Counts of both corpora lutea and embryos were obtained from 85 sows and 19 gilts as follows: sows, corpora lutea 7 to 31, mean 19 [to nearest whole number]; embryos 1 to 23, mean 12; gilts, corpora lutea 2 to 21, mean 14; embryos 2 to 15, mean 10. From these data it is not possible to estimate embryo mortality, because litters lost in entirety and late losses are not shown. In 15 gilts pregnant between 17 and 40 days, the loss, as disappearance of shed ova, was 20·1 per cent.; in 37 sows, 36·9 per cent. In 99 pregnant animals, ova lost, as the difference between corpora lutea and embryos found, increased with number of corpora lutea from 26 per cent. for 9 to 14 to 42 per cent. for 22 to 31 corpora lutea. Losses rose also with length of gestation.—I. Leitch.

4844

WORM, M., MOHNIKE, G. and GRIMM, H. Tierversuche über die Beziehungen zwischen der Zuckerkonzentration in Fruchtwasser, maternem und fetalem Blut. **[Animal experiments on the relations between the sugar concentrations in amniotic fluid and maternal and foetal blood.]** *Ztschr. ges. exp. Med.*, 1956, **127**, 293–299. [Diabetikerheim, Garz, Rügen.]

For these experiments rabbits and hares were chosen as having haemochorial placentae, one per foetus, and individual amniotic sacs. On the 28th day of pregnancy, with urethane anaesthesia, the foetuses were exposed; glucose or insulin was injected into the mother and samples were taken at intervals of maternal blood from an ear vein, which did not differ from blood from pelvic vessels, of foetal blood from the jugular vein and of amniotic fluid. Sugar in foetal blood followed

changes in maternal blood with a lag such that, after glucose followed by insulin, foetal might exceed maternal blood sugar for as long as 30 min. Changes in amniotic fluid were slower and less in magnitude. The results are discussed with reference to fluctuations in the blood sugar of diabetic women at term.—I. Leitch.

4845

HILL, R. **Calcium metabolism during pregnancy and lactation.** *Agric. Progress*, 1954, **29,** 98–109. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

A lecture in the form of a review.

4846

FEASTER, J. P., HANSARD, S. L., OUTLER, J. C. and DAVIS, G. K. **Placental transfer of calcium in the rat.** *J. Nutrition*, 1956, **58,** 399–406. [Nutrit. Lab., Florida Agric. Exp. Stat., Gainesville.]

Seventy-two nulliparous rats aged 12 to 15 months, maintained on commercial rat pellets containing 1·38 per cent. Ca and 0·96 per cent. P, were mated and at different stages of gestation were given by mouth single doses of $^{45}CaCl_2$. The pregnant rats were killed 30 min. to 20 days after receiving the isotope and the foetuses and carcases were analysed for ^{45}Ca and total Ca content; excretions were analysed for ^{45}Ca.

The ^{45}Ca was found to cross the placenta and to be deposited in the foetus at all stages of gestation studied, namely, from the fourteenth to the twenty-second day. The amount of ^{45}Ca transferred from dam to foetus in a given length of time increased with increasing foetal age. In 30 min. an appreciable amount of the isotope was absorbed and transferred to the foetus. It is suggested that part of the Ca transferred to the foetus must have been derived from Ca previously stored in the maternal skeleton.—G. F. Garton.

4847

LOGOTHETOPOULOS, J. and SCOTT, R. F. **Active iodide transport across the placenta of the guinea-pig, rabbit and rat.** *J. Physiol.*, 1956, **132,** 365–371. [Dept. Pathol., Postgrad. Med. Sch., London.]

Pregnant guineapigs, rats and rabbits received by injection ^{131}I and radio-activity was measured in maternal and foetal serum 70 to 80 min. later. Blocking the binding of ^{131}I by the thyroid with propylthiouracil made no difference to the serum concentrations; the ^{131}I apparently remained in ionic form.

In guineapigs and rabbits the foetal : maternal serum ^{131}I ratio was from 1·5 to 5, but when sodium thiocyanate was given subcutaneously before the experiment, the ratio never reached unity. In rats the foetal : maternal ratio rarely exceeded unity and fell to 0·3 to 0·4 after thiocyanate.

A placental transport mechanism for iodide, inhibited by thiocyanate, is postulated.

F. E. Hytten.

4848

DRYDEN, L. P., GLEIS, P. F. and HARTMAN, A. M. **Reproduction and lactation of rats fed glyceryl trilaurate-containing diets.** *J. Nutrition*, 1956, **58,** 335–339. [Dairy Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

Studies were made on female albino rats which had been reared by mothers which were transferred at parturition from a stock ration to one of 2 experimental rations. The first experimental ration consisted of sucrose 63·4, alcohol-extracted casein 25, salts 4·5, glyceryl trilaurate 5, methyl linoleate 1·7, fish liver oil 0·05 and vitamins 0·38 per cent.; the second differed only in that a commercial vitamin-free casein was used and the fish liver oil was replaced by synthetic vitamin A and calciferol. The rations and distilled water were supplied to appetite. In the first experiment the mothers with their young were given from parturition the first ration; the young were weaned at 21 days, reared to 77 days on the first ration and then mated to stock males. They were continued on the same ration until 2 litters had been carried to weaning, then they were divided into 2 groups, one given the second ration and the other maintained on the first ration and carried through 2 additional pregnancies and lactations. The second experiment was similar except that the animals were given the second ration throughout and were carried through 2 pregnancies and lactations.

Survival of young to weaning ranged from 78 to 94 per cent., as contrasted with none in work of Keane *et al.* (Abst. 5204, Vol. 21). There was no evidence of failure in any other aspect of reproduction or lactation.—G. F. Garton.

4849

SMITH, E. **Pregnancy in the little brown bat.** *Amer. J. Physiol.*, 1956, **185,** 61–64. [Dept. Anat., Coll. Med., Univ. Cincinnati, Ohio.]

Studies were made in 2 consecutive years on bodyweight changes and metabolism of 303 pregnant female bats of the species *Myotis lucifugus lucifugus*, and on the weights of all the newborn bats collected during 5 years. In this species the single pregnancy each year occurs in the spring just after the bat emerges from the inactivity of hibernation and begins feeding actively; pregnancy lasts from late April or early May until late June or early July. The weight of the mother increased exponentially with the weight of the foetus; the rate of increase differed with the year. At birth, the single offspring weighed on the average 28·8 per cent. of the mother's weight. The

oxygen consumption in pregnant bats rose from 0·08 c.c. per g. per hour to 0·34 c.c. as weight rose from 6·1 to 8·9 g., but the metabolic rate was always less than the expected rate for a non-pregnant mammal of the same weight. The total heat increment of gestation (Brody, Abst. 2077, Vol. 8) was about 2·2 Cal.—G. F. Garton.

4850

BISHOP, P. M. F. **Hormones and the breast.** *Practitioner*, 1956, **176,** 624 – 631. [Guy's Hosp., London.]

4851

GODIN, C. and WORK, T. S. **Biosynthesis of proteins. 4. The effect of intravenous peptides on casein synthesis in a lactating goat.** *Biochem. J.*, 1956, **63,** 69–71. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

For part 3 see Abst. 861, Vol. 26.

A fraction rich in lysine peptides, isolated from a partial acid hydrolysate of goat casein, was injected with lysine-^{14}C into a lactating goat. The ^{14}C in the peptides from the partial hydrolysis of the casein synthesised after 2 hr. was uniformly distributed. This indicated that peptides in the blood cannot be used for synthesis of casein without degradation to amino acids.—A. Hepburn.

See also Absts. 4382, 4417, 4437, 4557, 4930, 4977, 4978, 5104.

REPRODUCTION: BIRDS

4852

FELDMAN, M. and WADDINGTON, C. H. **The uptake of methionine-S^{35} by the chick embryo and its inhibition by ethionine.** *J. Embryol. Exp. Morphol.*, 1955, **3,** 44–58. [Inst. Animal Genetics, Univ. Edinburgh.]

Fertile eggs were injected 17 to 18 hr. before incubation began with 0·1 ml. of a solution of DL-methionine labelled with ^{35}S, with radioactivity about 50 μC. per ml. After incubation for different periods the embryos were fixed and autoradiographs were made from whole embryos and sections.

In primitive streak or head process stages the uptake of ^{35}S by ectoderm was much greater than that by mesoderm. From the beginning of its differentiation, neural tissue had the highest incorporation of isotope, and later this was true especially of brain. At the somite stage mesoderm became more active than ectoderm, in the region of the neural groove.

Ethionine injected with labelled methionine reduced the amount of isotope incorporated by more than half. Development of embryos was retarded by ethionine and abnormalities were found. Retardation was prevented by larger amounts of methionine, but several abnormal embryos occurred. Glycine did not abolish the effect of ethionine.

Aspects of the effect of ethionine are discussed. D. Duncan.

4853

ROMIJN, C. and VELTHUIZEN, J. Die Jodausscheidung im Hühnerei. [**The output of iodine in the hen's egg.**] *Arch. Geflügelk.*, 1956, **20,** 97–106. [Lab. Vet. Physiol., Reichsuniv. Utrecht.] English summary.

For an earlier experiment see Abst. 4729, Vol. 23.

Of 2 groups of 20 one-year-old hens in a laying battery, getting 140 g. of an all-mash ration daily in 2 equal feeds, one had 0·68 mg. I per kg. diet from the mineral mixture and the other had it raised to 7·79 mg. with Algit (seaweed meal); the daily intakes of I were 95 and 1091 μg. per bird, respectively. The eggs were found to contain 19·9 and 113 μg. I. The respective percentage distributions were yolk 60·3 and 78·3, white 7·0 and 4·7, membranes nil and 0·3, shell 32·7 and 16·8. Since most of the iodine in the yolk was soluble in water, it was assumed to be in inorganic form. Estimation of I in the droppings showed that these and the eggs accounted for all the iodine ingested.

The course of elimination of I in the egg at the start of the experiment was studied in the above groups and in another group of 20 hens given the same ration plus KI to raise the iodine content to 6·90 mg. per kg. diet. Little extra I appeared in the eggs till the fifth day, when there was a steep rise till the tenth day; this corresponds to the formation of the yolk in the ovary. The hens given Algit eliminated more I per egg than those given KI, but the eggs of the latter were smaller, and after about 200 days there was little difference between the groups in the total amount of I eliminated for the same weight of egg on a fresh basis.

Other experiments were made with hens which got iodine with the morning feed only, and grain in the late afternoon. In the first, 5 groups of 54 one-year-old hens had 1·5 mg. I per kg. diet (controls), 13·2, 51·6 or 72·9 mg. from Algit or 76·3 mg. from KI. In the other experiment 4 groups of 78 pullets 6 months old had 1·7 mg. I per kg. diet (controls), 26·6 or 52·9 mg. I from Algit or 56·3 mg. I from KI. Less I was eliminated by the younger birds, but variations were large, which may have been partly due to differences in age and breed.—W. M. Deans.

See also Absts. 4243, 4370.

SENESCENCE

4854

CHINN, A. B., LAVIK, P. S. and CAMERON, D. B. **Measurement of protein digestion and absorption in aged persons by a test meal of I^{131}**

labeled protein. *J. Gerontol.*, 1956, **11,** 151–153. [Dept. Med., Sch. Med., Western Reserve Univ., Cleveland, Ohio.]

Studies were made on 12 subjects aged 72 to 88 years who showed no apparent defect in digestion and absorption of protein. Their thyroids were blocked by 45 minims of Lugol's solution administered daily for 3 days and, after an overnight fast, a freshly prepared test meal composed of 0·5 g. gelatine and 1 g. glucose per kg. bodyweight and 100 μC. ^{131}I-labelled albumin, all mixed in 200 ml. distilled water, was given to each subject. Oxalated blood samples were obtained fasting and 1, 2 and 3 hr. after the test meal; the radio-activity of the samples was measured and the total isotope content of the blood was calculated. Blood sugar and the radio-activity of faeces were estimated also.

The rate of digestion and absorption of protein and their extent in 72 hr. were not significantly different in the aged subjects and in younger subjects studied previously (Abst. 2027, Vol. 24).

G. F. Garton.

4855

CALET, C. and JACQUOT, R. Rôle physiologique des antibiotiques comme facteurs de sénescence. [**Physiological role of antibiotics as senescence factors.**] *C.R. Acad. Sci.*, 1955, **241,** 991–993.

The authors' earlier work with rats given aureomycin (see Absts. 380, 3102, Vol. 24; 5128, Vol. 25) is summarised and that of other workers is quoted in support of the view that the changes produced by the antibiotic are those of senescence. Data are presented to show that with aureomycin in the diet the amount of deoxyribonucleic acid, as mg. P, falls from 0·20 to 0·15 per g. liver tissue and from 0·80 to 0·67 in the whole organ.

D. Harvey.

See also Absts. 4933, 5007, 5106, 5423.

EXPERIMENTAL STUDIES OF IMMUNITY AND MICRO-ORGANISMS

4856

HALLIDAY, R. **The termination of the capacity of young rats to absorb antibody from the milk.** *Proc. Roy. Soc.* [*B*], 1956, **145,** 179–185. [Agric. Res. Counc. Unit Embryol., Dept. Zool., Univ. Coll. N. Wales, Bangor.]

Young rats were suckled for more or less than the usual time by transferring them to foster-mothers at a different stage of lactation from their own mothers or by premature introduction to solid food by hand feeding. At the end of the experiment their capacity to absorb antibodies was tested either by allowing them to suckle females immunised against *Salmonella pullorum* or by introducing immune serum by stomach tube.

Rats from 6 to 9 days old readily absorbed antibodies from the milk of fostermothers at 21 to 25 days of lactation. Rats aged 21 days or more were unable to absorb antibodies from the milk of fostermothers at earlier stages of lactation. Milk from mothers at 16 to 23 days of lactation did not prevent rats aged 17 days or less from subsequently absorbing antibodies, *i.e.*, there did not appear to be a substance in the milk in late lactation which influenced the capacity of the young rat to absorb antibodies. The time at which solid food was given, either as early as 12 days or as late as 24 days, did not affect the time at which absorption of antibodies ceased. Sucking rats could be immunised by injection of *Salmonella pullorum* at about 10 days of age, but not at 2 or 3 days; quite high titres of circulating antibody were developed before the age when absorption of maternal γ-globulin ceased.—D. Duncan.

4857

PETUELY, F. Ist eine quantitative Erfassung der in Säuglingsstühlen vorhandenen Bifiduskeime durch Züchtung möglich? Ein Selektivnährboden für den Lactobacillus bifidus. [**Is the quantitative estimation of *bifidus* bacilli possible by culture from infants' stools? A selective medium for *Lactobacillus bifidus*.**] *Ztschr. Kinderheilk.*, 1956, **78,** 28–34. [Biochem. Lab., Univ. Graz.]

The medium contained in each 50 ml., at *p*H 6·4, lactose 3·5 g., K_2HPO_4 0·25 g., ammonium acetate 0·2 g., Tween 80 0·1 g., cystine 20 mg., Ca pantothenate 40 μg., biotin 0·4 μg., $MgSO_4 . 7H_2O$ 12·5 mg., $FeSO_2 . 7H_2O$ 0·625 mg., $MnSO_4 . 4H_2O$ 0·425 mg., NaCl 0·625 mg. and vitamin C 1 g. This was mixed at 60° C. with an equal volume of 4 per cent. agar solution and plates were made. Cultures had to be kept under CO_2; if the medium was heated above 60° C. or allowed to stand in air for more than 1 or 2 hr. the vitamin C oxidised and the plates were useless. Stool samples were diluted in physiological saline to 1 in 10^6 or 10^8. On this medium quantitative estimation of *Lactobacillus bifidus* in the stools could be made.

Three types of colony were obtained, but the type had no relation to breast or artificial feeding. The numbers were related to the *p*H of the stools; the greatest numbers were at *p*H 6 to 7.

D. Duncan.

4858

GYLLENBERG, H., ROSSANDER, M. and ROINE, P. **Effect of the fatty acids of human milk and**

cow's milk on intestinal lactobacilli. *Acta paediat.*, 1956, **45,** 147–160. [Dept. Nutrit. Chem., Univ. Helsinki.] French, German and Spanish summaries.

Strains of *Lactobacillus acidophilus* and *L. bifidus* isolated from faeces of rats and of infants, respectively, were grown in basal media to which fatty acids were added, and after a fixed incubation period growth was measured by titration of the lactic acid produced.

With *L. acidophilus* the optimum amount of oleic acid to stimulate growth was about 1 mg. per ml., and of linoleic acid 0·2 mg. per ml. or less. Myristic, palmitic and stearic acids increased growth to a less extent, and were best in a concentration of about 1·5 mg. per ml. In amounts varying from 0·2 to 2·5 mg. per ml. propionic, butyric and caproic acids were without effect, and capric and lauric acids were inhibitory even in the presence of oleic acid. With *L. bifidus* propionic, butyric and caproic acids were without effect and all other acids tested were inhibitory in the above range of concentration.

The inhibitory effect of some acids upon both organisms was reversed to some extent by the addition of 2 mg. per ml. of Tween 80, and by the proteins of skimmed human and cow's milk.

A growth-stimulating effect of human milk, particularly if it had been heated to a high temperature, for *L. acidophilus* was thought to be due to the unsaturated fatty acids which it contains.

J. C. Appleby.

4859

PETERSEN, C. S. and CARROLL, R. W. **Biological effect of hydroxylysine.** *Science*, 1956, **123,** 546–547. [Res. Labs., Quaker Oats Company, Chicago, Ill.]

Small amounts of racemic hydroxylysine decreased the amount of lysine required for growth of *Streptococcus faecalis*. Hydroxylysine had a similar effect on *Leuconostoc mesenteroides*, but in large amounts it depressed growth. This inhibition of growth was eliminated when lysine was added.

A. Hepburn.

4860

TURBA, F., HÜSKENS, G., BÜSCHER-DAUBENBÜCHEL, L. and PELZER, H. Einbau von S^{35} und C^{14} in Torulazellen; biologische Halbwertszeit von Glutathion. [**Incorporation of ^{35}S and ^{14}C into torula cells: biological half-life of glutathione.**] *Biochem. Ztschr.*, 1956, **327,** 410–421. [Inst. Org. Chem., Univ. Mainz.]

Earlier work showed how ^{14}C is built in succession into amino acids, peptides and protein in torula cells (Abst. 2192, Vol. 26). Similar experiments with ^{35}S are described. Technique and tests of methods for separation and purification of the radio-active compounds produced are described.

^{35}S is rapidly built into first acid, then neutral and finally basic fractions of low molecular weight; the predominance of acid fractions was striking. Most, but not all, acidic peptides contained sulphur amino acids. Incorporation of ^{35}S into glutathione was demonstrable in a fraction of a second and activity of glutathione had a maximum at about 90 sec. To estimate the half-life of glutathione the slower and less easy method with ^{14}C was preferred. The experiments and calculations are shown in detail. The half-life of glutathione in yeast cells is 22 ± 2 min., which is much less than that measured in mammalian tissues. Implications for protein metabolism are discussed.

I. Leitch.

4861

MICHEL, M. and FRANÇOIS, A. C. Influence de la chlortétracycline sur les decarboxylases de la flore intestinale du porc. [**Effect of chlortetracycline on the decarboxylases of the intestinal flora of the pig.**] *C.R. Acad. Sci.*, 1956, **242,** 1770–1772.

The intestinal flora of the pig can cause decarboxylation of the amino acids of the feed. It was shown *in vitro* that glutamic and aspartic acids were most affected, then arginine, tryptophan and alanine. Methionine, ornithine and lysine were only slightly affected. Aureomycin (chlortetracycline), 10 μg. per ml., almost completely inhibited decarboxylation and the consequent formation of amines. It is suggested that this modification of decarboxylation and of the deamination process previously reported (see Abst. 3997, Vol. 25) are part of the mechanism by which growth of pigs is increased by antibiotics.—T. D. Bell.

4862

GRIMBERGEN, A. H. M. De invloed van antibiotica op de darmflora. (Literatuuroverzicht en eigen onderzoek.) [**Effect of antibiotics on intestinal flora. Review of literature and original studies.**] *Tijdschr. Diergeneesk.*, 1956, **81,** 549–568. [Inst. Mod. Veevoeding "De Schothorst", Hoogland.] English, French and German summaries.

Results reported by many workers in several countries on the influence of antibiotics on the bacteria of chickens' intestines vary widely, probably because of dissimilarity of methods. The author's own tests showed that lactobacilli developed resistance to penicillin after 6 days; and *Bacterium coli* to terramycin after 3 weeks. Terramycin also caused resistance to aureomycin, but not to chloramphenicol. In a subsequent test resistance was not produced by terramycin, but by

introduction of resistant *Bact. coli* in the feedingstuffs. Resistance may be due to alteration in bacterial metabolism, selection of resistant bacteria in the presence of antibiotics or increased propagation of resistant mutants in the presence of antibiotics.

Antibiotics have been widely used in feedingstuffs in the United States and so far no harmful effect has been reported. This does not mean that there has been none or that none will develop in the future. The occurrence of cross-resistance emphasises the need for caution, as the curative effect of antibiotics may be lost by their use in feedingstuffs.—M. Eddison.

4863

BAUMAN, H. E. and FOSTER, E. M. **Characteristics of organisms isolated from the rumen of cows fed high and low roughage rations.** *J. Bacteriol.*, 1956, **71,** 333–338. [Dept. Bacteriol., Univ. Wisconsin, Madison.]

Two groups of 3 cows had rations high in grain and in roughage, respectively, and the predominant types of rumen bacteria were investigated.

Serial dilutions of rumen contents were made in 9-ml. quantities of broth containing trypticase, phytone, cysteine, glucose and mineral salts. Anaerobic and reducing conditions were maintained under nitrogen. The highest dilutions showing growth on incubation under these rather selective conditions usually contained only one morphological type of bacterium, which was purified in agar shake cultures.

From 13 rumen samples of cows on the high-roughage ration 13 rods were isolated at limiting dilution, which all resembled *Lactobacillus bifidus*. The 9 isolates from separate rumen samples from the cows on the high-concentrate ration were all Gram-positive cocci, considered to resemble *Pediococcus* rather than the *Streptococcus bovis* previously described. The characteristics of these organisms, including fermentation tests and fermentation products from glucose, are given.

J. C. Appleby.

4864

LODGE, J. R., MILES, J. T., JACOBSON, N. L. and QUINN, L. Y. **Influence of chlortetracycline on in vitro cellulose digestion by bovine rumen microorganisms.** *J. Dairy Sci.*, 1956, **39,** 303–311. [Dept. Animal Husb., Iowa Agric. Exp. Stat., Ames.]

Twenty lactating dairy cows and 4 calves 4 months of age were used. Half had received aureomycin from an early age. Half the cows now got 240 mg. aureomycin each daily and half the calves 80 mg.

Rumen contents were withdrawn by stomach pump ; in the artificial rumen those from the cows given aureomycin digested only 73 per cent. of cellulose, those from the untreated cows 85 per cent. With calves the corresponding values were 58 and 78 per cent.

When aureomycin content was estimated in rumen inocula of the treated cows, withdrawn 16 hr. after the supplement was given, 0·08 μg. per ml. was found ; after 4 hr. the value was 0·22 μg. The calves were given their supplement in 2 equal parts, one with each feed. The level of aureomycin in the rumen 2 hr. after receiving half the supplement, *i.e.*, 40 mg., was 0·22 μg. per ml.

When 2·4, 1·6, 0·8 or 0·4 μg. aureomycin was added to the digestion medium, digestion of cellulose by the rumen micro-organisms of the cows not given aureomycin was inhibited; the inhibition was much less in cows given aureomycin.

It was shown that bacterial counts are affected by supplements of aureomycin, but the depression found initially in some types is lost when the micro-organisms have become adjusted.—T. D. Bell.

4865

LAMBERT, M. R. and JACOBSON, N. L. **The effect of chlortetracycline feeding on *in vitro* cellulose digestion by rumen microorganisms.** *J. Animal Sci.*, 1956, **15,** 509–514. [Iowa Agric. Exp. Stat., Ames.]

See above Abst.

4866

BELASCO, I. J. **The role of carbohydrates in urea utilization, cellulose digestion and fatty acid formation.** *J. Animal Sci.*, 1956, **15,** 496–508. [Polychem. Dept., E.I. du Pont de Nemours and Co., Inc., Du Pont Exp. Stat., Wilmington, Del.]

When starch, xylan and pectin in equal amounts were used as sources of energy in studies *in vitro*, utilisation of urea by rumen micro-organisms was improved. The starch was more effective than the other sources, and half quantities of starch and either xylan or pectin were equal to starch alone. Fatty acid production was the same with all these sources of energy.

Cellulose was inferior to starch in aiding utilisation of urea, digestion of cellulose and production of fatty acids. Dextrose was superior to cellulose in producing fatty acids. Cellulose was digested better alone than with high levels of dextrose. Starch, dextrose and cellulose, at high levels, influenced the proportions of butyric, propionic, valeric and acetic acids in the total fatty acids produced.—T. D. Bell.

See also Absts. 4425, 4439, 4442.

MISCELLANEOUS FEEDING EXPERIMENTS

4867

LE MAGNEN, J. Hyperphagie provoquée chez le rat blanc par altération du mécanisme de satiété périphérique. [**Hyperphagia induced in the white rat by alteration in the peripheral satiety mechanism.**] *C.R. Soc. Biol.*, 1956, **150,** 32–35.

For 32 days 8 adult rats received for 2 hr. each morning a complete synthetic ration and for 2 hr. each evening stock biscuits (Sorolabo). The synthetic ration contained on different days for each rat citral, eucalyptol, benzyl acetate or benzaldehyde. The amount eaten was recorded. Later the rats received diets containing each substance for 30 min. in the morning in a different order, and this was repeated every second day for 6 tests, and in the intermediate days one of the rations was given for the whole 2 hr.

The rats ate on the average 72 per cent., range 43 to 170 per cent., more on the days when all 4 rations were given in succession than they did when only one was offered. It is concluded that the frequent change of olfactory stimulus provoked hyperphagia. Satiety was achieved much more rapidly with the single diet, and little was eaten after the first hour. Change in the olfactory stimulus renewed the appetite, but consumption still declined in successive half-hours. The peripheral stimulus of the new odour to some extent overcame the mechanism of satiety.—D. Duncan.

4868

LE MAGNEN, J. Rôle de l'odeur ajoutée au régime dans la regulation quantitative à court terme de la prise alimentaire chez le rat blanc. [**Effect of odour in the diet on the quantitative short-time regulation of food intake in the white rat.**] *C.R. Soc. Biol.*, 1956, **150,** 136–139.

Nine male rats, of average weight 150 g., caged individually, were fed as described in the preceding Abst. The amount of synthetic feed eaten was ascertained daily and is shown graphically. After 24 days, during which the amount consumed was fairly steady and rate of weight gain normal, the rats in 3 subgroups of 3 had, per 100 g. synthetic diet, 0·4 ml. citral, 0·2 ml. eucalyptol or 0·2 ml. benzyl acetate for 14 days, then for 2 days the amounts of scented substance were reduced to one-fifth, for the next 2 double the original amounts were added and finally for 6 days the feed was again given unscented.

Benzyl acetate did not affect consumption of the synthetic feed ; rats given eucalyptol and one of the rats given citral ate significantly less of it for 2 or 3 days, but the effect then disappeared. Dilution or concentration of the scented substance had no significant effect. On its removal, 7 of the 9 rats ate significantly more, but after 3 days their consumption reverted to that of the fore-period.

The results are considered to show that in the regulation of food intake scent acts to limit rather than to stimulate.—W. M. Deans.

4869

ADRIAN, J., PERISSÉ, J. and JACQUOT, R. Intérêt et signification de la farine d'arachide comme aliment de protection du noir africain. Étude expérimentale. [**Interest and significance of groundnut meal as protective food for the African native. Experimental study.**] *Ann. Nutrit. Alimentation*, 1956, **10,** 3–10 (Mem.) [Lab. Biochim. Nutrit., C.N.R.S., Bellevue.]

Ten groups of 8 weanling rats, average weight 34 g., were used in a 2-month experiment to test the feasibility of supplementing poor African diets based on millet, maize or cassava with groundnut meal and possibly small quantities of hydrolysed fishmeal. The rats had food and water to appetite. All diets included red palm oil, containing 0·14 per cent. carotene, 5, Osborne Mendel salt mixture 1·5 and $CaCO_3$ 0·5 per cent., and vitamin D was supplied. Apart from these, the control diet consisted of maize starch 72, casein 18, cellulose 2 and a mixture of B vitamins 1 per cent. Diets 1, 2, 3, intended to represent poor African diets, had whole millet, yellow maize or whole cassava meal 90, maize starch 3 per cent. Diets 4, 5, 6, 7 had millet 75, supplemented with maize starch 17·4 and DL-lysine 0·6, or maize starch 8 and groundnut meal 10, or groundnut meal 18, or groundnut meal 15 and enzymically hydrolysed fishmeal 3 per cent. Diets 8 and 9 were the same as diet 7 except that millet was replaced by maize or cassava.

None of the experimental rats grew as well as the controls. Best total weight gains were with millet plus groundnut meal and hydrolysed fishmeal, maize with the same supplement, and millet plus 18 per cent. groundnut meal. Best gains per g. protein ingested were with millet plus lysine, and maize or cassava plus groundnut meal and hydrolysed fishmeal. With diets 1 and 2 weight gains were trifling, and all the rats on diet 3 lost weight and died.

It was concluded that a supplement of groundnut meal 15 and hydrolysed fishmeal 3 per cent. could balance African diets in respect of protein. Since the average human consumption of millet is estimated at 600 g. daily, this would mean 90 g. groundnut meal and 18 g. fishmeal, which might not be acceptable, for cost or other reason ; but

even 60 g. groundnut meal would have a worthwhile effect. Standards of composition would be required.—W. M. Deans.

4870

SZKIŁŁĄDZIOWA, W., RUDOWSKA-KOPROWSKA, J. and MUSZKATOWA, B. Wyniki badán nad wartością biologiczną białek zestawów kulinarnych oznaczoną rożnymi metodami. [**Estimation of the biological value of proteins in meals by different methods.**] *Rocz. Państwowego Zakł. Hig.*, 1956, **7**, 141–162. Russian and English summaries.

The biological value of meals served in institutions was measured in experiments with rats by the methods of Osborne, Mendel and Ferry (*J. Biol. Chem.*, 1919, **37**, 223), of Carpenter and Porter (Title 1360, Vol. 23) and of Harrison and Long (Abst. 717, Vol. 16). The results were compared with the chemical score of the diets (Block and Mitchell, p. 249, Vol. 16). Agreement was good with the results for the first method if the diet was a mixed one, less good if much of it consisted of cabbage or wheat flour. The deviations were still greater for the second and third methods in that order. [From English summary.]

D. Harvey.

4871

ALLEGRETTI, N. and GABRIĆ, D. Über die willkürliche Aufnahme von Aminosäuren bei Ratten. [**Voluntary intake of amino acids by rats.**] *Naturwissenschaften*, 1956, **43**, 135–136. [Physiol. Inst., Med. Fac., Univ. Zagreb.]

In continuation of experiments on the selection of salt solutions by rats exposed to metabolic stress (Gabrić and Allegretti, *Liječn. Vjesn., Zagreb*, 1955, **77**, 204 ; *Pflügers Arch.*, in the press), 2 groups each of 6 rats on an ordinary diet had a choice of *M*/6 sodium glutamate, *M*/6 glycine or tap water to drink. Rats in one group each had a daily injection of 0·4 unit insulin, those of the other, controls, an injection of saline, for 6 days. Rats given insulin drank slightly more than the controls ; about 20 per cent. of the fluid taken by the controls was water and the rest equally divided between sodium glutamate and glycine, but the rats given insulin, contrary to expectation, drank much more glycine and sodium glutamate and hardly any water.—W. M. Deans.

4872

WITTE, S., BÜNTE, H. and KIMBEL, K. H. Untersuchungen über enterale Antibiose bei der Ratte. [**Studies on intestinal antibiotics in the rat.**] 9. Veränderungen der Blutgerinnungsfaktoren durch Tetracyclinderivate. [**9. Changes in blood coagulation factors produced by tetracycline derivatives.**]

FISCHER, W., KIMBEL, K. H. and HEINKEL, K. 10. Das Verhalten der Aktivität von Lipase und Diastase des Serums unter oralen Chlor- und Oxytetracyclingaben. [**10. Effect of chlortetracycline and oxytetracycline by mouth on lipase and diastase activity in the serum.**] *Ztschr. ges. exp. Med.*, 1956, **127**, 160–167 ; 188–202. [Med. Klin., Univ. Erlangen.]

For part 8 see Abst. 3127, Vol. 26.

9. Treatment of rats with 100 mg. oxytetracycline (terramycin) per kg. bodyweight for 4 weeks reduced coagulation factors V and VII, and increased prothrombin time by about 50 per cent. ; aureomycin had no effect. In such rats which also had Marcumar (Roche), *i.e.*, 3-(1′-phenylpropyl)-4-hydroxycoumarin, 500 mg. vitamin K_1 per kg. removed its effect but not that of terramycin. Hence it was concluded that the effect of terramycin is not due to lack of vitamin K arising from a change of intestinal flora.

10. Previous findings (Absts. 5271, 2215, Vol. 25) that antibiotics improved absorption of fat and retarded uptake of carbohydrate suggested investigation of their effect on lipase and diastase. Because of the difficulties of studying these enzymes in the digestive tract *in vivo*, recourse was had to studying them in the blood. The mean lipase activity of the blood of 23 rats given 25 mg. chlortetracycline (aureomycin) daily for 30 days was little over half that of 132 untreated rats of the same age. In 4 rats given terramycin, no effect was found. Neither antibiotic significantly affected blood diastase.

The activity of lipase and diastase in human serum *in vitro* was reduced when either antibiotic was added.—W. M. Deans.

4873

GARCIA, J., KIMELDORF, D. J., HUNT, E. L. and DAVIES, B. P. **Food and water consumption of rats during exposure to γ-radiation.** *Radiation Res.*, 1956, **4**, 33–41. [Div. Biol. Med., U.S. Naval Radiol. Defence Lab., San Francisco, Calif.]

Young male rats were exposed to γ-radiation for 8-hr. periods under conditions which are described and which gave a total dose of 75 r per exposure. Control animals were littermates kept under similar conditions with sham exposure. Exposures were 8 in number at intervals of 1 week and there were 3 experiments. Conditions in the second and third were identical except that water was withheld during alternate periods of exposure. Bodyweights of the rats were recorded.

In all 3 experiments amounts of both food and water consumed during each exposure were less for treated than for control animals. The difference appeared during the first exposure and, for water, became greater as the number of exposures

rose. In the second and third experiments the difference in food eaten by the groups also increased with the number of exposures, but in the first experiment it did not alter. Changes in bodyweight reflected these differences in intakes of food and water; control rats gained weight and treated animals lost several g. during each exposure.

Measurements begun in the first experiment 1 hr. after the end of exposure showed that the groups did not differ in the amount of food eaten; the amount of water drunk by the treated rats was greater by an amount which increased progressively with the number of exposures.

It is suggested that radiation produces these effects by an action on gastro-intestinal function during exposure.—D. Harvey.

4874

REINIUS, L. **Growth failure caused by mild heat treatment of the diet.** *Acta physiol. scand.*, 1956, **35,** 265–271. [Vet. Coll., Helsinki.]

Groups of rats were weaned at 21 days of age and then given, to appetite, water and a diet of whole wheat meal 35·5, potatoes 35·5, whole milk powder, 12·5, minced beef 8, sucrose 4·4, lard 3·6 and NaCl 0·5 per cent. Most of the water in the diet was evaporated at 50° to 60° C.; the mixture lost about one-third of its weight in the process. It was then finely ground and a mixture of vitamins of the B group and vitamin K was added; this diet was given to control animals. The heated diet, which was given to the experimental animals, was prepared from the basal diet by keeping it in layers $\frac{1}{2}$ in. deep in an oven at 140° C. until it developed a slightly brown colour and a palatable taste, which took 30 to 40 min. During the heating the layers were turned over every 10 min. Before use the heated diet was supplemented with the same vitamin mixture as the unheated diet. The rats on both diets received 1 drop of cod liver oil weekly.

The heated diet caused total cessation of growth of the rats. Growth was restored by addition of casein or lysine; addition of leucine, methionine, histidine, vitamin B_{12} or sucrose was without effect.—G. F. Garton.

4875

GRIFFIN, C. A. and THOMPSON, W. R. **Studies of prepared feeds in relation to Salmonella infection in laboratory animals. 2. Reproduction and growth of mice on heated and unheated commercially prepared feeds.** *Amer. J. Vet. Res.*, 1956, **17,** 311–317. [Div. Labs., New York State Dept. Health, Albany, N.Y.]

Part 1 appeared in *J. Amer. Vet. Med. Assoc.*, 1952, **121,** 197.

2. Three commercial mouse feeds, the composition of which is given, were studied. For some groups of mice they were heated in bags to from 210° to 220° F. for 30 min. in dielectric ovens, or heated under a vacuum in an autoclave to a minimum of 100° C. for 30 min. Other groups had unheated feeds. The groups were large, up to 20 families of 1 male and 5 females, and were studied for 3 generations.

There was some difference in reproductive performance in favour of one of the 3 feeds, but no difference attributable to heating.—D. Duncan.

4876

DE GROOT, A. P. and ENGEL, C. **The effect of commercial sterilization on the nutritive value of milk as determined in experiments with rats and baby pigs.** *J. Dairy Res.*, 1956, **23,** 257–268. [Central Inst. Nutrit. Res. T.N.O., Utrecht.]

The effect of heat treatment on the quality of milk protein was studied. Biological values by the Mitchell method, using balance experiments with rats, were 87·0, 88·0 and 85·1 for raw, pasteurised and sterilised milk, respectively, and the digestibilities were 96·8, 96·3 and 94·4. When the milks were given to protein-depleted rats the average liveweight gains in 5 days were 27·7, 26·3 and 22·9 g., respectively. In a growth experiment with rats the differences in performance on the 3 milks were very small. In growth experiments on pigs weaned at 1 to 4 days of age the average weight gains on sterilised milk were 97, 95, 98 and 98 per cent. of those on pasteurised milk, but the differences were ascribed partly to more difficult adaptation and to a smaller intake of milk solids on the sterilised milk.

None of the differences observed was statistically significant, and the experiments failed to demonstrate a significant decrease in the nutritive value of milk caused by sterilisation according to the Stork procedure.—I. A. M. Lucas.

4877

SARETT, H. P. and SNIPPER, L. P. (with SCHNEIDER, D. L.) **Effect of adding carbohydrate to milk diets. 1. Growth and body composition. 2. Water restriction.** *J. Nutrition*, 1956, **58,** 529–542; 543–555. [Mead Johnson Res. Labs., Evansville, Ind.]

1. One of 6 groups of 10 male weanling rats was fed for 6 weeks on a diet of 99·5 per cent. powdered whole milk and 0·5 per cent. minerals and vitamins. The protein content was 24·4 per cent. The other groups were given 66·2 per cent. powdered milk and 33·3 per cent. carbohydrate, which reduced protein content to 16·2 per cent. Average weight gain was significantly greater with sucrose in the diet than with glucose or dextrin and was about the same as with milk alone. There was no significant difference in average weight gain between

groups given glucose, dextrin and starch. With lactose weight gain was significantly less than in any other group. There was no significant difference in energy intake between groups. Efficiency of food utilisation on the lactose diet was significantly lower than on other diets; between the other diets there was no significant difference. Water intake was significantly higher in animals on milk alone than on the diets with added carbohydrate. The concentration of lipid in the carcases of animals on diets with added carbohydrate was higher than in animals on milk alone. Protein content of carcases was about the same for all groups.

Data on liver, kidney and adrenal weights, relative to bodyweight, protein and lipid content of liver, ascorbic acid and cholesterol content of adrenals are tabulated. Relative kidney and adrenal weights were highest in the lactose group. This group also had relatively large livers, as had the dextrin group.

2. In the previous experiment animals on a diet of powdered milk drank 25 to 30 per cent. more water than those on diets with added carbohydrate. The effect of water restriction was investigated in weanling rats given the powdered milk diet and in rats given starch in place of one-third of the powdered milk. All rats were given water to appetite for 2 weeks. For the remaining 4 weeks each group was subdivided into 3 groups of 10 given 100, 80 and 60 per cent. of their previous water intake. Water restriction led to curtailment of food intake of rats in both groups, less in the starch group. On both diets water restriction resulted in reduced weight gains, fall in body lipid, increase in relative size of kidneys and adrenals and decrease in relative size of liver. Composition of liver and carcase was not much affected by water restriction. At all levels of water intake, weight gain per g. protein consumed was higher on the starch diets.—F. C. Aitken.

4878

MILLER, D. S. **The nutritive value of fish proteins.** *J. Sci. Food Agric.*, 1956, **7**, 337–343. [The Crookes Laboratories Ltd., 37–43 Gorst Rd., Park Royal, London, N.W.10.]

Nutritive values of some commercial fishmeals and of other laboratory preparations of cod were tested by estimation of the net protein utilisation (see Abst. 1993, Vol. 26). For the first group of 10 samples the range was from 33·1 per cent., for an oily fishmeal suspected of having been heated strongly during manufacture, to 68·3 per cent. for a meal from South Africa. The value for the meal used in the FAO experiment in Chile (*FAO Memorandum*, 1954, **3**, No. 9, 4) was 67·0 per cent. For the second group of products, either meals or extracted proteins, 27 values are tabulated; the highest was 83·0 per cent. for a product for which the drying temperature had not exceeded 50° C., the lowest were 43·0 and 40·0 per cent. for extracted proteins with 9 and 17 per cent. moisture, respectively, heated for 24 hr. [temperature not stated]. Impairment was the result of the Maillard reaction at the high temperature. The net protein utilisation was not affected by wet storage of the fish for 7 days or storage of the extracted proteins, wet for 4 or 8 days or dry for 100 days.

In further experiments with rats methionine was shown to be one, but probably not the only, limiting amino acid.—D. Harvey.

4879

HUTCHINSON, J. B., MORAN, T. and PACE, J. **Nutritive value of the protein of white and wholemeal bread in relation to the growth of rats.** *Proc. Roy. Soc.* [*B*], 1956, **145**, 270–279. [Res. Assoc. Brit. Flour Millers, Cereals Res. Stat., St. Albans, Herts.]

Wholemeal and 70 per cent. extraction flour were milled from the same sample of Manitoba wheat and baked into bread with yeast. The bread was dried and powdered to crumb. The white bread crumb formed 80 per cent. by weight of the basal diet. The other ingredients were arachis oil 5, skimmed milk powder 4, salt mixture 4, choline chloride 0·2, liver powder 0·4 and sucrose 6·4 per cent. In the wholemeal diet the percentage of crumb was such that it provided the same quantity of N as 80 per cent. of white crumb; sucrose was adjusted accordingly. In some experiments 10 per cent. potato powder, or an amount of steamed potato equivalent in N content to the potato powder, replaced an equivalent amount, in terms of N, of crumb. The lysine contents of the whole meal and white crumb diets were estimated. In one experiment the lysine content of the white crumb diet was raised by the addition of lysine to that of the wholemeal crumb diet. In another experiment the lysine contents were brought to 1 per cent. by addition of lysine to both diets, and in a third experiment the lysine content was 0·8 per cent. and the skimmed milk powder was replaced by an amount of crumb equivalent in terms of N. All diets were supplemented with vitamins of the B complex, vitamins A and D and α-tocopherol. Groups of weanling and 8-week-old rats were fed on these diets and mean weight gains, food consumption and gains per g. N consumed are tabulated.

In weanling rats wholemeal bread gave better growth than did white bread, even when the diet included skimmed milk powder and potato. In older male rats the differences were less and in older female rats the differences were not significant. Addition of lysine to both diets increased growth rates of

rats on both diets and eliminated the differences in growth rates of weanling rats. When the lysine content of the white bread diet was raised to that of the unsupplemented wholemeal bread diet the growth rate of rats on the white bread diet doubled, and they grew better than rats on the wholemeal bread diet unsupplemented with lysine. This last finding requires further investigation.

It is concluded that with diets adequately supplemented with vitamins and minerals the greater growth rate of weanling rats on wholemeal than on white flour is due to the slightly higher lysine content of wholemeal.—F. C. Aitken.

4880

MEREDITH, P., SAMMONS, H. G. and FRAZER, A. C. **Studies on the effects of treatment with chlorine dioxide on the properties of wheat flour. 1. The chemical composition of protein of treated flours.**

FRAZER, A. C., HICKMAN, J. R., SAMMONS, H. G. and SHARRATT, M. **2. Nutritional value of proteins of treated flours. 3. Lipid changes and vitamin content of treated flours. 4. The biological properties of untreated, normally treated and overtreated flours.** *J. Sci. Food Agric.*, 1956, **7**, 361–370 ; 371–375 ; 375–380 ; 464–470. [Dept. Pharmacol., Med. Sch., Univ. Birmingham.]

1. Flours of 78 per cent. extraction were tested chemically for the formation of abnormal substances or destruction of amino acids. A control sample was untreated ; experimental flours were treated with ClO_2 at 2 rates, the normal of 3·42 g. and tenfold of 34·2 g., and with NCl_3 65 g., also about 10 times the normal amount, each amount per 280 lb. sack. Flours were then defatted. Gluten, prepared from each by washing with tap water, was hydrolysed and examined chromatographically.

Within the limits of the nature and sensitivity of the methods employed no substance was found in the flour overtreated with ClO_2 which could be regarded as abnormal. Monochlorotyrosine was not detected in any of the treated flours. Failure to find methionine sulphoximine in the flour treated with NCl_3 was explained by its destruction during hydrolysis. Amino acid contents of the glutens with and without treatment are tabulated. Changes were in cystine, tryptophan, tyrosine, alanine and *iso*leucine but were significant probably only for the first 2, which fell by about 25 and 10 per cent., respectively.

2. In short-term experiments rats were given wheat products either untreated or treated with the normal or tenfold amount of ClO_2. In 2 trials the form was breadcrumbs, 77 or 88·5 per cent. with or without 11·5 per cent. casein, the remainder in both being yeast 7 and salt mixture 4·5 per cent. ; in the third the diet was wheat flour 86, arachis oil 9, salts 4, B vitamins 0·14 and L-lysine hydrochloride 0·86 per cent. Intake of food and gain of weight were studied for 4, 5 or 6 weeks after weaning. Statistical examination of the results indicated no difference in nutritive value between treated and untreated flours.

3. Peroxide values were estimated and effects of rancidity were assessed by feeding experiments ; vitamin E activity also was studied chemically by estimation of α-tocopherol and biologically by measurement of weight of testes in groups of rats. In untreated and normally treated flours, or bread or breadcrumbs made from them, peroxide values did not differ ; with tenfold treatment the peroxide value was high. Animals given untreated products ate more than those given treated but, relative to food consumption, increase in weight was the same with both flours. Vitamin E was destroyed both by treatment with ClO_2 and by the aeration procedure for ageing flour.

4. In long-term experiments with rats the same types of treated flours, with ClO_2 in normal and tenfold amounts, were used ; the experiments continued over 4 generations for the treated and 2 for the untreated flours. The criteria were survival rate at 55 weeks, bodyweight gained at age 100 days, fertility and number of offspring, birthweight of young and their gain in weight in the first 14 days, survival rate at weaning and weight of organs at age 15 months. The flour provided 56·8 per cent. of the diet ; other components were fishmeal 7·2, dried milk 25·6, yeast extract and dried yeast each 3·5, cod liver oil 2·8 and salt mixture 0·6 per cent. There was no difference in nutritive value between the diets with treated or overtreated and that with untreated flour.

D. Harvey.

4881

BHARGAVA, R. P. **An experimental study on the aetiology of lathyrism.** *J. Indian Med. Assoc.*, 1956, **26**, 338–341. [S.M.S. Med. Coll., Univ. Rajputana, Jaipur.]

A pure strain of *Lathyrus sativus* seed was isolated and, for periods of 12 weeks, 8 groups of pigeons were fed on dry, soaked, or germinating and boiled seeds alone, or on a synthetic diet containing 60 per cent. lathyrus flour to which were added different aqueous or alcoholic extracts of whole seeds. Lathyrism did not appear. The birds grew on a diet of only whole dry seeds, but not if the seeds were germinating. The other groups failed to gain weight, and loss of weight occurred with germinated and boiled seeds and with soaked seeds.—D. Harvey.

4882

WALKER, D. G. and WIRTSCHAFTER, Z. T. **Resorption of embryos in rats on Lathyrus**

odoratus diet. Estrogenic inhibition of fetal resorption in lathyrism. *J. Nutrition*, 1956, **58,** 147–159; 161–173. [Res. Lab., Med. Serv., Veterans Admin. Hosp., Portland, Oreg.]

(*a*) Eighteen adult female rats were maintained from the time of conception for from 11 to 21 days on a control diet of whole wheat 67·5, casein 15, whole milk powder 10, iodised NaCl 0·75, $CaCO_3$ 1·5 and hydrogenated vegetable oil 5·25 per cent., with a concentrate of fish oil to provide vitamins A and D. Fifty-one rats were maintained on a mixture of equal parts of the control ration and seeds of the sweet pea (*Lathyrus odoratus*) for selected periods after conception. No group contained less than 4 animals. Vaginal smears were examined microscopically daily from the time of conception to the day of implantation; all the animals were X-rayed weekly throughout gestation for evidence of bone changes.

The length of time which elapsed between conception and the withdrawal of the pea diet determined the degree of resorption of the embryos. Resorption was first found in animals given the pea diet for a week or more before being killed on the eighteenth day of gestation. The embryos did not survive beyond the sixteenth day. The adult rats showed during gestation no lesion of bone or other tissue characteristic of lathyrism. Only when they were given the pea diet for at least 22 days did breeding rats develop any lesion, although in non-pregnant females lesions appeared by the fourteenth day of treatment.

(*b*) Of 20 adult female rats on the pea diet, 5 were controls and 15 were given oestrone or progesterone by injection daily from the first to the twenty-first day of gestation.

The hormones, particularly when administered in combination, protected the rat embryo against the effect of the *Lathyrus* diet.—G. F. Garton.

4883

PYÖRÄLÄ, K., SEPPÄLÄ, T. and PUNSAR, S. Aorten- und Knochenveränderungen beim Rattenfötus verursacht durch Fütterung von Lathyrus-Samen an Muttertiere. [**Changes in the aorta and bones of the rat foetus caused by giving *Lathyrus* seeds to the mother.**] *Acta pathol. microbiol. scand.*, 1956, **38,** 273–284. [Wihuri-Forschungsinst., Helsinki.] English summary.

The diet was that of Bachhuber and Lalich (Title 2523, Vol. 25), containing 50 per cent. *Lathyrus* seeds. Four groups, in all 24 pregnant rats, received this diet at different stages of pregnancy; a group of 8 controls received the stock diet all the time. The young rats were killed and examined at birth. The females given the *Lathyrus* diet were examined also, but no pathological change was found in them.

In 9 litters from females given the *Lathyrus* diet for 15 days starting between the second and seventh day of pregnancy, all the young were born dead. They were of normal size, cyanotic, and some were slightly macerated. All had kyphosis of thoracic vertebrae, visible on inspection and by X-ray examination. The aorta was always distorted at the level of the kyphosis and abnormalities of the aortic arch were common, though the hearts were normal. Histologically the aorta was always oedematous and the elastic fibres of the media were disorganised. Dissecting aneurysms were present in several rats and haematomata in others. The thoracic vertebrae were grossly deformed, but other bones seemed to be normal.

The 5 rats which had *Lathyrus* for 6 consecutive days before the eleventh day of pregnancy had 29 young, all born alive and without abnormality. The 5 rats which had *Lathyrus* for 6 days between the eighth and sixteenth days of pregnancy had 35 young, all born alive and with normal skeleton, though one had foetal coarctation and 2 had slight abnormalities of development in the aorta. Of 34 young born to the 5 rats given *Lathyrus* during the last 8 days of pregnancy, 16 were cyanotic and dead or dying. All the young except those of 1 litter had kyphosis, all had deformed aortae, and there were 3 ruptured dissecting aneurysms, 10 not ruptured, and 9 aortic haematomata. The 6 young from a rat which had *Lathyrus* from the 17th to the 22nd day of pregnancy had no kyphosis, but the thoracic vertebrae were abnormal.

D. Duncan.

4884

LEE, J. G., DUPUY, H. P. and ROLFS, H. E. **Dietary protein and the development of rat lathyrism.** *J. Nutrition*, 1956, **58,** 433–442. [Dept. Agric. Chem. Biochem., Louisiana State Univ., Baton Rouge.]

The growth rate and incidences of skeletal and muscular changes were studied in rats for which 1 of 3 basal diets, with 70, 70 or 60 per cent. Singletary pea (*Lathyrus pusillus*) meal and 25 or 20 per cent. dextrin or 29·5 per cent. sucrose, was provided. Additions to these diets, made at the expense of the dextrin or sucrose, were casein, whole or hydrolysed, lactalbumin, gelatine or zein or the individual essential amino acids.

Casein and lactalbumin improved gain in weight and delayed the onset of skeletal change; the effect of gelatine on weight was less than that of casein, and the effects of zein were least. Methionine was the only amino acid which was effective; it improved growth only slightly. When meal from which the toxic substance had been removed by extraction with methanol was used, both casein and methionine improved the rate of growth, the effect being greater with casein. When lathyrism was produced by including β-aminopropionitrile

with the detoxified meal, casein again delayed the incidence if the amount of nitrile was less than 0·1 per cent.

The effect of casein on the incidence of paralysis in comparison with earlier results (see Abst. 2493, Vol. 20) was to shorten the time of appearance, but in this work the animals recovered when given a stock laboratory diet.

It is suggested that the added protein overcame an interference with amino acid metabolism and that the exacerbation of paralysis resulted from the strain of more normal growth combined with a larger intake of toxin.—D. Harvey.

4885

DASLER, W. **Protective action of glutamine, cysteine and other substances against experimental lathyrism in the rat.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 554–557. [Dept. Biochem., Chicago Med. Sch., Ill.]

Of a wide variety of supplements, only L-cysteine hydrochloride, L-glutamine, lactalbumin and casein hydrolysate partly prevented the development of skeletal deformities in rats given sweet peas or β-aminopropionitrile. For the protective action of casein and gelatine, see Abst. 5044, Vol. 24. The protection by cysteine was prolonged if the diet was made up freshly each week. The protective action of glutamine may be related to its role in the synthesis of chondroitin sulphate and mucopolysaccharide (see Boström *et al.*, *Nature*, 1955, **176,** 601; *Acta chem. scand.*, 1955, **9,** 1034).

A. Hepburn.

4886

FINK, H. and HOPPENHAUS, K. W. Eigenartige Beobachtungen bei der Bestimmung der biologischen Eiweissqualität von Steinpilz (*Boletus edulis*) und Champignon (*Psalliota bispora*) in diätetischer und therapeutischer Hinsicht. Ein Beitrag zur alimentären Lebernekrose der Ratte. [**Peculiar observations in the estimation of the biological quality of the proteins of edible boletus (*Boletus edulis*) and mushroom (*Psalliota bispora*) with reference to dietetics and therapeutics. Dietary liver necrosis in the rat.**] *Naturwissenschaften*, 1956, **43,** 133–134. [Inst. Gärungswiss., Univ. Cologne.]

Although rats on a mushroom diet grew poorly and most died of liver necrosis (Abst. 2073, Vol. 24), rats in 3 groups of 24 given for 4 months edible boletus, fresh, or dried free of maggots, or dried as commercially available, showed excellent growth and there was only 1 with doubtful liver necrosis. Boletus and the mushroom used were much the same in crude protein content and digestibility but differed in composition; they contained, respectively in dry matter: urea 0·18, 0·71, cystine 2·27, 0·73 and methionine 0·21, 0·52 per cent., and boletus had less proline than mushrooms. Boletus protein is considered to surpass most vegetable proteins and to be almost as good as animal protein. Other fungi are being investigated.

W. M. Deans.

4887

GOYCO, J. A. **A study of the relation between the liver protein regeneration capacity and the hepatic necrogenic activity of yeast proteins.** *J. Nutrition*, 1956, **58,** 299–308. [Dept. Biochem. Nutrit., Sch. Med., Sch. Trop. Med., Univ. Puerto Rico, San Juan.]

Groups of at least 5 male rats were given for 7 days 15 to 16 g. daily of a stock ration of vitamin-free casein 20, maize starch 50, hydrogenated vegetable oil 24, cod liver oil 2 and salt mixture 4 per cent. The rats were fasted for 48 hr. and then given for 4 days synthetic rations containing casein, dry brewer's yeast or dry *Torula utilis* yeast; the rations contained 9 or 18 per cent. protein and all were isocaloric with the stock ration. Supplementation of both yeasts with DL-methionine and torula yeast with L-cystine was also investigated, and the supplementary action of brewer's yeast on torula yeast was studied. After the 4 days the animals were killed and livers were removed for estimation of N.

Weanling rats were given to appetite rations of yeast protein 9 or 18, lard 5, salt mixture 4, cod liver oil 1 and maize starch to make 100 per cent. When animals died or at the end of 10 weeks the livers were removed for chemical analysis.

The rats which received the 18 per cent. casein ration after a fast showed 92 per cent. regeneration of liver protein; this group served as a basis for comparison of the results obtained with the rations containing yeast. The torula yeast produced liver necrosis at both the 9 and the 18 per cent. level and was incapable of restoring liver protein in the depleted animals. The brewer's yeast acted similarly at the 9 per cent. level, but at 18 per cent. it did not produce liver necrosis and was capable of restoring maximum liver protein in the depleted animals. Both DL-methionine and L-cystine at 0·5 per cent. together with the torula yeast protected all the animals from liver necrosis and also induced complete regeneration of liver protein in the depleted animals. When both yeasts were given together in the proportion of one-third brewer's and two-thirds torula yeast full protection against liver necrosis as well as optimum liver protein regeneration was obtained.

G. F. Garton.

4888

SCHIEBLICH, M. and WETZEL, I. Ist unter Verwendung von chlorbenzolsulfonsäurehaltiger Schwefelsäure hergestellte Trockenfutterhefe für Tiere unschädlich? 2. Vergleichende Fütterungsversuche an weissen Ratten mit Ratio-

nen, denen chlorbenzolsulfonsäurehaltige bzw. reine Schwefelsäure in verschiedenen Mengen zugesetzt wurde. [**Is dried fodder yeast prepared with sulphuric acid containing chlorobenzenesulphonic acid harmless for animals? 2. Comparative feeding trials with white rats with rations to which chlorobenzenesulphonic acid or pure sulphuric acid has been added in different amounts.**] *Arch. Tierernährung*, 1956, **6**, 1–34. [Vet. Physiol. Inst., Karl Marx Univ., Leipzig.]

Part 1 appeared in *Monatsh. Vet. Med.*, 1955, **10**, 515. The diet was described in that paper. Rats weighing initially about 100 g. received for 150 days the same diet with different amounts of H_2SO_4 with 25 to 30 per cent. chlorobenzenesulphonic acid, from 0·009 to 0·9 g., or of pure sulphuric acid, from 0·0082 to 0·82 g., per 50 g. diet. Each concentration was given to a group of 10 rats, and one group had no acid; each group consisted of 2 mated pairs and 6 rats kept separately.

The diets were eaten readily even with the highest proportions of acid, but the rats given the highest dose of chlorobenzenesulphonic acid ate slightly less than controls given no acid and some of the females given H_2SO_4 did not eat all their food, though this did not depend on the acid content. All the rats given the highest dose of chlorobenzenesulphonic acid survived the 150 days, but only 1 given the highest dose of H_2SO_4, 5 others dying after from 5 to 20 days. Mean daily weight gains were reduced by the 3 highest doses of chlorobenzenesulphonic acid, but the effects of H_2SO_4 on weight were irregular, and the differences were not significant with either acid.

Several pairs of rats failed to breed, but this could not be closely related to acid intake, except that 6 pairs of rats given the highest intake of H_2SO_4 all failed to breed. Of 3 pairs given the highest intake of chlorobenzenesulphonic acid 1 pair had a litter of 10, but reared none. The 2 control groups had 5 litters.

Post-mortem examination of the rats kept separately at the end of 150 days revealed a high incidence of cystitis and urolithiasis in males on the higher intakes of both acids, 4 rats in these groups with chronic gastritis and several with liver degeneration or increased interstitial tissue. These disorders, and also pyelonephritis, appeared in rats which died earlier in the experiment. No skeletal damage was revealed by X-rays.

It is concluded that rats have an extremely high tolerance of acid compared with rabbits, dogs or pigs. It is considered that H_2SO_4 containing chlorobenzenesulphonic acid is much to be preferred to pure H_2SO_4 for acidification in the production of fodder yeast.—D. Duncan.

4889

GRAYZEL, H. G., GRAYZEL, D. M., MILLER, P., COHEN, H. and AKST, P. **Amyloidosis: experimental studies. 5. The effect of various liver preparations on the production of amyloidosis in albino mice.** *J. Lab. Clin. Med.*, 1956, **47**, 743–746. [Dept. Paediat., Jewish Hosp., Brooklyn, N.Y.]

See also Absts. 131, Vol. 4; 4000, Vol. 8.

5. Only a preparation of whole beef liver dried at 40° C. without chemical treatment, and given as 10 or 20 per cent. of the diet, prevented the development of amyloidosis in mice given injections of sodium caseinate. Liver preparations extracted or dried at higher temperatures were less valuable.—D. Duncan.

4890

CHRISTENSEN, F., DAM, H. and KRISTENSEN, G. **Alimentary production of gallstones in hamsters. 6. Disappearance of cholesterol stones by treatment with a non-lithogenic diet.** *Acta physiol. scand.*, 1956, **36**, 329–336. [Dept. Biochem., Polytec. Inst., Copenhagen.]

For previous parts see Absts. 4874, Vol. 23; 1033, 2406, Vol. 25.

6. Groups of 10 and 12 hamsters received for 63 and 140 days the diet which gave rise in earlier experiments to gallstones. Another 10 hamsters were fed on this diet for 63 days and then transferred to a normal diet for 77 days.

Gallstones were found in 21 out of the 22 hamsters killed at once after the experimental diet, but in only 5 of the 10 animals transferred to normal diet. The cholesterol content of the gallstones from the first 2 groups was 53 and 55 per cent., that of the gallstones from group 3 less than 0·7 per cent., indicating that the normal diet had resulted in dissolution of cholesterol.

G. A. Garton.

4891

SILBERBERG, M., JARRETT, S. F. and SILBERBERG, R. **Obesity and degenerative joint disease: experiments in "yellow" mice.** *Arch. Pathol.*, 1956, **61**, 280–288. [Snodgras Lab. Pathol., City Hosp. Div., St. Louis, Mo.]

Grey-coated and yellow-coated male and virgin female mice of the YBR/Wi strain, 345 in all, were divided into groups and, from the time of weaning until death occurred naturally or they were killed if found in poor condition, were given one of 3 diets, a stock Purina Laboratory Chow diet supplying protein 26·2 g., fat 5·4 g. and carbohydrate 48·5 g., a high-fat diet of stock diet base 75 g., lard 20 g. and lactalbumin 5 g. or a high-carbohydrate diet of stock diet base 60 g., maize starch 36 g. and lactalbumin 4 g. All the diets were allowed to appetite with water available at all times. Body-weights were recorded at weekly intervals. After

death the tibiae, femurs and, in some, vertebral columns were removed for microscopical examination.

The mice developed osteoarthritis as do mice of other strains. In yellow-coated males and females and in grey-coated females a high incidence of articular lesions was found; grey-coated males were less severely affected. The high-fat diet favoured the development of the disease in all groups except the grey-coated males. The high-carbohydrate diet had injurious effects on the joints only in yellow-coated mice. Moderate obesity had no appreciable effect on the development of osteoarthritis; excessive obesity appeared to favour its development. There were indications that neuro-endocrine or endocrine imbalances occur in the mice of this strain.—G. F. Garton.

4892

TAKETA, F., CONSTANT, M. A., PERDUE, H. S. and PHILLIPS, P. H. **Maternal diet and resistance to dental caries in the cotton rat.** *J. Nutrition*, 1956, **58**, 519–527. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Female cotton rats in 3 groups were given a diet with 30 per cent. protein and 0·6 per cent. Ca or modifications of it with 15 per cent. protein or 0·2 or 0·1 per cent. Ca. They were mated while on these diets and their young, weaned at 17 days, were fed for 14 weeks on a high-sucrose cariogenic diet with 0·56 or 0·20 per cent. Ca (see Abst. 3499, Vol. 14). Some young rats were on their mother's diet until 6 weeks of age before being given the cariogenic diet with the lower Ca content. Rates of growth of the young were not affected by differences in the mother's diet. There was evidence that reproduction was affected when Ca in maternal diets was reduced, more especially when the protein also was low. As the Ca in the mothers' diets fell, so too did the ash content of the femurs of the young.

Data showing the higher incidence of caries when the diets of the young had the smaller Ca content, and the lower incidence which resulted from delay in introducing the cariogenic diet, confirmed earlier findings (see Constant *et al.*, Abst. 1049, Vol. 25). A change in the Ca content of the mother's diet from 0·6 to 0·2 or 0·1 per cent. had much less influence on the development of caries in the young rats' teeth than had the young rats' own diet; change in the protein content of the mother's diet had none.

Calcinosis was seen in the kidneys of some young on the diet with the lower and in the hearts of some on the diet with the higher content of Ca.

D. Harvey.

4893

WYNN, W., HALDI, J., BENTLEY, K. D. and LAW, M. L. (with RAMSEY, D.) **Dental caries in the albino rat in relation to the chemical composition of the teeth and of the diet. 2. Variations in the Ca/P ratio of the diet induced by changing the phosphorus content.** *J. Nutrition*, 1956, **58**, 325–333. [Dept. Physiol., Div. Basic Sci. Health Serv., Emory Univ., Emory University, Ga.]

For part 1 see Abst. 2213, Vol. 26.

2. Two sets of experiments were made with the high-sucrose diet of Haldi and Wynn (Abst. 2665, Vol. 22) modified by the addition of sodium phosphate so as to give Ca : P ratios of 1 : 05, 1, 2 or 3. In one set the rats were desalivated. In the first the animals developed caries within the 70-day period; in the above order of Ca : P ratio the average caries scores were 44 ± 18, 25 ± 11, 16 ± 8 and 13 ± 8. The change with Ca : P ratio from 1 : 2 to 1 : 3 was not significant. In the second set of experiments caries did not appear within the period and estimations of N, Ca, P, Mg, F and CO_2 in enamel and dentine showed that the amounts of these in the teeth after eruption were not influenced by the Ca : P ratio of the diet.

It is concluded that the difference in the incidence of caries was not caused by a change in the chemical composition of the teeth produced by varying the Ca : P ratio in the diet.—D. Harvey.

See also Absts. 4536, 4641, 5314.

GENERAL METABOLISM AND FEEDING HABITS OF ANIMALS OTHER THAN MAMMALS AND BIRDS

4894

WADDINGTON, C. H. and SIRLIN, J. L. **The incorporation of labelled amino-acids into amphibian embryos.** *J. Embryol. Exp. Morphol.*, 1954, **2**, 340–347. [Inst. Animal Genetics, Edinburgh.]

Axolotl and toad (*Xenopus*) embryos were allowed to develop in capsules of solution containing labelled amino acids and similar substances. Diffusion was increased by removal of vitelline membranes and cuts in blastocoel or archenteron. Incorporation of labelled substances was studied with the Geiger counter and in autoradiographs.

In *Xenopus* embryos exposed for 21 hr. to glycine-1-^{14}C the incorporation of tracer was, in descending order, epidermis, somitic mesoderm, neural tube, notochord and endoderm. In early

axolotl embryos there was preferential incorporation of glycine or of methionine-^{35}S into nuclei and possibly also into cell membranes, rather than into cytoplasm. Uptake of glycine-2-^{14}C was reduced in the presence of the antagonist *p*-fluorophenylalanine, but the inhibition was less when L-phenylalanine also was present.—D. Duncan.

4895

LALLIER, R. Chlorure de lithium et biochimie du développement de l'oeuf d'amphibien. [**Lithium chloride and biochemistry of the development of the amphibian egg.**] *J. Embryol. Exp. Morphol.*, 1954, **2**, 323–339. [Inst. Biol. Phys. Chim., Paris.] English summary.

Eggs of the frog, *Rana temporaria*, were exposed for 3 hr. at the late blastula or early gastrula stage to 4·5 parts per thousand of LiCl. Their carbohydrate metabolism was then studied by methods described.

In anaerobic conditions treated embryos consistently produced less lactic acid than normal embryos. Hexokinase and aldolase activity were not affected by lithium *in vitro*, but triose phosphate dehydrogenase was inhibited. Treated embryos had reduced consumption of oxygen, but the R.Q. was normal. Consumption of oxygen by control embryos was increased by from 30 to 74 per cent. in the presence of pyruvate, lactate, acetate, ketoglutarate, succinate, fumarate, malate or glutamate; in treated embryos oxygen consumption changed little, but it decreased in the presence of ketoglutarate or glutamate. Oxygen consumption increased in embryos treated with KCl and remained normal in embryos treated with KCl plus LiCl. In homogenates of Li-treated embryos, dehydrogenase activity was reduced but cytochrome oxidase was normal. The content of ribonucleic acid in the cell fraction containing microsomes and mitochondria was reduced after treatment of the embryos with Li. It is argued that this change in the particulate system of cells is probably fundamental for the other morphological and metabolic changes caused by Li.

D. Duncan.

4896

MOLNÁR, G., SZÉKY, P. and NAGY, E. Haematológiai vizsgálatok nyurgapontyon (Cyprinus carpio morpha hungaricus Heckel). [**Haematological study of the carp (*Cyprinus carpio* f. *hungaricus*, Heckel).**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1**, No. 9, 3–15. [Inst. Zool., Univ. Agric. Sci., Budapest.] German, English and Russian summaries.

Values for Hb content and red and white cell counts in carp are tabulated and photographs show the morphology.—D. Duncan.

4897

MAYMONE, B., TIBERIO, M. and TRIULZI, G. A. Ricerche comparative sulla digeribilità delle foglie di gelso nelle larve di *Bombyx mori* e negli animali superiori. [**Comparative study of the digestibility of mulberry leaves for larvae of *Bombyx mori* and for higher animals.**] *Ann. Sper. agrar.*, 1956, **10**, 619–646. [Ist. Sper. Zootec., Rome.] English summary.

Samples of mulberry leaves taken between June and August for feeding silkworm larvae and sheep contained from 30·25 to 34·71 per cent. dry matter, the percentage composition of which was crude protein 20·52 to 22·34, true protein 19·93 to 20·51, crude fat 4·46 to 6·78, crude fibre 9·95 to 12·57, ash 15·86 to 17·10, and N-free extract 44·27 to 48·51. These values are compared with others from the literature. The high protein and low fibre contents are stressed.

The digestibility of the foliage was studied with fourth- and fifth-stage larvae of New White European and Green Japanese silkworms. For fourth-stage larvae of the 2 strains, respectively, percentage digestibility was dry matter 76·06 and 85·35, organic matter 73·76 and 84·70, true protein 89 and 93·13, crude fat 95·45 and 97·44, fibre 48·63 and 68·10, N-free extract 71·77 and 83·76, and lignin 57·97 and 77·01. Corresponding values for fifth-stage larvae were 58·69 and 47·66, 58·54 and 46·52, 86·76 and 83·63, 84·87 and 79·96, 24·24 and —, 51·77 and 36·10, and 30·50 and 28·42. For 3 sheep the mean values were for dry matter 70·30, organic matter 75·54, true protein 87·89, crude fat 43·85, fibre 55·53, N-free extract 81·68 and lignin 14·15. The value by the Kellner system was 93 Scandinavian feed units per 100 kg. dry matter for fourth-stage larvae, 59 for fifth-stage larvae and 90 for sheep, with 18, 17 and 17 per cent. digestible protein.—D. Duncan.

4898

LEA, A. O., DIMOND, J. B. and DELONG, D. M. **Role of diet in egg development by mosquitoes (*Aedes aegypti*).** *Science*, 1956, **123**, 890–891. [Dept. Zool. Entomol., Ohio State Univ., Columbus.]

Groups of 200 fertile female mosquitoes were fed for 16 days on different solutions in saturated cotton pads. Daily counts were made of eggs laid. In descending order of value, based on the number of eggs, were citrated beef blood, egg albumin, enzymic digest of casein, fresh skimmed milk, proteose-peptone, enzymic digest of lactalbumin, enzymic digest of yeast and digest of soya bean meal, all with 10 per cent. honey.

A medium containing 18 amino acids, dextrose, fructose and a salt mixture allowed females to produce viable eggs; so did a mixture with 12 amino acids. Eggs were not deposited in the

absence of arginine, *iso*leucine, leucine, lysine, phenylalanine, threonine, tryptophan or valine and few were deposited in the absence of histidine, methionine, cystine or glutamic acid. The best results were obtained when all 12 were present. Optimum amounts of each were found.

D. Duncan.

4899

McGinnis, A. J., Newburgh, R. W. and Cheldelin, V. H. **Nutritional studies on the blowfly, *Phormia regina* (Meig.).** *J. Nutrition*, 1956, **58,** 309–323. [Dept. Chem., Oregon State Coll., Corvallis.]

Flies were reared on a diet containing, per cent., vitamin-free casein 26, yeast extract 3, agar 1 and water 70, with, in mg. per 100 g., cholesterol 0·78, NaCl 0·7, KCl 0·015, $CaCl_2$ 0·015, $NaHCO_3$ 0·015, $NaH_2PO_4 . H_2O$ 0·41 and K_2HPO_4 0·35. The adults were kept on sucrose cubes and water, but when they were desired to lay eggs fresh liver or kidney was given.

Nine experimental diets were used, with different proportions of casein or its hydrolysate, glucose, sucrose, starch and DL-tryptophan. The standard had 29 per cent. casein. In another experiment a mixture of 18 amino acids was substituted for casein and individual amino acids could be omitted.

With 6 per cent. glucose replacing casein, growth was retarded by about 15 per cent., and with 10 per cent. glucose larval mortality was high. Sucrose at 6 per cent. allowed better growth than glucose, and starch was similar. Starch was the only carbohydrate tested which allowed growth at the 10 per cent. level. Casein hydrolysed either with acid or with enzymes gave poor results, and addition of the diet with enzymic hydrolysate to the standard diet caused inhibition of growth. Of individual amino acids added to the standard diet, D-serine was toxic, but its effect could be prevented by excess of D-alanine. It was not thought to be concerned in the effect of casein hydrolysates, since these should contain only L-amino acids.

A chemically defined medium was evolved on which pupation was 4 days later than on the standard diet, but which gave good growth. It contained, in mg. per ml., DL-alanine 2·58, L-arginine 1·06, DL-aspartic acid 3·06, L-cystine 0·36, L-glutamic acid 5·48, glycine 0·70, L-histidine 0·70, hydroxy-L-proline 0·48, DL-*iso*leucine 3·06, L-leucine 2·80, L-lysine 1·76, DL-methionine 1·88, DL-phenylalanine 2·80, L-proline 2·00, DL-threonine 1·88, DL-tryptophan 0·94, L-tyrosine 1·64, DL-valine 3·30, ribonucleic acid 1·0, cholesterol 1·0, inorganic salts 2·4 and agar 25·0, and in μg. per ml., vitamin B_1 5, riboflavin 15, pyridoxine 15, inositol 100, nicotinic acid 15, choline chloride 100, Ca pantothenate 15, *p*-aminobenzoic acid 15, folic acid 5 and biotin 0·025. The 10 essential amino acids were arginine, histidine, *iso*leucine, leucine, lysine, phenylalanine, proline, threonine, tryptophan and valine. The N content of the chemically defined diet was only a tenth of that of the casein diet, but when the concentration of amino acids was more than 60 mg. per ml. growth was inhibited. A high osmotic pressure may be harmful to the larvae. Of the vitamins, *p*-aminobenzoic acid and inositol were not required; in absence of folic acid and biotin pupation occurred but the flies failed to emerge. The other 6 vitamins were essential. Reproduction was not studied with this diet.—D. Duncan.

4900

House, H. L. and Barlow, J. S. **Nutritional studies with *Pseudosarcophaga affinis* (Fall.), a dipterous parasite of the spruce budworm, *Choristoneura fumiferana* (Clem.). 5. Effects of various concentrations of the amino acid mixture, dextrose, potassium ion, the salt mixture, and lard on growth and development; and a substitute for lard.** *Canad. J. Zool.*, 1956, **34,** 182–189. [Lab. Entomol., Belleville, Ont.]

4901

Hurpin, B. Influence de l'alimentation sur la croissance du premier stade larvaire de *Melolontha melolontha* L. (Coléopt. Scarabeidae). [**Effect of nutrition on the first larval stage of *Melolontha melolontha*, L. (Coleoptera, Scarabeidae).**] *C.R. Soc. Biol.*, 1956, **149,** 2107–2109. [I.N.R.A. Stat. Agric. Zool., Rouen.]

Larvae of the cockchafer (*Melolontha melolontha*, L.) did not survive on compost alone, but when roots of agrostis were present they developed. A series of plants were offered as food and in descending order of value for survival and development of the larvae they were sow thistle, carrot and white clover, agrostis and plantain, dandelion and ox-eye daisy, ryegrass and cocksfoot, poa and timothy.—D. Duncan.

See also Absts. 4413, 4436.

5. HUMAN DIET IN RELATION TO HEALTH AND DISEASE

DIET

REQUIREMENTS

4902

HOLT, L. E. (Jr.) **Nutritional requirements in early life.** *Pediatrics*, 1956, **17**, 578–585. [Dept. Paediat., Coll. Med., Univ. New York.]

Report of the Borden Award Lecture for 1955.

4903

VOORLICHTINGSBUREAU VAN DE VOEDINGSRAAD. Aanbevolen hoeveelheden voedingsstoffen per dag. [**Recommended amounts of nutrients per day.**] *Voeding*, 1956, **17**, 202–204. [Koninginnegracht 42, The Hague.]

A table gives mean requirements for the same nutrients as specified in 1952 (see Abst. 3390, Vol. 23) but for different age groups. Amounts are specified for children in 5 age groups up to 12 years, for boys and girls separately at ages 13 to 15 and 16 to 19 years and for men and women separately at ages 20 to 29, 30 to 44, 45 to 64 and 65 years and over. The adult requirements are further subdivided according to, for men, 4, 4, 3 and 2 and, for women, 3, 3, 3 and 2 grades of work at these respective ages. The standard of weight is 70 kg. for a man and 60 kg. for a woman.

M. Eddison.

4904

Recomendaciones nutricionales diarias para las poblaciones de Centro América y Panamá. [**Daily nutritional recommendations for the people of Central America and Panama.**] *Bol. Ofic. sanit. panamer*, 1955, Suppl. No. 2, 225–226. [Inst. Nutrición Centro Amér. y Panamá, Guatemala.]

The allowances are derived from those recommended by the U.S. National Research Council and FAO, and adapted to bodyweights and to environmental temperatures appropriate for Central America.—D. Duncan.

4905

LEVERTON, R. M., JOHNSON, N., PAZUR, J. and ELLISON, J. **The quantitative amino acid requirements of young women. 3. Tryptophan.** *J. Nutrition*, 1956, **58**, 219–229. [Nebraska Agric. Exp. Stat., Lincoln.]

3. Tryptophan was the third of the amino acids studied; for other parts see Absts. 3538, 4685, Vol. 26. Eight college girls were the subjects, and auxiliary foods supplied, on the average, 7 mg. tryptophan daily. With 307 mg. N balances for all were positive and with 82 mg. negative. With 120 mg. 3 of the 8 were in negative balance and of 5 given 157 mg. all were in positive balance. When all were tested with a mixture which supplied 157 mg. tryptophan and adequate amounts of threonine, valine, phenylalanine and leucine, N balance was positive in all.

The rounded amount of 160 mg. is taken to be the minimum daily requirement for tryptophan of young women like these.—D. Harvey.

4906

SWENDSEID, M. E., WILLIAMS, I. and DUNN, M. S. **Amino acid requirements of young women based on nitrogen balance data. 1. The sulfur-containing amino acids.**

SWENDSEID, M. E. and DUNN, M. S. **2. Studies on isoleucine and on minimum amounts of the eight essential amino acids fed simultaneously.** *J. Nutrition*, 1956, **58**, 495–505; 507–517. [Dept. Home Econ., Univ. California, Los Angeles.]

1. Eight women between 21 and 30 years of age were given a semi-synthetic diet with from 7 to 8 g. N daily, in which peanut protein, L-isomers of essential amino acids and glycine were the main sources of N; only small amounts, from 0·3 to 0·4 g., were derived from the natural foods in the diet. In its complete form the diet supplied 1000 mg. sulphur amino acids, 200 mg. as cystine and 800 mg. as methionine; on it all 8 subjects were in N equilibrium. When methionine was removed from the amino acid mixture, so that intake of methionine was reduced to 150 mg., giving a total of 350 mg. sulphur amino acids, 5 subjects remained in equilibrium. Methionine was then added in 100-mg. amounts to the diets of the 3 other women; one such increment was sufficient to bring 2 of them into equilibrium but the third required two.

2. Seven women between 20 and 36 years of age were the subjects in a similar investigation. The complete diet supplied from 6 to 7 g. N daily and 1330 mg. *iso*leucine, 1280 mg. from the mixture and 50 mg. from the natural foods. At that level all were in N equilibrium. When *iso*leucine was removed from the mixture and the intake of it was only 50 mg., all were in negative N balance, lost N at the rate of about 1 g. daily, and experienced extreme discomfort. The amino acid was then restored in amounts of 100 mg. With one increment results were indefinite; with two, 4 of the subjects were not in equilibrium but 3 of these were so after 3 increments; the fourth subject required 4 increments.

The findings in both studies are discussed in relation to those of other workers.—D. Harvey.

FEEDING OF INFANTS AND CHILDREN

4907

NORMAN, A. P. **The premature baby.** *Practitioner*, 1956, **176,** 352–359. [Hosp. Sick Child., Gt. Ormond St., London.]

4908

JACKSON, E. B., WILKIN, L. C. and AUERBACH, H. **Statistical report on incidence and duration of breast feeding in relation to personal-social and hospital maternity factors.** *Pediatrics*, 1956, **17,** 700–715. [Yale Rooming-In Project, Dept. Paediat., Sch. Med., Yale Univ., New Haven, Conn.] Spanish and Interlingua summaries.

4909

JELLIFFE, D. B. **Breast feeding in technically developing regions (with especial reference to West Bengal).** *Courrier*, 1956, **6,** 191–195. [Dept. Paediat., All India Inst. Hyg. Pub. Health, 110 Chittaranjan Ave., Calcutta.] French and Spanish summaries.

The incidence of breast feeding at 6 months was 100 per cent. in a small group of rural women and 95 per cent. in one of urban women, both of lower socio-economic status in West Bengal. In a group of women of higher economic status in Calcutta the percentage was 46. The decline of breast feeding in the upper socio-economic groups of developing countries is in line with that in Western countries. In developing countries educational measures are needed to prevent the middle and lower socio-economic groups from following the same path.—F. C. Aitken.

4910

SALBER, E. J. **The incidence of breast feeding on discharge from hospital of European, Coloured, Bantu and Indian infants.** *S. African Med. J.*, 1956, **30,** 339–344. [Dept. Med., Univ. Cape Town.]

The percentage incidence of breast feeding was for Bantu 98·6, Coloured 97·9, European 93·4 and Indian 71·1. In all except the Coloured multiparae were more successful than primiparae. The effect of age of mother and rank of baby was studied in European and Indian mothers. Of Europeans the most successful were mothers of 20 to 29 years having babies of rank 5. The most successful Indian group was that of the youngest mothers having their first babies. The most unsuccessful Indian group was that of the youngest mothers having their second to fourth babies. Milk came into the breasts sooner in Bantu than in Indian and in both groups sooner in multiparae than in primiparae.—F. C. Aitken.

4911

MILLIS, J. **The influence of breast feeding on weight gain in infants in the first year.** *J. Pediat.*, 1956, **48,** 770–775. [Dept. Social Med. Pub. Health, Univ. Malaya, Singapore.]

This study is based on 60 male and 54 female infants from Chinese families in middle and upper income groups in Singapore in 1953; 59 infants were breast fed for less than 12 weeks and 30 for over 24 weeks. For these groups mean weight in oz. at 4-week intervals is tabulated along with those for infants from poor Indian families (Abst. 2634, Vol. 25) and poor Chinese families (Abst. 3582, Vol. 26) [date in reference should be 1954, not 1953].

Analysis of variance showed that at 1 year of age the boys, but not the girls, of the first group were significantly heavier than those breast fed for over 24 weeks. In contrast to findings for infants from poor Indian and poor Chinese families, infants fed in different ways did not differ significantly in weight at 24 weeks. The deviations from the earlier results are attributed to the better artificial feeding and hygiene in the better-off families.—W. M. Deans.

4912

HENDERSON, J. L. **Feeding problems in infants.** *Practitioner*, 1956, **176,** 378–385. [Dept. Child Health, Univ. St. Andrews.]

A brief account is given of the general principles of infant feeding, the management of breast and artificial feeding, the introduction of mixed feeding and the avoidance of feeding problems. When national dried milk is used, half-cream milk is advocated for young infants, with gradual introduction of full-cream milk at from 6 to 12 weeks, according to progress and appetite. It is considered that there is no justification for beginning mixed feeding before the age of from 4 to 5 months.

F. C. Aitken.

4913

BERGER, H., WAVRE, D. and GILARDI, A. Die Ernährung von reifen Säuglingen und Frühgeburten mit HUMANA-Milch. Eine klinische Untersuchung. [**Feeding mature and premature infants with HUMANA milk. Clinical study.**] *Ann. paediat.*, 1956, **186,** 383–406. [Kinderklin., Univ. Basle.] English and French summaries.

A clinical trial is reported in which pooled human milk was partly or wholly replaced by buttermilk, lactic acid milk, or Humana milk, a preparation of cow's milk modified to resemble human milk (see Lemke, Abst. 1069, Vol. 22), over periods of 2 or 3 weeks. In all there were 134 mature infants, and 92 premature (these did not have lactic acid milk), all treated at different

times in the same hospital ward. The compositions of the diets are given. According to the Swiss manufacturer (Schweizerische Milch-Gesellschaft A.G., Hochdorf, Lucerne), Humana milk as given supplies, per 100 ml., 67 Cal., Fe 0·4 mg., vitamin C about 3·5 mg. and vitamin D 200 I.U. There were 5 or 6 feeds daily, in amount regulated by the rate of gain of weight. The results are tabulated.

For mature infants, in mixtures with human milk, Humana milk gave a mean daily weight gain intermediate between those for buttermilk (highest) and lactic acid milk. Alone, lactic acid milk was best and Humana not quite so good as buttermilk. Differences in energy quotient [not defined] were trifling.

For premature infants, Humana milk alone or with human milk gave weight gains which were satisfactory but not quite so good as those with buttermilk alone or mixed.

Results were also good in 21 infants, including 9 premature, examined after they went home, except for 4 which were overfed, generally because the mother thickened the feed with gruel.

In the hospital infants given Humana milk, appetite was generally good. Their stools tended to resemble those of breast-fed infants in colour, consistency and odour; bacteriological findings will be published elsewhere. Infections were few.

X-rays of the wrist of 86 premature infants, some of whom had the usual massive treatment with vitamin D, and of 28 mature infants in whom there was clinical suspicion of rickets, at intervals during a year, indicated that although Humana milk did not contain enough vitamin D to prevent rickets in all, signs of healing were more frequent than in those given buttermilk or human milk. No ill effect of the added vitamin D was seen.—W. M. Deans.

4914

BALLABRIGA AGUADO, A. Punto de vista sobre el empleo de las leches enteras acidificadas en pediatría. [**Point of view about the use of acidified whole milk in infant feeding.**] *Medicamenta*, 1956, **25**, 255. [Centro Estud. Crec. Nutrición Infantil, Barcelona.]

4915

WALCH, E. Zur Frage der Beeinflussbarkeit der Darmflora des Säuglings durch N-Acetyl-D-glucosamin-derivate. [**Effect of derivatives of N-acetyl-D-glucosamine on the intestinal flora of infants.**] *Deutsch. med. Wochenschr.*, 1956, **81**, 661–664. [Frauenklin., Univ. Heidelberg.]

The substance studied was synthetic β-ethyl-N-acetyl-D-glucosaminide, referred to as N 180. It was given to 35 newborn infants artificially fed on a mixture of half cow's milk and half 6 per cent. oat gruel, with 5 per cent. sucrose. Each received 50 mg. N 180 per 100 g. food, and the faecal flora were compared with those of 50 infants on the same regimen without N 180, or breast fed.

The stools of infants given N 180 were similar in colour and consistency to those of breast-fed infants, with a *p*H between 5·0 and 6·5. The flora was almost exclusively Gram-positive, with about 65 per cent. *Lactobacillus bifidus*. In 5 infants fed on the half cow's milk diet and not given N 180 until they were some days old the proportion of *L. bifidus* in the faecal flora, at first low, increased considerably within 24 to 48 hr. after N 180 was introduced. When N 180 was added to Humana milk for 12 infants, the faecal flora became indistinguishable from that of breast-fed infants, with up to 90 per cent. *L. bifidus*.

D. Duncan.

4916

PUDLIK, K., WOŹNIAK-TORBICKA, E., SZCZYGIEŁ, A., SZCZYGŁOWA, M. and BERGER, S. Wpływ racjonalizacji wyżywienia w jednym z internatów na stan odżywienia młodzieży. [**The influence of improved nourishment on the nutritional status of adolescents in a boarding school.**] *Rocz. Państwowego Zakł. Hig.*, 1955, **6**, 369–378. Russian and English summaries.

The effects were studied in March and June 1954 of changes introduced in September 1953 into diets at boarding schools. [Details of the changes not given in summaries.] Signs of deficiency became less common for vitamin A, riboflavin and nicotinic acid and especially for vitamin C. [From English summary.]—D. Harvey.

See also Absts. 4524, 4918, 4950, 4983.

DIETARY SURVEYS AND INDIVIDUAL STUDIES

4917

BOEK, J. K. **Dietary intake and social characteristics.** *Amer. J. Clin. Nutrition*, 1956, **4**, 239–245. [Dept. Foods Nutrit., Michigan State Univ., East Lansing.]

4918

EPPRIGHT, E. S., JEBE, E., SIDWELL, V. D., MARLATT, A. L., NORTHAM, J. I., BISCHOFF, G. A., CLARK, R. M., MCGRATH, B. C., LOOSE, B. L., CELLUCCI, H. W., PATTON, M. B., GLUYAS, S. B., TYRRELL, D., BASNETT, D. T., GLENN, G., ADRIAN, F., BOWSER, M. and ANDERSON, B. **Nutrition of 9-, 10- and 11-year-old public school children in Iowa, Kansas and Ohio. 1. Dietary findings.** *Iowa Agric. Exp. Stat. Res. Bull.* No. 434, December 1955, pp. 18.

1. The nutritive value of the diets of 1700 children was assessed from 3-day diet records kept by the children in 1948–51. Except for Ca, the

average intakes of boys and girls for each year of age and each state conformed to or exceeded the U.S. National Research Council's recommended allowances (1953). Only 10, 21 and 25 per cent. of the boys and 8, 9 and 13 per cent. of the girls in Kansas, Ohio and Iowa, respectively, had diets which conformed fully to the recommendations. Children who had school lunches tended to have nutrient intakes better than those who did not.

F. C. Aitken.

4919

HARD, M. M. and ESSELBAUGH, N. C. **Nutritional status of selected adolescent children. 1. Description of subjects and dietary findings.** *Amer. J. Clin. Nutrition*, 1956, **4**, 261–268. Washington Agric. Exp. Stat., Pullman.]

1. Two areas in Washington State, Snohomish County and Yakima County, were chosen for study for the reasons that incidences of dental caries differed, the F content of the drinking water in both was below the level currently recommended for the control of caries, their climates were widely different and the population was non-migratory. The children studied were aged 15 and 16 years.

Seven-day diet records were obtained in Snohomish County from 63 boys and 62 girls and in Yakima County from 61 boys and 62 girls. Each recorded his or her own food.

In Snohomish County the boys had a significantly higher intake of Ca and the girls of ascorbic acid compared with boys and girls in Yakima County. Differences between the areas in intakes of other nutrients were not significant. In general the diets of girls were poorer than those of boys, especially in Fe, Ca and ascorbic acid. Both boys and girls had less ascorbic acid than the amount recommended by the U.S. National Research Council. Interpretation of nutrient intake and medical and biochemical findings will be discussed in subsequent reports.

Summarised data on heights and weights, Wetzel grid ratings, urine constituents and Hb values are reported. According to the Baldwin and Wood standards the boys tended to be taller than average for their age. A higher percentage of girls than of boys were overweight. About one-fifth of the girls were overweight by 10 per cent. or more. In Snohomish and Yakima Counties, respectively, average Hb values were for boys 14·6 g. and 15·0 g., and for girls 13·6 g. and 13·3 g. per 100 ml.—F. C. Aitken.

4920

CHALMERS, F. W., CHAPMAN, L. L., LAWLESS, J. J., LEWIS, W. R., STREGEVSKY, S., VOTH, O. L. and VANLANDINGHAM, A. H. **Nutritional status studies in Monongalia County, West Virginia.** *W. Virginia Univ. Agric. Exp. Stat. Bull.* No. 375T, June 1955, pp. 31.

Diet studies with clinical observations were made on 3 occasions in West Virginia. In 1950–52 the subjects were 430 schoolchildren aged from 7 to 12 years, of whom 46 per cent. were in urban, 44 in industrial or mining and 10 per cent. in rural areas; in 1952–53 they were 462 schoolchildren from 7 to 15 years of age in 4 small coal-mining communities; from this last group the studies were extended to include social conditions and blood composition for other members of the families, and 39 families with 57 adults and 137 children participated in this survey. The diet studies were by the 24-hr. recall method; the blood analyses were by methods already described (Abst. 140, Vol. 22). The results are summarised in 15 tables in which nutrient intakes are compared with U.S. National Research Council recommendations (1948) and blood constituents are grouped in categories poor, fair, good or excellent by the system of Bessey and Lowry quoted from *Final Report New York Joint Legislative Commission on Nutrition*, 1947, pp. 167–192.

In the first study intakes of Ca and P were below recommended amounts for, respectively, one-half and one-third of the population; about a fifth were receiving less than half the amount of ascorbic acid; vitamins of the B group were often smaller than, but seldom fell below two-thirds of, the amounts suggested. In blood, the level of vitamin A was poor for a quarter of the children and that of ascorbic acid poor or fair for 38 per cent. The commonest of 14 clinical states were gingivitis, cheilosis and thyroid enlargement. In the second study dietary and clinical data were similar with, in addition, the possibility that intakes of protein, Fe and riboflavin also were low. In the third study, in which families of children known to be undernourished were selected, more than half of the children were rated poor or fair for ascorbic acid in blood, and its level was low in the blood of the parents as well. The children were frequently underweight by the standards of Baldwin and Wood; adult women were often overweight.

The findings are discussed in comparison with other North-eastern surveys (see Absts. 3430, Vol. 23 and 2265, 2266, Vol. 24).—D. Harvey.

4921

CERVIÁ, T. Los valores hematológicos medios en Canarias. (Nota previa.) [**Mean haematological values in inhabitants of the Canary Islands. Preliminary note.**] *Rev. clín. española*, 1956, **61**, 39–40. [Inst. Fisiol. Regionales, Tenerife.] English, German and French summaries.

The blood picture of inhabitants of the Canary Islands frequently shows red cell counts between 3·5 and 4 million per c.mm., leucopenia and neutro-

penia, associated with achylia, vascular fragility and vague and poorly localised pain. The syndrome is especially common in women who have immigrated from the mainland. The diet is monotonous, with much carbohydrate and relatively little protein, lacking fresh foods and fruit and rich in K. The uncertain supply of vitamins may be unbalanced by "abuse of some synthetic vitamin preparations". The condition is to be studied more fully in relation to the diet.

D. Duncan.

4922

REVERTE, J. M. and PEREZ, C. Estudios clínicos nutricionales en poblaciones de Panamá. 1. La Mesa, Provincia de Veraguas. [**Clinical and nutritional studies of the inhabitants of Panama. 1. La Mesa, Province of Veraguas.**]

PEREZ, C. and PEDRESCHI, C. 2. Barrio El Chorrillo, ciudad de Panama. [**2. Barrio El Chorrillo, city of Panama.**] *Bol. Ofic. sanit. panamer.*, 1955, Suppl. No. 2, 27–32; 33–37. [Dept. Salud Púb., Panamá.]

1. La Mesa has a semi-rural population of 591, almost isolated from other populations; about half live in a village, the rest on scattered farms. Fifty children of both sexes, aged from 7 to 10 years and of low social and economic status, were selected for clinical examination.

The 6 children of 7 years were on the average 5 kg. and 9 cm. below the weight and height standards of the Institute of Nutrition of Central America (1952), and the two 10-year-olds were 7 kg. and 11·7 cm. below. The incidence of clinical signs of malnutrition, which are tabulated, was high, especially that of conjunctival pigmentation and vascularisation. Ten children had diffuse goitre of grade 1. The 38 samples of serum examined showed normal values for protein, vitamin C and riboflavin, and low values for vitamin A and carotene. Alkaline phosphatase levels were high, but there was no rickets. In 37 of 39 blood samples there was macrocytic anaemia. Of 42 samples of faeces, 33 contained *Necator americanus*, 29 *Ascaris lumbricoides*, 18 *Trichuris trichiura* and 4 *Strongyloides stercoralis*, either as worms or eggs, and some contained also *Entamoeba* and *Giardia* spp.

2. The subjects, from a suburban district of the city of Panama, were of low economic class and of mixed race. They were 79 boys and 71 girls, 68 of them up to 5 years old and the rest between 7 and 10. The examination was similar to that described above.

The infants up to a year old were not much below normal in height and weight for age, but between the second and fifth years there was a severe setback and this was not made up by the tenth year. The clinical state was better in the pre-school children than in those of school age. The commonest clinical findings were vascularisation and pigmentation of the bulbar conjunctiva and bad teeth. Serum analyses showed low levels of protein in many in the pre-school group and of vitamin A and carotene at all ages. Of 116 blood samples 79 indicated anaemia, which in 73 was macrocytic; all the samples from school children showed macrocytic anaemia. Half the faecal samples contained parasites, especially *Entamoeba coli* and *Trichuris trichiura*.

D. Duncan.

4923

SOGANDARES, L. and DE BARRIOS, G. Estudios dietéticos en Panamá. 1. La Mesa, Provincia de Veraguas. [**Dietary studies in Panama. 1. La Mesa, Province of Veraguas.**]

SOGANDARES, L. (with DE BARRIOS, G. and DE CORCO, E. Z.) 2. Barrio El Chorrillo, ciudad de Panamá. [**2. Barrio El Chorrillo, city of Panama.**] *Bol. Ofic. sanit. panamer.*, 1955, Suppl. No. 2, 38–46; 47–53. [Sec. Nutrición, Dept. Salud Púb., Panamá.]

1. The dietary study in La Mesa (see preceding Abst.) embraced 24 families with 151 members in March 1952, and 14 of these families with 96 members in November 1953. Daily visits were made to each house for 7 successive days.

The mean daily intake of each type of food per person per week is tabulated. The staple food was rice. The preparation of food is described. The mean intakes per head at the 2 inquiries were 1927 and 1958 Cal., 55 and 54 g. protein with 37 and 34 per cent. from animal sources. Half the families had an adequate intake of protein, but fewer had enough animal protein. Intakes of Fe and nicotinic acid were good, those of vitamin B_1 and vitamin C almost adequate, and those of Ca, vitamin A and riboflavin low.

2. The dietary study in El Chorrillo was made in March and April 1954. The 13 families were chosen from those of the children examined clinically (see preceding Abst.), and their heads ranged from expert artisans to unskilled labourers; the heads of 2 families were women, of whom one depended mainly on public assistance and the other on the earnings of adolescent sons. The mean income of 10 of the families, with a mean of 7 members each, was 78·00 Balboas monthly (B); 1 B equals 1 U.S. dollar. The mean expenditure on food was about B 1·63 weekly per person. The 13 families had a total of 88 permanent members.

The staple food was rice, with a mean intake of 180·8 g. per head daily. The intake of meat, on the average 86·8 g. daily, was much greater than that of the rural population. The mean intake of energy was 1454 Cal. per person daily and that of protein 44 g., half of animal origin. The energy

intake was thus only 86 per cent. of the allowance recommended by the Institute of Nutrition of Central America (1952) and the protein intake 89 per cent. Intakes of Fe and nicotinic acid were adequate ; those of Ca, vitamin A and riboflavin were especially low. The energy intake was adequate in about 75 per cent. of the families, that of protein in 62 per cent.—D. Duncan.

4924

PEREZ, C., ARCE PAIZ, A. and MAZA, E Estudios clínicos nutricionales en poblaciones de El Salvador. 1. Cantón Platanillos, Municipio de Quezaltepeque, Departamento de La Libertad. [**Clinical and nutritional studies of the inhabitants of El Salvador. 1. Platanillos Canton, Municipality of Quezaltepeque, Department of La Libertad.**] *Bol. Ofic. sanit. panamer.*, 1955, Suppl. No. 2, 22–26. [Inst. Nutrición Centro Amér. y Panamá, Guatemala.]

1. Platanillos is a poor agricultural community situated in an arid district 3 km. from the town of Quezaltepeque. A group of 305 persons formed the subject of clinical study, and of these 148 were included in the diet survey (see next Abst.) ; 94 were less than 7 years old, 94 were from 8 to 18 years and 117 were 19 or more. Height, weight, clinical state, thickness of subcutaneous tissue and Hb were recorded for all subjects and samples of faeces and blood from some were examined.

The exact chronological age was known in only 45 of the pre-school children ; by comparison with the standards of growth of the Institute of Nutrition of Central America (1952), the boys were 30 to 40 per cent. below normal weight and 20 to 40 per cent. below normal height for age ; for girls corresponding values were 40 to 60 and 30 to 40 per cent. In all the groups the incidence of clinical findings associated with malnutrition was high, and 57 cases of goitre were found ; 40 per cent. of the children were considered to be in a poor state of nutrition.

In 56 samples of serum, mostly from subjects less than 20 years old, carotene was extremely low. Of 51 subjects with low Hb, 45 per cent. had macrocytic and 47 per cent. hypochromic anaemia. Of 42 samples of faeces, 29 contained parasites or their eggs, most commonly *Necator americanus*, *Ascaris lumbricoides*, *Trichuris trichiura* and *Hymenolepis nana*.—D. Duncan.

4925

CASTILLO, A. S. and FLORES, M. Estudios dietéticos en El Salvador. 2. Cantón Platanillos, Municipio de Quezaltepeque, Departamento de La Libertad. [**Dietary studies in El Salvador. 2. Platanillos Canton, Municipality of Quezaltepeque, Department of La Libertad.**] *Bol. Ofic. sanit. panamer.*, 1955, Suppl. No. 2, 54–65. [Direccion Gen. Sanidad, El Salvador.]

2. Platanillos (see preceding Abst.) has a total population of 1084 in 180 houses. The index of births in the 5 years up to 1952 was 44·3 per cent. [*sic*] and mortality 1·76 per cent., with infantile mortality 131·2 per 1000 live births. The main causes of infant mortality were diarrhoea and enteritis, respiratory disorders, infections and malnutrition.

The water supply for human and animal needs comes from streams, but one well supplies a limited number of families. Some 95 per cent. of the houses lack latrines.

Most of the people were born in the district. About 45 per cent. of the adults can read and write and 52 per cent. of the children between 6 and 15 years go to school ; the girls usually leave at 10 or 12. The women spend much of the day in making cloth and the men in farming ; the main crops are maize, beans, sorghum, sugar cane, yucca and rice. During the dry season the people work in the sugar factories. A few families have cows.

The subjects of study were 264 persons in 43 families during the dry season and 106 persons in 15 families during the wet season. For the diet survey each house was visited once or twice daily for 7 days. Most of the food was weighed.

The quantities of foods eaten are tabulated in g. per person per week. The staple food was maize. In the dry and wet seasons, respectively, meat was eaten, on the average, 4 and 3 times a week, milk once and 5 times, cheese twice and 5 times, eggs twice and once. The mean intakes were energy 2267 and 2131 Cal., protein 58 and 62 g., animal protein 8 and 11 g., daily. Fe intake was high and intakes of vitamin B_1 and nicotinic acid were adequate ; intake of vitamin A was only 770 and 640 I.U. and that of riboflavin also was low ; vitamin C intake was adequate or high in the wet season when there was plenty of fruit.

The people are co-operative and would benefit from education in the improvement of the diet.

D. Duncan.

4926

REH, E. and FERNANDEZ, C. Condiciones de vida y de alimentación en cuatro grupos de población de la zona central de Costa Rica. [**Living conditions and diet of four groups of the population of the central zone of Costa Rica.**] *Bol. Ofic. sanit. panamer.*, 1955, Suppl. No. 2, 66–89. [Inst. Nutrición Centro Amér. y Panamá, Guatemala.]

The 4 groups studied live in the central plateau of Costa Rica, about 1150 metres (3770 ft.) above sea level. The mean annual temperature is about 20° C. and the annual rainfall 1850 mm. The investigation was made in the second half of the

rainy season when supplies of some foods were best. The 4 districts were a middle-class part of the town of San José, Lourdes, a suburb of San José, the rural village of Villa Colón, and the country district of Ticufres-Quitirrisi. For the medical and laboratory study a group of schoolchildren under 10 years was chosen in each district, 75 from the first and 25 from each of the others. Of these 150 children 51 were included in the diet survey. There were, in their families, totals of 177, 48, 79 and 60 persons in the respective districts, and mean family sizes were 6·8, 6·9, 8·0 and 8·6 persons. The method of selection automatically eliminated families whose children did not go to school and whose status was probably lowest. The proportion of subjects below 14 years was high and over 50 years low. Housing conditions and family occupations are tabulated. For the diet survey the houses were visited 4 times on alternate days, half one day and half the next, except in the rural districts where they were visited daily.

The weekly amounts of food are tabulated for each group. The weekly cost in colones (8·89 colones = 1 U.S. dollar) was 9·59, 8·02, 5·95 and 4·78 per head in the 4 areas. The proportion of food grown at home was 2, 4, 20 and 28 per cent. In an analysis of the nutritive value of the diets each population group was divided into the " poor " and others. The village poor had the lowest energy intake, 1559 Cal. per head daily, and the suburban better-off people the highest, 2404 Cal. Total protein ranged from 39 to 62 g. daily, with much the same distribution, and animal protein from 3 in the rural group to 24 g. in the urban group. The town and suburban groups also had the highest intakes of Ca, vitamin A and riboflavin. The proportions of the recommended allowances eaten by each group are tabulated.

The schoolchildren in all the areas were below U.S. standards in height, weight and skeletal maturation by about 2 years. Clinical signs of malnutrition were rare. There was some goitre in San José. The incidence of dental caries was high everywhere. Anaemia was not prevalent. Faeces examinations showed only 6 per cent. of the children free from parasites. In serum, protein and riboflavin were normal, ascorbic acid high and vitamin A and carotene very low. Suggestions were made for improving the diet, and especially the school meals.—D. Duncan.

4927

FLORES, M. and REH, E. Estudios de hábitos dietéticos en poblaciones de Guatemala. [**Dietary habits of the inhabitants of Guatemala.**] 1. Magdalena Milpas Atlas. [**1. Magdalena Milpas Atlas.**] 2. Santo Domingo Xenacoj. [**2. Santo Domingo Xenacoj.**] 3. San Antonio Aguas Calientes y su aldea, San Andrés Ceballos. [**3. San Antonio Aguas Calientes and the nearby village, San Andrés Ceballos.**] 4. Santa María Cauqué. [**4. Santa María Cauqué.**] *Bol. Ofic. sanit. panamer.*, 1955, Suppl. No. 2, 90–128 ; 129–148 ; 149–162 ; 163–173. [Inst. Nutrición Centro Amér. y Panamá, Guatemala.]

1. Magdalena Milpas Atlas is the capital of the Department of Sacatepéquez, on a hill with a deep valley on each side. The town is 2062 m. (6765 ft.) above sea level and has a mean annual temperature of 16·6° C. It has much wind, especially in the dry season. The rainy season is from May to October. Shortage of water is a serious problem, as there is no river near and the springs are the only places for washing. The region depends much on maize growing and produces a surplus for sale.

Magdalena has 291 families, of which 22 were included in the dietary survey and 206 in the economic study. The total population in 1952 was 1092. The birth rate was 28 and the mortality 21 per 1000. The death rate in the first year of life was 28 per cent. ; mortality in children from 1 to 4 years old also was high. Health is reviewed.

The families of 22 schoolchildren between 7 and 11 years old were studied. For the diet survey each house was visited daily for a week. There was one well-to-do negro (" ladino ") family of 10 members, and of the 21 native families 6 were classed as well-to-do, 10 as medium and 5 as poor ; the mean sizes of the families were 5·4, 6·7 and 5·5 persons. The quantities and types of food consumed are given in detail. The poor group ate most cereals, 40 per cent. of the total diet, and least animal products, 19 per cent. On the standards recommended by the U.S. National Research Council all the groups had enough energy, protein, Ca, Fe, vitamin B_1 and nicotinic acid, some had enough vitamin C, but vitamin A and riboflavin were deficient.

2. Santo Domingo Xenacoj is a town in the Department of Sacatapéquez, 2064 m. (6771 ft.) above sea level, with a mean annual temperature of 15·6° C. and very cold weather from November to February. The rainy season is from May to October. Besides agriculture there are 2 industries ; the women weave and the men make charcoal. One of the main difficulties is lack of water.

There were 1875 inhabitants by the 1950 census, 1694 natives and 181 negroes. Most are illiterate. The birth rate is 55 and the death rate 40 per 1000, with mortality of 31 per cent. in the first year of life. Data about health are inadequate because of lack of medical services. Of 59 samples of faeces from schoolchildren only 12 showed no parasites and four-fifths had *Ascaris lumbricoides*.

Neither houses nor clothes give sufficient protection from the climate.

From the school registers 50 children from 7 to 10 years old were selected and of these the families of 27 were visited. Finally 23 families took part in a diet study. Four families were negroes, and the 19 native families were classed as poor and very poor. The quantity of food eaten by each family in a week is tabulated. Maize is the staple food.

The energy intake did not differ much from the recommended allowances of the U.S. National Research Council, but amounts of animal protein were low, from 5 to 15 g. daily. Intakes of Ca, Fe, vitamin B_1 and nicotinic acid were adequate and the native families had enough vitamin A and vitamin C, but the negroes had not. Riboflavin intakes were consistently low and no family had enough. On the whole the very poor families had a slightly better diet than the poor.

3. The 2 settlements lie in an isolated valley 1445 metres (4740 ft.) above sea level, with a mean annual temperature of 18·8° C. The soil is excessively wet all the year round and contains much volcanic ash. All the men in San Andrés are engaged in agriculture and, except for the small tradesmen and craftsmen, so are most of those in San Antonio. The standard of housing is much higher in San Antonio. The whole district has a population of 2637, including 350 in the village of San Andrés and probably also the inhabitants of another village not studied. Nearly all are of native origin and 57 per cent. of persons aged 7 years or more are illiterate ; there are 226 schoolchildren. From the public school and a mission school were selected 20 children, half living in each centre of population, and the diet survey was made on their families. Daily visits were made for a week.

The mean cost of food was 1·07 quetzal (1 Q = 1 U.S. dollar) per person per week in San Antonio and Q 0·95 in San Andrés. The main component of the diet was maize. The diet is described in detail. In relation to the recommended allowances of the U.S. National Research Council and FAO the mean intakes of energy, protein, Ca, Fe, vitamin B_1 and nicotinic acid were sufficient in both places, but intakes of vitamin A and riboflavin were low. The intake of vitamin C reached the recommended level in San Antonio, but only 65 per cent. of this in San Andrés. Of the total protein intakes of 69 and 72 g. daily, 10·4 and 7·7 g. were of animal origin.

4. The village of Santa María Cauqué lies on a sloping site about 1979 metres (6490 ft.) above sea level, and heavy rains from May to October cause much surface water to run down its farms, most of which are on the lower ground. There is a relatively good water supply to the village. The village has 706 inhabitants in 146 families, including 9 families of negro origin. The diet survey was made on 17 families of schoolchildren, 9 families classed as not poor and 8 as poor.

The diet is described in full. Intakes of energy, protein, Ca, Fe, vitamin B_1 and nicotinic acid were adequate ; those of vitamin A, riboflavin and vitamin C were not. About 10 per cent. of the protein was of animal origin.—D. Duncan.

4928

MAYER, J., ROY, P. and MITRA, K. P. **Relation between caloric intake, body weight, and physical work : studies in an industrial male population in West Bengal.** *Amer. J. Clin. Nutrition*, 1956, **4**, 169–175. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Employees at a jute mill near Calcutta, all of whom were between 5 ft. 2 in. and 5 ft. 4 in. tall, provided, at interviews, records of their diets, budgets and family composition. There were 213 men and, from the detailed information available about their work and mode of life, they were classed as sedentary or as being engaged on light, medium, heavy or very heavy work. Data are tabulated for the average daily intake of 7 nutrients by 17 different occupational groups within these 5 classes. Intakes of total protein, three-quarters of it from vegetable sources, and of vitamins B_1 and C and nicotinic acid were considered adequate ; the intake of riboflavin, in the range of 0·6 to 1 mg., was low. Amounts of carotene and Ca also were small, but were influenced by the habit of chewing betel with lime. Energy intake was not related to income.

Mean values for energy intake are plotted for different degrees of activity. The amount of energy was least for the light work group, but was as high in the sedentary group as in the groups doing heavy or very heavy work. Bodyweight for the sedentary group was, on the average, about 25 lb. greater than for the others (cf. Review Article, pp. 877, 878, Vol. 25).

A comparison is drawn between these findings for men and those for rats (see Abst. 1040, Vol. 25).

D. Harvey.

4929

JOLLIFFE, N. and TUNG, T. C. **Nutrition status survey of the civilian population of Formosa.** *Metabolism*, 1956, **5**, 309–327. [Bur. Nutrit., Dept. Health, New York.]

In a group of over 1000 urban and rural sixth grade children the incidences of nutritional deficiences were, per cent. : riboflavin deficiency 70, low excretion of vitamin B_1 in urine 55, Fe-deficiency anaemia 13, vitamin A deficiency 10, nicotinic acid deficiency 10, hypoproteinaemia 3·2. The clinical and biochemical findings from which these conclusions were drawn are tabulated. Data

are presented also for smaller groups of children in other grades, senior high school pupils, normal college students and adults. The incidence of beriberi was 6 per cent. in adults ; there was none in sixth grade children. Findings on height, weight and skinfold thickness, estimated daily intake of nutrients per head of the population and incidence of parasitic infestation are given as well. (See also Absts. 4956, 4957).—F. C. Aitken.

4930

PÉQUIGNOT, E. Enquête par interrogatoire sur l'alimentation réelle de 55 femmes enceintes. Corrélations obstétricales et post-natales. [**Inquiry by questionnaire on the actual food consumption of 55 pregnant women. Obstetric and postnatal correlations.**] *Bull. Inst. nat. Hyg., Paris*, 1956, **11**, 107–149. [Hôp. Saint-Antoine.]

The diets during pregnancy of 55 women, chosen from patients attending an antenatal clinic or in a lying-in ward, were investigated by questionnaire. The data are expressed in relation to assessed requirements of each subject and are related to total weight gain during pregnancy, birthweight and length of the infant, occurrence of pregnancy toxaemia and other clinical abnormalities, and nature of infant feeding. [The results are not assessed statistically.]

A. M. Thomson.

4931

LEITNER, Z. A. and CHURCH, I. C. **Nutritional studies in a mental hospital.** *Lancet*, 1956, **270**, 565–567. [Claybury Hosp., Woodford Green, Essex.]

Average daily intakes of energy, protein, fat and carbohydrate in a mental hospital for each of the months October 1951 to September 1952 were calculated from measurements of all food delivered to the kitchen, with deduction for plate waste. Periodical measurement of plate waste indicated that this amounted to about 10 per cent., rarely up to 15 per cent. by weight of the served food. Intakes of energy and proximate principles appeared satisfactory.

Studies were made of Hb, prothrombin time, level of carotenoids and vitamin A in blood and of ascorbic acid saturation tests and the results are tabulated. Hb, carotenoids and vitamin A in blood were low and responses in ascorbic acid saturation tests were delayed. These findings, with clinical signs of ascorbic acid deficiency, follicular hyperkeratosis, gingivitis and petechial haemorrhages not apparent in all and the last only in men working in the garden, and the striking rise in carotenoids and vitamin A in the blood of patients given a daily helping of carrots or spinach, indicated some of the inadequacies of the diet.

It is suggested that all patients in mental hospitals should be given a supplement of 50 mg. ascorbic acid daily and that the supply of leafy green vegetables should be increased.

F. C. Aitken.

4932

VAN BERGE, A. W. S. De voeding in enige tehuizen voor bejaarden in Nederland. [**Diet in some homes for old people in the Netherlands.**] *Voeding*, 1956, **17**, 174–195. [Voorlichtingsbur., Voedingsraad, The Hague.] English and French summaries.

A diet survey was made in 29 homes for old people where 1004 men and 1243 women, healthy and over 60 years of age, were living. For daily energy intake the Dutch Nutrition Council has recommended 1800 Cal. for women and 2400 Cal. for men in old age. The range found was from 1287 to 2503 Cal. but extra sweets, cakes and fruit may have supplied from 150 to 300 more Cal. daily. On the average the sources of calories were 12 per cent. from protein, 35 per cent. from fat and 53 per cent. from carbohydrate. The proportion from fat was high but was that to which the inmates were accustomed. They accepted vitaminised margarine in place of cooking fat but were reluctant to take the recommended amount of milk, 3/4 litre daily. Suggestions are made for improvement of the diets in these homes.

M. Eddison.

4933

ABBOTT, O. D., TOWNSEND, R. O. and FRENCH, R. B. (with MARSHALL, O. and NEELANDS, E.) **Dietary and hematologic studies of the aged.** *Univ. Florida Agric. Exp. Stat. Bull.* No. 562, May 1955, pp. 16.

A group of 306 men and women, ageing under favourable environmental conditions, was selected for study. Individual 7-day diet records were obtained from 251 of them. The nutrients compared well with the U.S. National Research Council's recommendations except that energy intake by the men was 20 per cent. below the standard. The means for Hb of men and women were within the normal range ; it appeared that standards for Hb derived from younger groups were applicable to this group of elderly people. No significant difference in red cell counts or in total or differential leucocyte counts, attributable to age or sex, was found. There was no close relation between Hb value and Fe intake. Subjects with low Hb with or without a low red cell count responded to treatment with haematinic preparations, which is taken to show that low values were due not to ageing but to some other cause, such as faulty absorption or impaired utilisation.

F. C. Aitken.

See also Absts. 4169, 4215, 4589.

GENERAL STUDIES: DIET PLANNING: EDUCATION

4934

YUDKIN, J. **Man's choice of food.** *Lancet*, 1956, **270**, 645 – 649. [Dept. Nutrition (Univ. London), Queen Elizabeth Coll.]

A lecture.

4935

MOGENA, H. G. Crítica de algunos principios generales cualitativos de la dietética. [**Examination of some general qualitative principles of dietetics.**] *Rev. española Enferm. Apar. digest. Nutrición*, 1956, **15**, 152–166. [Madrid.]

4936

HARTWICH, A. Ernährung im Alter. [**Nutrition in old age.**] *Lebensmittel u. Ernährung*, 1956, **9**, No. 4, 9–10.

4937

ROBINSON, C. H. **Fiber in the diet.** *Amer. J. Clin. Nutrition*, 1956, **4**, 288–290. [Dept. Food Nutrit., Coll. Home Econ., Drexel Inst. Technol., Philadelphia, Pa.]

4938

DARBY, W. J. **Nutrition and nutritional diseases.** *Annu. Rev. Med.*, 1956, **7**, 25–40. [Dept. Med., Vanderbilt Univ., Nashville, Tenn.]

4939

LANGER, A. and HENSHAW, P. S. **The interacting effects of public health, fertility behavior and general economy on standards of living. 4. Characterization of thresholds and stages of development in the bioeconomic mechanism.** *Amer. J. Med. Sci.*, 1956, **231**, 407–426. [Nat. Committee on Maternal Health, Inc., 2 East 103rd St., New York 29.] Interlingua summary.

For previous parts see Absts 965, 2269, Title 3576, Vol. 26.

4. This analysis of successive stages of biological and economic development and their interactions includes diagrams in which birth rate and death rate, both before and after the war, life expectancy, infant mortality (data from *U.N. Demographic Yearbook*, 1953) and the authors' Situation Index (see Abst. 965, Vol. 26) are plotted against daily calorie intake per person for numerous countries and territories (data from *FAO World Food Survey*, 1952). Birth rate is a maximum at about 2000 Cal., death rate becomes stable at about 2400 Cal., full health is believed to be attainable at some point between 2400 and 2700 Cal. and life expectancy is a maximum at about 2700 Cal. It is suggested that the turning point from subsistence to socio-economic and cultural development occurs when daily intake per person is about 2700 Cal., average annual income is equivalent to about 300 U.S. dollars and yearly industrial energy consumption per person is equivalent to about 1·4 ton of coal.—W. M. Deans.

4940

MUSZKATOWA, B., RUDOWSKA-KOPROWSKA, J. and SZKIŁŁĄDZIOWA, W. Zestawy kulinarne o wysokiej wartości biologicznej białek otrzymanejprzez wykorzystanie ich wzajemnego uzupełniania się. [**Meals of high biological value as a result of supplementation of their proteins.**] *Rocz. Państwowego Zakł. Hig.*, 1956, **7**, 123–139. Russian and English summaries.

Tables showing limiting amino acids and biological values of proteins were used to examine the effect of substituting vegetables for animal products on the calculated biological value of proteins in a meal. The reference meal was 100 g. meat or 2 eggs, with 300 g. potatoes or 70 g. wheat flour; 65·7 per cent. of the total protein was of animal origin. Pulses were first substituted for animal foods. When soya bean protein replaced $\frac{1}{2}$ or $\frac{3}{4}$ of the egg protein the biological value of protein in the meal was reduced from 82 to 72 in each case; navy bean protein reduced it to 66 and 64. Replacement of meat by navy bean protein had little effect; pea protein reduced the biological value of the meal from 72 to 59 and 50. When wheat flour replaced potatoes the biological value of protein in the meal was less, especially if it contained navy beans.

In the second series yeast and wheat flour protein were used as substitutes for egg and cheese. The standard meal was of egg, cheese and wheat flour; 53·1 per cent. of the total protein was of animal origin. When yeast was substituted for cheese, 9·1, 41·0 and 46·9 per cent. of total protein being supplied by egg, yeast and wheat flour, respectively, the biological value of the meal was reduced from 66 to 55. Replacement by wheat flour, 16·2 and 83·8 per cent. of total protein being supplied by egg and wheat flour, respectively, reduced the biological value of the meal to 35.

Meals containing dishes made up of these ingredients were served to a tasting panel and found attractive after some modifications.

The biological values of protein in typical meals were tested also by the rat growth method. Meals containing meat, eggs and pulses showed experimental results lower by a few percentage units than the calculated values. Meals containing mainly cereal products (second series) showed results several percentage units higher than the calculated values. This discrepancy is explained on the grounds that rats require relatively less lysine than man.

The conclusion is that meals in which vegetable proteins are substituted for animal proteins along the lines indicated have biological values of the total proteins comparable to that of meat alone.—W. Z. Billewicz.

4941

SCHWEIGART, H. A. Das physiologische Bild der Butter. [**Physiological importance of butter.**] *Milchwissenschaft*, 1956, **11**, 197–205. [Inst. Biochem. (Hanover), Versuchsstat. Neuland, Dachau.] English, Spanish and French summaries.

A recapitulation of the butter-margarine controversy, with 71 references. The author is on the side of butter.—W. M. Deans.

4942

SCHMIDT-BURBACH, A. Über die Bedeutung der Sauermilch für die Darm-Symbiose. [**Importance of sour milk for intestinal symbiosis.**] *Milchwissenschaft*, 1956, **11**, 61–63. [Med. Diagnost. Inst. Dr. Schmidt-Burbach, Berlin.]

Bioghurt, a variety of yoghurt produced with a mixture of *Thermobacterium intestinale* (*acetophilus*) and the Taette streptococcus, a Swedish-Finnish variant of *Streptococcus tactis*, is claimed to be less likely to disturb the intestinal flora than ordinary yoghurt.—W. M. Deans.

4943

YOUNG, C. M., BERRESFORD, K. and WALDNER, B. G. **What the homemaker knows about nutrition. 1. Description of studies in Rochester and Syracuse, New York.**

YOUNG, C. M., WALDNER, B. G. and BERRESFORD, K. **2. Level of nutritional knowledge.**

YOUNG, C. M., BERRESFORD, K. and WALDNER, B. G. **3. Relation of knowledge to practice.**

YOUNG, C. M., WALDNER, B. G. and BERRESFORD, K. **4. Her food problems, shopping habits and sources of information.** *J. Amer. Dietetic Assoc.*, 1956, **32**, 214–217; 218–222; 321–326; 429–434. [Sch. Nutrit., Cornell Univ., Ithaca, N.Y.]

4944

YOUNG, C. M., BERRESFORD, K. and WALDNER, B. G. **Nutritional knowledge and practices.** *Pub. Health Rep., Washington*, 1956, **71**, 487–492.

A summary of the first 3 papers in preceding title.

FOOD ECONOMICS AND STATISTICS

4945

JURÉEN, L. **Long-term trends in food consumption: a multi-country study.** *Econometrica*, 1956, **24**, 1–21.

Statistical data are available for 16 European countries and for the United States showing prewar energy intake per head daily within 2 groups of foods, animal foods and residual items. It is found that energy intakes are clearly dependent on the corresponding average values of real income per head of population, and simple hyperbolic demand curves have been fitted to the data for total calories and animal products. The difference between these two hyperbolic curves represents the demand function for "vegetable products", *i.e.*, all residual items. Some of the larger discrepancies between the demand curves and the original data are explicable in terms of the climates of the countries concerned or their importance as producers of animal food. Similar demand curves are obtained from post-war data, showing that they are stable in time; such evidence as is available suggests that they can be applied also within single countries to furnish quantitative information about probable differences in food consumption between classes of the population, and about long-term trends in consumption.

Income elasticities have been calculated from the multi-country demand curves. The demand for animal foods increases with income, but the elasticity is much less at higher income levels. For "vegetable products" the demand is almost inelastic except at very low levels of income. The most important item included is cereals, for which the demand rises with income at very low levels, then flattens and falls again at medium and high levels of income. For total energy intake the elasticities confirm the well known fact that it has almost reached a maximum in the rich countries but that in the poorest countries some increase is to be expected if economic conditions improve. For accurate estimates of trends in food consumption it would be necessary to know how the distribution of income in the country, as well as its average amount, was likely to change.

There is a discussion of the problem of obtaining price elasticities of demand; estimates are made although primary data available for this purpose are judged to be far from sufficient. It is concluded that in North-western European countries the demand for animal foods has a significant negative price elasticity but is practically independent of changes in cereal prices. On the other hand, the demand for cereals and potatoes has a

very small price elasticity but is highly dependent on animal prices. The demands for fruit and vegatables are sensitive to price changes; total energy intake is not.

A summary is given of the developments in food consumption in Western Europe since the middle thirties. The long-term tendency, somewhat masked by changes in inter-food price relations, has been for feeding standards to improve substantially with the gradual rise in incomes. This tendency continues, and would be strengthened if price relations returned towards those existing pre-war.

I. McDonald.

4946

RHODES, V. J. and KIEHL, E. R. **On consumer grades for foods.** *J. Farm Econ.*, 1956, **38,** 44–61. [Univ. Missouri.]

4947

WAUGH, F. V. **A partial indifference surface for beef and pork.** *J. Farm Econ.*, 1956, **38,** 102–112. [Agric. Marketing Serv.]

This paper suggests a method of handling empirical data so as to provide statistical estimates of use in the study of problems which arise when two or more commodities compete with one another.

The data used in illustration are the annual consumptions, by weight per head, of beef and of pork in the United States between 1932 and 1941, their average retail prices and average disposable incomes per head in each year. A very good fit to these data is found by an equation of the form

$$r = aq_1^b q_2^c y^d$$

where r = price ratio of beef to pork, q_1 = per caput consumption of beef (lb.), q_2 = per caput consumption of pork (lb.), y = disposable income per caput (dollars) and a, b, c, d are constants fitted to the data.

This equation is used to eliminate the small effect of the variations in y from year to year, by calculating the values

$$r' = aq_1^b q_2^c (490{\cdot}9)^d$$

where 490·9 dollars was the average disposable income over the period. Cartesian co-ordinate axes q_1, q_2 and z are now taken, where z is a function of q_1 and q_2 chosen so as to define a surface whose contours on the q_1q_2 plane pass through the plotted consumptions of beef and pork in each year with slopes equal to the negatives of the estimated adjusted price ratios, r'. The diagram showing these contours is what the author calls a partial indifference surface for beef and pork. The diagram can be imagined to be a cross-section of an assemblage of such diagrams, for different values of disposable income, in which the contours would link to form a family of three-dimensional surfaces. Arguments are put forward in favour of the identification of this construction with a partial indifference surface, and it is shown in particular that the observed data are statistically consistent with the hypothesis that the function z is a monotonic function of utility.—I. McDonald.

4948

STOLTING, W. H., GARFIELD, M. J. and ALEXANDER, D. R. **Fish and shellfish preferences of household consumers.** *U.S. Dept. Interior, Fish and Wildlife Serv. Res. Report* No. 41, 1955, pp. 115.

4949

BELTRÁN, R. Futuras orientaciones sobre la industria de la alimentación. [**Future trends of the food industry.**] *An. Bromatol.*, 1956, **8,** 123–143. [Inst. Nac. Indust.] English summary.

The Spanish diet provides, with a predominance of carbohydrates, 2680 Cal. per head daily. It is considered inadequate in energy value, animal protein, Ca and vitamin A, and in infants signs of deficiency are common. The mean cost of the family diet is 39·6 pesetas daily, but 60 pesetas has been estimated to be the cost of the cheapest adequate diet. The percentage of the total income spent on food varies, according to social class, from 87 to 49 with a mean about 75. To buy 1 kg. meat in Spain it is necessary to work for 9 hr., compared with 1 hr. 5 min. in America (U.S.) and 1 hr. 46 min. in Great Britain.

In Spain attention should be paid to the technical side of the food industry to prevent losses of vitamins and minerals. The milk industry is much neglected, especially in the development of pasteurisation and similar techniques. Industrial refrigeration is being studied, and so to some extent are new methods of dehydration and electrical treatment of foods. Use of new sources of protein such as yeasts, and the recovery of waste materials, are briefly discussed and the need for capital for their development is reviewed.

D. Duncan.

4950

TARVER, J. D. **Costs of rearing and educating farm children.** *J. Farm Econ.*, 1956, **38,** 144–153. [Oklahoma Agric. and Mech. Coll.]

The estimates are based on data for 1941 on expenditure of a representative sample of farm families in the United States (*U.S. Dept. Labor Bull.* No. 822, 1945, p. 75). For a typical farm family of husband, wife, son aged 13 and daughter aged 7, food accounted in 1941 for $589 out of a total of $1344 (which included $521 for value in kind). Recalculated for 1954 retail prices on the assumption that spending habits have not changed, food would have accounted for $1240 out of $2829.

The yearly cost of food (the requirement of a child as a fraction of that of an adult male being taken from the report of Stiebeling *et al.* (Abst. 2409, Vol. 11)) and of other items is tabulated for the sexes separately up to age 29. The yearly cost of food rises steadily to a maximum between the ages of 16 and 19, $380 for a boy, $336 for a girl. The total cost of rearing to the end of the 18th year was for a boy $15,281, or, deducting the estimated value of his labour, $11,497; for a girl $15,178, less $820 (no estimate was made of the value of housework).—W. M. Deans.

See also Abst. 4256.

DIET IN ETIOLOGY OF DISEASE

METHODS OF ASSESSING STATE OF HEALTH

4951

NAKAGAWA, I. **Studies on the assessment of nutritional states.** *Bull. Inst. Pub. Health. Tokyo*, 1956, **5**, 6–24. [Dept. Nutrit., Inst. Pub. Health, Tokyo.]

In a review the value of different methods for assessing state of nutrition in respect of different nutrients is discussed.—E. M. Hume.

See also Abst. 4611.

GENERAL STUDIES

4952

BERNHEIM, M., FRANÇOIS, R., VINCENT, P. and RUITTON-UGLIENGO. Dystrophie oedémateuse d'origine alimentaire chez un eczémateux. Ses rapports avec le syndrome "kwashiorkor". [**Dystrophy with oedema of dietary origin in a patient with eczema. Relation to the kwashiorkor syndrome.**] *Pédiatrie*, 1956, **11**, 356–359.

A syndrome closely resembling that of kwashiorkor appeared in a child aged 1 year after it had been fed for 3 months on water and vegetable soup. After 2 plasma transfusions, treatment with a high-protein diet led to rapid improvement. Blood proteins are often low in patients with eczema even when they are well fed.—L. Wills.

4953

JEUNE, M., CARRON, R. and GAUTHIER, J. Sur 7 cas de dystrophie nutrionnelle oedémateuse d'origine alimentaire chez des nourrissons eczémateux. [**Seven cases of oedematous nutritional dystrophy of dietary origin in infants with eczema.**] *Pédiatrie*, 1956, **11**, 359–362.

In 7 infants with eczema, aged from 4 to 18 months, the typical syndrome of nutritional oedema of the kwashiorkor type appeared after from 15 days to 13 months of diets grossly deficient in protein. The pathological and biochemical findings were typical of kwashiorkor but, in addition, 3 infants showed signs of rickets, 4 had albuminuria and in 2 of 3 examined urinary excretion of amino acids was above normal. Further, of 8 patients with eczema but no oedema, 6 showed an increase of amino acids in the urine which was not related to the plasma protein concentration, though in one the loss of amino acids decreased as the plasma proteins increased. There was some relation between that increase of amino acids and the presence of rickets. The condition was considered to differ from kwashiorkor only in degree.

L. Wills.

4954

OLIVÉ BADOSA, A. Nueva versión patogénica de la distrofia nutritiva del lactante. La distrofia, enfermedad de adaptación. [**New version of the pathogenesis of nutritional dystrophy of infants. Dystrophy as a disorder of adaptation.**] *Rev. clín. española*, 1956, **61**, 30–36. [Clín. Pediát., Hosp. Sta. Cruz y S. Pablo, Barcelona.] English, German and French summaries.

Nutritional dystrophy in infants may have a number of causes, such as inadequate intake of energy, protein, carbohydrates, or vitamins, infections or metabolic abnormalities, but the clinical picture is always much the same. It includes diminution or absence of subcutaneous fat, slow circulation, bradycardia, low blood volume and pressure, slow respiration, anoxaemia, reduced haemopoiesis, low blood protein, oliguria, hypothermia, reduced immunity related to low γ-globulin levels and altered metabolism. By some it is regarded as a "static" condition but, in the author's view, it should be looked on as an "active" reaction by which the body defends itself against expenditure of energy. He compares it with "permanent shock" or "autohibernation". The components of the condition are discussed in relation to Selye's general adaptation syndrome. [The literature is discussed, but there is no bibliography.]—D. Duncan.

4955

BELL, L. H., MEADE, E. M. and SPENCER, J. C. **Social and economic background of children attending L.C.C. Nutrition Clinics.**] *Med. Officer*, 1956, **95**, 162–169. [Dept. Social Sci., London Sch. Econ.]

The numbers of children referred to the nutrition clinics in each of the years 1949, 1950 and

1951 were more than double the number referred in 1937. The rise is not attributed to an increase in the incidence of malnutrition but possibly to rising standards set by school doctors and parents and to a change in the type of case sent to the clinic. The children were selected partly on weight relative to height, partly on clinical grounds. The records of 100 children were examined in 1952. Graphs of height-weight-age relationships are presented to show that, with few exceptions, the children were both short and thin for their age compared with the averages for London County Council children in 1949, but, again with few exceptions, rate of growth was normal while the children were attending the clinic. Evidence of past rickets was seen in 8 per cent., compared with 44 per cent. in a group of 50 children attending one of the clinics before the war. The social and economic environment was unfavourable in 57 and seriously so in 19 cases. In 13 the main finding was a history of premature birth or of serious or recurrent illness. In 11 there was some evidence of emotional and behaviour difficulties although conditions were good.

The functions of the clinics are discussed.

F. C. Aitken.

4956

POLLACK, H. **Studies on nutrition in the Far East. 1. The problem and outline of the test protocol.**

CONSOLAZIO, C. F., CROWLEY, L. V., ARMSTRONG, F. B., DORSCH, I. F., GUILLORY, R. L. and POLLACK, H. **2. Biochemical findings before and after enrichment of rice with vitamins.**

POLLACK, H. **3. Clinical indicator signs of nutritional insufficiencies before and after enrichment of rice with synthetic vitamins.**

CROWLEY, L. V., GODBER, J. T., CONSOLAZIO, C. F., GOLDSTEIN, D. R., SMITH, E. P., LEWIS, O. H., RYER, R. R. (III) and POLLACK, H. **4. Mess practices in the Chinese Nationalist Army and the field test of a proposed enriched ration.**

CONSOLAZIO, C. F., POLLACK, H., CROWLEY, L. V. and GOLDSTEIN, D. R. **5. Calorie cost of work and energy balance studies.**

CROWLEY, L. V., RYER, R. R. (III) and POLLACK, H. **6. Relations between body weight, height and skinfold thickness measurements in Chinese Nationalist troops.**

POLLACK, H. **7. The problem of rice supplementation.**

JEFFERIES, T. C., CONSOLAZIO, C. F. and POLLACK, H. **8. Protein partitions in the blood and some notes on total lipids.**

BROCKETT, J. E. (Jr.), CROWLEY, L. V. and POLLACK, H. **9. Correlations between clinical signs and biochemical findings.**

CONSOLAZIO, C. F., ARMSTRONG, F. B., DOSCH, E. L., GOLDSTEIN, D. R. and GUILLORY, R. L. **10. Composition of food items in the Formosan diet.**

POLLACK, H. and EBY, T. M. **11. Ophthalmic findings.**

CROWLEY, L. V., POLLACK, H. and BROCKETT, J. E. (Jr.) **12. The relation of intensity of hookworm infestation to changes in body weight and clinical signs of nutritional deficiency.** *Metabolism*, 1956, **5**, 203–218 ; 219–230 ; 231–244 ; 245–258 ; 259–271 ; 272–275 ; 276–278 ; 279–282 ; 283–286 ; 287–291 ; 292–296 ; 297–301. [Dept. Med., Post-Grad. Sch. Med., Univ. New York ; Med. Nutrit. Lab., Fitzsimmons Army Hosp., Denver, Colo.]

1. In May and June 1954 a survey was made of the rationing system of the Chinese Republican Army in Formosa. Clinical examinations of 711 men drawn from units serving under widely different conditions showed that signs of deficiencies of riboflavin, nicotinic acid and vitamin A were common. Nutritional oedema was never seen and, although the vitamin B_1 content of the diet was suspected to be low, no beriberi was found. The average weight was 126 lb., height 65·6 in., surface area 1·62 sq. m. and age 28 years. The staple in their diet was rice, 848 g. (27 Chinese oz.) daily for officers and enlisted men and 14, 10 and 5 kg. monthly for adult, youth and infant dependents, respectively. Extraction rate for the rice was 93 or sometimes 90 per cent. Other foods issued generally were edible oil and salt ; serving soldiers got small amounts also of fish and pork. A money allowance was given with which vegetables were bought ; hence the amounts varied with the price. The amount of Ca in the diet was increased by the use of " stone powder " to facilitate the flow of rice during milling and to whiten the product. This powder produced alkalinity and consequently caused some destruction of vitamin B_1.

From these findings certain changes were recommended, of which the most important were reduction of the rice to 656 g. (21 Chinese oz.) daily, and addition of 200 g. yellow sweet potato and of an enrichment mixture to provide daily 2·1 mg. vitamin B_1, 5·4 mg. riboflavin, 20 mg. nicotinic acid and 14 mg. Fe per head. It was suggested also that the effects as a vermifuge of the mass use of single doses of hexylresorcinol should be studied. With this aim 12 companies were set up and, with suitable precautions for separate feeding, 6 were given the regular and 6 the enriched ration ; in each of these groups 3 companies were given 1 g. vermifuge and 3 remained infested. The total number of subjects was about 1200 and the experiment lasted from October 1954 to February

1955. The following abstracts refer to the findings in this mass experiment.

2. Over the whole period of the experiment mean daily intakes per man were, for the control group, vitamin A nil and carotene 3·77 μg., vitamin B_1 1·48, riboflavin 0·86 and ascorbic acid 68·1 mg.; for the group on the enriched diet, corresponding amounts were nil and 5·98 μg. and 3·55, 4·56 and 93·4 mg. Samples of blood and urine were collected from 380 soldiers before the experiment began and again in its last week. On these occasions mean values for the control and experimental groups, irrespective of treatment with vermifuge, were, vitamin A 26·6, 25·2 and 26·5, 32·0 μg. and carotene 32·2, 43·7 and 28·7, 74·1 μg. per 100 ml. serum: ascorbic acid 0·289, 0·534 and 0·395, 0·933 mg. per 100 ml. blood and 0·130, 0·242 and 0·209, 0·859 mg. per hr. in urine; vitamin B_1 2·81, 5·49 and 2·42, 35·43, riboflavin 5·82, 4·78 and 5·17, 63·94, N^1-methylnicotinamide 194·9, 330·9 and 221·3, 898·0 μg. per hr. in urine: Hb 15·5, 15·0 and 15·3, 14·8 g. per 100 ml.: haematocrit 46·0, 44·4 and 44·5, 43·8 per cent.: serum proteins 7·63, 6·79 and 7·57, 6·79 g. per 100 ml.

It was concluded that carotene from yellow sweet potato was readily absorbed, that enrichment corrected the biochemical deficiencies, that the protein content of the diet was normally adequate and, from comparison with similar values reported by other investigators, that the level of enrichment was unnecessarily high.

3. The procedure during the clinical examination and the system of recording results are described. The findings are summarised in 9 tables for the individual companies and are grouped to show the numbers of subjects, as percentages of the total, in whom the particular condition was found at the start and at the end of the experiment. The numbers of men examined were 542 on the control and 507 on the experimental diet.

Tongues were normal in 1·8 and 1·1 per cent. of the control and in 1·8 and 31·5 per cent. of the experimental group at the beginning and end of the test, respectively. Corresponding percentages for other conditions in the same order were: extensive tongue lesions 44·8, 69·3 and 47·3, 20·7; acne of face 16·2, 19·3 and 17·3, 4·5; naso-labial seborrhoea 80·6, 82·8 and 82·0, 22·2; angular stomatitis 70·4, 78·7 and 71·7, 18·1; scrotal dermatitis 18·1, 36·9 and 16·0, 1·9. There was evidence that with change of diet there was less bleeding in the gums; effects on hyperaemia, oedema, recessing of gums and gingivitis were not significant. The findings for follicular keratosis on 6 areas were difficult to interpret in relation to trauma. Nutritional oedema and calcium deficiency were not recorded and, unexpectedly, only 1 case of suspected beriberi was found.

Enrichment of rice is considered applicable under these conditions of army service; civilian populations might be prejudiced against the colour which the added riboflavin imparts. With 93 per cent. extraction and cooking of rice in water not made alkaline by "stone powder", addition of vitamin B_1 would not be necessary.

4. The foods used and the methods of preparation of the meals are described. From detailed studies of the amounts issued, or purchased by the men with their money allowance, and from analyses of sample meals, the daily intakes of nutrients were calculated to be, for the regular ration, energy 3610 Cal., protein 95, fat 77 and carbohydrate (by difference) 630 g., vitamin A none, carotene 3·77, vitamin B_1 1·43, riboflavin 0·86 and vitamin C 68 mg. For the enriched ration corresponding values were 3380 Cal., 105, 60 and 605 g., none, 5·48, 3·35, 4·55 and 93 mg.

The proposed enriched diet was palatable and acceptable to the troops; its cost was comparable with that of the regular diet.

5. Energy exchange was studied with the Müller Franz respirometer (see Abst. 3943, Vol. 23) and by time and motion studies in 20 men in training. Ten had the regular and 10 the enriched diet. On 2 days of the week they marched for 8 hr. with short rests and on 4 days they marched for 4 hr. and spent 2 hr. at sports; the seventh was a day of rest. Tables show the time spent in 23 different activities and the B.M.R. and energy cost of 19 types of activity. These metabolic rates are compared with similar data for Japanese, American and British subjects. For all subjects the average energy intake was 3610 Cal. on the control and 3380 Cal. on the enriched diet. Energy expended daily by the groups was, on the average, 3307 and 3138 Cal. in the same order. When changes in bodyweight were taken into account the energy balance unaccounted for was within the limits of accuracy of the technique. Analysis of the data showed that performance by the men on the enriched diet was better than by those on the regular diet by an amount which was statistically significant, a finding which is in contrast with the results of earlier work from the same laboratory (see Abst. 5115, Vol. 24) in which, with well nourished subjects, massive doses of vitamins were found not to increase efficiency of work.

6. The data for height, weight and skinfold thickness from paper 3 were analysed. The mean values for the numbers of troops in the 4 groups according to diet and vermifuge treatment were: 273 men, regular ration, no vermifuge, age 26·7 years, height 164·9 cm., weight at beginning 55·7 and at end of experiment 55·4 kg., skinfold thickness, sub-scapula 0·80 and mid-arm 0·42 cm.; 269 men, regular ration, with vermifuge, 27·0

years, 164·0 cm., 56·2 and 56·1 kg., 0·80 and 0·42 cm.; 256 men, enriched ration, no vermifuge, 27·0 years, 164·0 cm., 55·8 and 55·0 kg., 0·79 and 0·41 cm.; 251 men, enriched ration, with vermifuge, 26·8 years, 165·0 cm., 55·9 and 55·4 kg., 0·78 and 0·43 cm. The differences between the groups were not statistically significant. Compared with American recruits accepted for military service the Chinese soldiers were about 3 in. shorter and 27 lb. lighter and had smaller skinfold thicknesses.

7. The basic problem is to define the amount and kind of substitutes for rice and to decide the extent to which they should be used and the level below which consumption of rice should not be allowed to fall.

8. Blood proteins, estimated at the end of the experiment by the Kjeldahl method, were on the average for the control group 7·04 and for the group on the enriched diet 6·91 g. per 100 ml. serum; the copper sulphate method gave 6·79 g. for both groups (see paper 2). Mean values for the fractions measured by paper electrophoresis were for the 2 groups, respectively, in g. per 100 ml., albumin 3·41, 3·44; globulin, α_1 0·256, 0·271, α_2 0·602, 0·555, β_1 0·990, 0·903, β_2 0·014, 0·031, γ 1·768, 1·711. Total globulin was 3·639 and 3·470 and albumin : globulin 0·956 and 1·005, respectively. The difference from American values was largely in the higher γ-globulin fractions and in a correspondingly lower albumin : globulin ratio.

For lipids mean values were for the control group 657·2 and for the group on enriched diet 635·1 mg. per 100 ml. serum. Both are higher than the average quoted (see Boyd, Abst. 369, Vol. 12) for Americans whose diets are likely to contain about twice as much fat (Consolazio *et al.*, *Nutrition survey of two consecutive cycles of the airborne training Bn. Co., "G", Fort Benning, Ga.* MNL Report 166, 1955). Serum lipids were above 700 mg. per 100 ml. for 56·6 per cent. of the control and 53·7 per cent. of the experimental subjects.

9. Clinical signs were given arithmetical values and a technique of squaring was devised in order to weight them for importance of, for example, site or degree. These basic data are tabulated with the correlation coefficients which were calculated between incidence of a sign and vitamin intake. There was a close relation between intake of riboflavin and occurrence of cheilosis, magenta colour of the tongue, papillary atrophy of the tongue and scrotal dermatitis; between intake of nicotinic acid and incidence of filiform and fungiform papillary lesions of the tongue. Intake of carotene was inversely related to follicular keratosis on chest, arms, back and buttocks. The signs of nutritional deficiency tended to disappear in soldiers given the enriched diet.

10. The composition of more than 100 Formosan foods is given in terms of moisture, fat, protein, ash, vitamins A, B_1 and C, carotene and riboflavin. Scientific names are given. Data are tabulated also for moisture, fat and protein in a total of 58 samples of 45 cooked foods.

11. Each of 1049 soldiers underwent an eye examination. Trachoma was the commonest disease but not a frequent cause of blindness. Most visual defects could be explained by local conditions. In general vision was good. Optic atrophy and unexplained poor vision may have been the result of severe deprivation some years earlier.

12. Examinations of stools were made twice, first before half the men were given the hexylresorcinol, and four months later. The methods are described and the system of recording intensity of infestation with hookworm, Trichuris and Ascaris is shown. Loss of bodyweight was greater in untreated than in treated companies and its relation to hookworm intensity was significant at the 5 per cent. level. There was no correlation between infestation and the incidences of angular stomatitis or of papillary lesions of the tongue or between infestation and excretion of riboflavin or of N^1-methylnicotinamide in urine.—D. Harvey.

4957

FRICK, L. P., MOON, A. P. and LIN, S. S. (with ASAKURA, S. and HISHINUMA, Y.) **Parasitologic studies in the Far East. 15. A preliminary survey for parasitism in southern Formosa.** *Metabolism*, 1956, **5,** 302–308. [Dept. Med. Zool., 406th Med. Gen. Lab., APO 500, San Francisco, Calif.]

The results of a survey of the incidence of helminth and protozoan infection in 1044 Chinese Nationalist soldiers and 725 young Taiwanese men attached to the Chinese Nationalist army in Formosa are tabulated and discussed.

F. C. Aitken.

4958

LAMBOTTE-LEGRAND, J. and LAMBOTTE-LEGRAND, C. Activité et problèmes pédiatriques au Centre extra-coutumier de Léopoldville. [**Activity and paediatric problems at the extra-tribal centre of Léopoldville.**] *Ann. Soc. belg. Méd. trop.*, 1955, **35,** 725–745. Flemish summary.

The population of Léopoldville has increased threefold in 8 years and children constitute one-third of it. Infant mortality has decreased but is still high. The causes are considered. Prematurity ranks high as a cause, but malnutrition in children seems to be rare.—E. M. Hume.

4959

HOLEMANS, K. and ANDRÉ, J. Considérations sur l'absence de la toxicose éclamptogène en

milieu rural au Congo Belge. [**Absence of eclampsia in rural districts of the Belgian Congo.**] *Ann. Soc. belg. Méd. trop.*, 1955, **35,** 583–589. Flemish summary.

To find a possible relation between diet and the occurrence of eclampsia among Europeans, studies were made in the Kwango of rural people among whom the disorder is not found. Calcium does not exceed 400 mg. daily, but this low intake is thought unlikely to contribute. The disorder does not occur where the intake of protein is very low, but in the cities, where the intake is higher, eclampsia does appear. In the Kwango consumption of salt is only 4 g. daily, about one-quarter that of Europeans (see Abst. 4581, Vol. 26).

In Feshi weights were recorded for 700 non-pregnant Basuku women and for 81 pregnant women, just before, shortly after and again 10 days after delivery. The gain of weight during pregnancy was much less than in American women. Excretion of urine by Basuku women did not fall during pregnancy (see Abst. 4581, Vol. 26).

The tentative conclusion is that in white women the much greater intake of salt and consequent greater retention of water may be significant in connection with the occurrence of eclampsia.

E. M. Hume.

4960

BELL, S. **The Ameru people of Kenya : a medical and social study. 1. Geographical and ethnological background. 2. The medical background. The changing background. 3. Materials and methods of study. 4. Anthrax, treponematosis. 5. Treponematosis. 6. Pulmonary tuberculosis. 7. Relapsing fever. 8. Malaria. 9. Ascariasis. Taeniasis. Ancylostomiasis. Conclusion.** *J. Trop. Med. Hyg.*, 1955, **58,** 223–239 ; 249–259 ; 280–290 ; 1956, **59,** 5–14 ; 31–40 ; 57–65 ; 82–88 ; 106–112 ; 121–133. [Dept. Clin. Trop. Med., London Sch. Hyg. Trop. Med.]

The Ameru are a Bantu people numbering, by the 1948 census, about 310,000 and living in an area of about 1450 sq. miles north-east of Mt. Kenya. This series includes brief references in part 1 to the feeding of infants, young girls and warriors and in part 2 to the preparation of foods. In part 9 one conclusion is that intake of protein of low quality from maize and deficiencies of calcium and of fat-soluble vitamins are conditions affecting the course of disease especially among vulnerable groups in seasons when the rains fail.

W. M. Deans.

4961

HEUPKE, W. and FISCHER, H. Kann die Zahl der Gallensteinträger vermindert werden ? [**Possibility of reducing the number of those with gall-stones.**] *Münch. med. Wochenschr.*, 1956, **98,** 194–196. [Hosp. zum Heiligen Geist, Frankfurt a.M.] English and French summaries.

The medical field is surveyed from the point of view of formation of gall-stones as the result of overfeeding. Gall-stones are generally composed almost entirely of cholesterol. The number and severity of cases declined during the second world war. In obesity, pregnancy and diabetes, in which there is a high incidence of cholelithiasis, consumption of foods rich in cholesterol tends to be high. Geographical survey shows gall-stones to occur much more frequently in temperate regions where animal fats containing cholesterol are eaten than in tropical countries where the fats are chiefly vegetable oils free from cholesterol. It is therefore considered that when inflammatory or other changes are present in the gall-bladder and the gall-duct a diet rich in cholesterol has much to do with the formation of gall-stones and the tendency should be counteracted by a diet low in cholesterol. The cholesterol contents of some animal fats is given.—E. M. Hume.

4962

HAYES, O. B., BOWSER, L. J. and TRULSON, M. F. **Relation of dietary intake to bone fragility in the aged.** *J. Gerontol.*, 1956, **11,** 154–159. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Diet studies were made by the interview method of 16 male and 31 female patients in hospital with fracture of the femur and of the same numbers of control subjects selected from a random sample of 100 old people living at home. All the subjects were over 65 years of age and had been or were at least moderately active ; the normal subjects were free from major illness and had no history of fractured bones.

There was no significant difference between the eating habits of the groups, nor had there been a significant difference in their milk intake during childhood. There was some evidence that the patients with fractures were underweight compared with the control subjects.—G. F. Garton.

See also Abst. 4930.

DEFICIENCY DISEASES

General

4963

SUMMERSKILL, W. H. J., DAVIDSON, E. A., SHERLOCK, S. and STEINER, R. E. **The neuropsychiatric syndrome associated with hepatic cirrhosis and an extensive portal collateral circulation.** *Quart. J. Med.*, 1956, **25,** 245–266. [Dept. Med., Postgrad. Med. Sch., London.]

The neurological and psychiatric changes which occurred in 17 patients, of whom 5 have already

been described (Sherlock *et al.*, *Lancet*, 1954, **267**, 453) are given in detail. All had chronic liver disease. In 15 patients the existence could be demonstrated of an extensive portal-systemic collateral circulation which in 5 had arisen from occlusion of the portal vein by thrombosis and in 4 followed surgical operations. The degree of mental disturbance ran parallel to the intake of N; all 17 responded to restricted intake of protein. In 15 patients the condition deteriorated when they were tested with a diet rich in protein. It is suggested that the existence of the portal collateral circulation allows a toxic substance or substances, absorbed from the intestine, to reach the brain by the systemic system.—D. Harvey.

4964

FISCHER, H. Pathologisch-anatomische Befunde nach schwerer alimentärer Dystrophie. [**Pathological anatomy after severe nutritional dystrophy.**] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselkr.*, 1956, **16**, 103–111. [Pathol. Inst., Univ. Munich.]

The findings post mortem in 92 men who returned from prisoner-of-war or concentration camps are described and discussed. The most frequently occurring causes of death were: carcinoma and sarcoma, ages 23 to 58, 19; chronic endocarditis 18, tuberculosis 13 and other diseases of the lungs 8. The proportion of endocarditis is far above expectation. Atherosclerotic changes were in general slight.—I. Leitch.

4965

SAPIN-JALOUSTRE, J. and SAPIN-JALOUSTRE, H. La pathologie en expédition polaire antarctique. A propos des observations de la 1re expédition en Terre Adélie (1948–51). [**Pathology on an Antarctic polar expedition. Observations on the first expedition to Adélie Land (1948–51).**] *Presse méd.*, 1956, **64**, 579–582; 637–640; 791–794; 821–823.

A review is presented of the pathological states reported by earlier expeditions with notes on those encountered by the French group who visited Adélie Land in 1948–51 in preparation for the International Geophysical Year. The finding which had nutritional significance for this expedition was that, when supplies of pharmaceutical vitamin preparations failed for a month, vitamin C saturation tests showed by delay in saturation that, without these, the intake of ascorbic acid from the diet was not quite adequate although rations did include orange drinks fortified with vitamin C.

D. Harvey.

4966

OLIVER PASCUAL, E. (with ANDOLZ, F., ELEIZEGUI, J. and OLIVER, A.) Alteraciones de la flora intestinal consecutivas al empleo de las sulfamidas y deficiencias de nutrición secundarias. [**Changes in the intestinal flora after the use of sulphonamides and secondary nutritional deficiencies.**] *Rev. española Enferm. Apar. digest. Nutrición*, 1956, **15**, 167–185. English summary.

Several patients are described who during treatment with sulphonamides developed signs of deficiency of vitamins A and C, vitamin E, vitamin B_1, vitamins K, C, B_{12} and folic acid, or vitamin A and riboflavin. All these deficiencies are ascribed to changes in the intestinal flora. During treatment with sulphonamides special notice should be taken of the appearance of diarrhoea, anaemia, glossitis and similar signs.—D. Duncan.

4967

FOLLIS, R. H. (Jr.) **The effects of nutritional deficiency on the heart: a review.** *Amer. J. Clin. Nutrition*, 1956, **4**, 107–116. [Dept. Pathol., Coll. Med., Univ. Utah, Salt Lake City.]

4968

BROCK, J. F., HANSEN, J. D. L. and HOWE, E. E. **The role of amino acids in kwashiorkor.** *Amer. J. Clin. Nutrition*, 1956, **4**, 286–287. [Dept. Med., Univ. Cape Town.]

As criteria of the initiation of cure of kwashiorkor (see Abst. 998, Vol. 26) a rise in albumin and, in some cases, in amylase content of serum may be useful. Further tests have been made of this initiation produced by a mixture of 18 amino acids forming 59·5 per cent. of the diet or one of 11 acids forming 16 per cent., the first given with a vitamin mixture and the second with or without it. From the results it seemed that with the smaller group of acids the lower limit of efficacy was being reached and that the vitamin mixture might influence the efficiency of utilisation of amino acids.

D. Harvey.

4969

PRETORIUS, P. J., DAVEL, J. G. A. and COETZEE, J. N. **Some observations on the development of kwashiorkor. A study of 205 cases.** *S. African Med. J.*, 1956, **30**, 396–399. [Dept. Paediat., Univ. Pretoria.]

The patients were 200 Bantu and 5 Coloured children admitted to Pretoria Hospital in 1954 and 1955. In age groups they numbered under 1 year 26, 1 to 2 years 138, 2 to 3 years 30 and over 3 years 11; none was under 6 months or over 5 years. The incidence of kwashiorkor was unrelated to sex. Their diets had been rich in carbohydrate and poor in protein and had included little vegetables and fruit; 12 children were still being breast fed. The disease usually appeared

from 1 to 6 months after weaning. Data for social conditions, incidence of bacterial infections of respiratory system and digestive and urinary tracts, of intestinal parasites and of venereal disease are summarised.

The conclusions are that in the etiology of kwashiorkor socio-economic conditions lead to a cheap diet poor in protein and, more tentatively, that susceptibility to infection may create still greater demands for protein in the diet.

D. Harvey.

4970

VARGHESE, K. M. **Nutritional oedema (among children in the K.D.H.P. Co. Ltd., Tea Estates, High Range, T-C. State).** *Antiseptic*, 1956, **53**, 293–296. [Chokanad Estate, Munnar P.O., Travancore-Cochin, India.]

4971

MEHTA, G., VENKATACHALAM, P. S. and GOPALAN, C. **Steatorrhoea in nutritional oedema syndrome (kwashiorkor).** *Indian J. Med. Res.*, 1956, **44**, 231–235. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor.]

When faeces from 6 children with nutritional oedema were examined by microscope, fat globules were seen to be abundant. The effect of different diets on excretion in faeces of total and neutral fat was studied and the iodine values of dietary and faecal fats were estimated. When the diet was low in fat more was excreted than was ingested and, as judged by iodine values, dietary and faecal fat bore no relation to one another. Increased intakes of fat or of glucose led to greater excretion of fat. Groundnut oil increased faecal fat to a greater extent than did an equal amount of butter.

The fat in the faeces of these subjects was considered to be partly endogenous and partly exogenous in origin.

Steatorrhoea was not aggravated by wheat in the diet and folic acid had no beneficial effect on it.

F. C. Aitken.

4972

VINCENT, G. Hypoprotéinémie nutritionnelle infantile à la Réunion : le kwashiorkor. [**Low blood protein values of nutritional origin in infancy in Réunion: kwashiorkor.**] *Méd. trop.*, 1956, **16**, 241–251. [Corps de Santé Colonial.]

Kwashiorkor was common, mainly in white or coloured children; infants of the black race were seldom affected. The basic diet after weaning was chiefly maize or rice. The number of cases varied with the season, probably because of seasonal variation in income and therefore in food rather than because of climatic changes. An unusual finding was that the concentration of γ-globulin in the serum frequently was normal or low, a result which, in the author's opinion, was possibly associated with the absence of malarial infection in the patients in Réunion. In no case was the liver clinically enlarged. In addition to the usual treatment with a high-protein diet, Syncortyl was given daily because of signs of adrenal insufficiency.—L. Wills.

4973

WALT, F., HOLMAN, S. and HENDRICKSE, R. G. **Megaloblastic anaemia of infancy in kwashiorkor and other diseases.** *Brit. Med. J.*, 1956, i, 1199–1203. [Dept. Paediat., McCord Zulu Hosp., Durban.]

Examination of bone marrow smears from 776 children admitted to hospital showed that 42, of whom 40 were Bantu, had megaloblastic anaemia. Of the 42, 22 had typical kwashiorkor; the others had infections or were undernourished. The ages of the anaemic children ranged from 1 month to 30 months, average 14·4 months. Treatment with folic acid cured the anaemia.

Possible reasons are considered for the authors' failure to find evidence of megaloblastic anaemia in a series of patients with kwashiorkor previously studied. See Abst. 5678, Vol. 20.—F. C. Aitken.

4974

PRETORIUS, P. J., HANSEN, J. D. L., DAVEL, J. G. A. and BROCK, J. F. **Skimmed milk and kwashiorkor.** *S. African Med. J.*, 1956, **30**, 447–450. [Dept. Paediat., Univ. Pretoria.]

In trials at Pretoria and Cape Town 3 forms of skimmed milk were given to 4 groups of children with kwashiorkor. The first, given with or without a vitamin mixture to groups of 49 and 52 children, respectively, had been prepared in South Africa by roller-drying and stored in bags not impervious to moisture; the second had been spray-dried, was imported in air- and moisture-proof containers and was given to 34 children; the third was fresh with Dextrimaltose added and was tested on 41 children. The criteria were those already described (see Abst. 998, Vol. 26); the findings are tabulated with statistical analyses.

It was confirmed that skimmed milk alone is satisfactory treatment for kwashiorkor and that added vitamins do not increase its efficacy. The imported product was significantly better than the local because, it is suggested, of its better conditions of storage.—D. Harvey.

4975

THOMPSON, M. D. **Sources of protein for the prevention and treatment of kwashiorkor.** *E. African Med. J.*, 1955, **32**, 451–458. [Med. Res. Counc., Mulago Hosp., Kampala.]

A general article: see Abst. 2308, Vol. 26.

4976

KAHN, E. **A neurological syndrome in children recovering from malnutrition.** *S. African Med. J.*, 1956, **30,** 345. [Baragwanath Hosp., Johannesburg.]

Since the author described the occurrence of this syndrome in Johannesburg (Abst. 1150, Vol. 25) he has received personal communications reporting it in Durban and Central Africa. Some features of the syndrome, seen in Johannesburg in 16 children recovering from malnutrition (kwashiorkor), are discussed.—F. C. Aitken.

4977

WOOLLAM, D. H. M. and MILLEN, J. W. **Role of vitamins in embryonic development.** *Brit. Med. J.*, 1956, i, 1262–1265. [Dept. Anat., Univ. Cambridge.]

Animal experiments showing the importance of vitamins for the survival and development of the embryo are reviewed. If human conditions are like those in animals it can be of little avail to give extra vitamins during pregnancy. The nutrition of the embryo can be safeguarded only by attention to the diet of women throughout their lives and especially in the later stages of adolescence, so that an adequate supply of essential nutrients may be ensured from the very outset of pregnancy.—F. C. Aitken.

4978

MOORE, H. C. **Acute fatty liver of pregnancy.** *J. Obstet. Gynaecol. Brit. Empire*, 1956, **63,** 189–198. [Dept. Pathol., Rotunda Hosp., Dublin.]

Four cases of acute liver failure in pregnancy, 2 of them fatal, are described. The pathological findings from fatal cases and others recorded in the literature are discussed. The sole pathological change was fat accumulation in the liver without necrosis of liver cells. Three of the patients were treated with lipotropic substances. Two recovered but in one of them, given choline chloride intravenously, recovery was thought from the clinical assessment to be spontaneous. In the other, choline chloride and a mixture of amino acids were given intravenously.—F. C. Aitken.

4979

FLINK, E. B. **Magnesium deficiency syndrome in man.** *J. Amer. Med. Assoc.*, 1956, **160,** 1406–1409. [Veterans Admin. Hosp., Minneapolis.]

Report of a lecture given at a symposium on inorganic elements in human nutrition, Nashville, Tenn., April 1955.

See also Abst. 4621.

Vitamin A

4980

DHANDA, R. P. **Clinical application of electroretinography with special reference to clinical manifestation of vitamin-A deficiency, cataract and glaucoma.** *Indian J. Med. Res.*, 1956, **44,** 295–303. [M.G.M. Med. Coll., Indore.]

The literature is reviewed and the principles of electroretinography are explained. Electroretinograms were recorded by the method of Karpe except that the amplifier used had a sensitivity of 1 millivolt = 1 cm. The electrical response was normal, or nearly normal, in 16 eyes of adults with different grades of xerosis. In some, xerosis had persisted for years without the development of night blindness. In one a xerotic patch had persisted for months in spite of 60 injections of vitamin A. Both the electroretinogram and the concentration of vitamin A in the blood remained normal. It is suggested that xerosis was probably not a direct manifestation of vitamin A deficiency. In a study of 60 eyes it was found that the electroretinogram was completely extinguished when the patient became night blind, and could be restored by treatment with vitamin A.

In preliminary studies on patients with cataract the electroretinogram was recorded a day before operation, and repeated on the 10th day and again 6 weeks after operation. Preliminary studies are reported also on patients with glaucoma, to test the value of electroretinography for diagnosis.

I. M. Sharman.

4981

FYFE, W. M. **Vitamin-A levels in idiopathic hypercalcaemia.** *Lancet*, 1956, **270,** 610 – 612. [Royal Hosp. Sick Child., Yorkhill, Glasgow.]

Vitamin A was estimated in the plasma of 7 healthy children, 5 marasmic infants and 8 infants with idiopathic hypercalcaemia, before and 4 hr. after an oral dose of 12,500 I.U. vitamin A palmitate per kg. bodyweight. The patients with idiopathic hypercalcaemia had higher resting values, from 225 to 435, mean 275, I.U. per 100 ml. plasma, than the marasmic infants with values from 50 to 210 and the healthy children with values ranging from 70 to 205 I.U., mean 131. After the large dose had been given also, the infants with idiopathic hypercalcaemia had higher values, 905 to 3590, mean 1786 I.U., than the other children, the range being from 100 to 765 for the marasmic infants, and from 180 to 1260, mean 648, for the healthy children. Possible reasons for the abnormally high values for vitamin A in idiopathic hypercalcaemia are discussed, but it was impossible to decide from the data whether the high values were due to greater absorption or less storage.—I. M. Sharman.

4982

STEINBERG, M. D. **A new treatment for resistant warts: report of 300 cases.** *Surgery*, 1956, **39**, 642–644. [Jewish Mem. Hosp., New York.]

Treatment of warts by injection of a sterile vitamin A dispersion into the base of the verruca was successful in all except 7 out of 300 cases. The solution injected contained vitamin A palmitate 2·96 g., α-tocopherol 0·40 g., sesame oil 0·60 g., polysorbate 80 U.S.P. 10·00 g., and distilled water to 100·00 ml. Unless vitamin A was included in the solution the treatment was not successful. In about 100 cases thus treated by other physicians the results were uniformly successful.—F. C. Aitken.

Vitamin D

4983

DEAS, K. S. **Uptake of Welfare Foods: a preliminary report.** *Med. Officer*, 1956, **95**, 203–205. [Dept. Child Welfare, Edinburgh City.]

Because of the decline in uptake of Welfare Foods in Scotland, especially the vitamin supplements, for which statistics for 1952–54 are given, the vitamin D and vitamin C intakes in their 3rd and 9th months of all infants born to Edinburgh mothers between 1 July 1954 and 30 June 1955 are being investigated by health visitors; the present report is based on the first 1000 cases investigated.

Of infants in their 3rd month, 681 were said to be having national cod liver oil compound regularly, and of those in their 9th month, 671; 92 and 105, respectively, were said to be having a substitute, the most frequent being concentrated preparations of vitamins A and D. It was estimated that in the 3rd and 9th months, respectively, 691 and 350 infants were getting no vitamin D supplement or less than the amount recommended to ensure intake of the British Medical Association's standard of 800 I.U. daily. On the other hand, 470 infants in the 3rd month were being fed on national dried milk containing vitamin D and of these 366 were having a vitamin D supplement as well, some of them enough to raise the daily intake to 2000 I.U., an amount regarded by some as toxic.

The numbers said to be having national orange juice were 733 and 743, and 142 and 183 were said to be having a substitute, the most frequent being rosehip syrup and fresh orange juice. It was estimated that 468 and 637 were having no vitamin C supplement or less than the amount recommended to ensure intakes of 10 and 20 mg. ascorbic acid daily. Of infants in the 3rd month, 330 were being breast fed, and 142 were having cow's milk.

In well over half the cases where the national supplements were not given, it was stated that the babies would not or could not take them. Carelessness of mothers accounted for from 15 to 20 per cent. of omissions.—W. M. Deans.

4984

SYDOW, G. v., RANSTRÖM, S., BEREZIN, D. and AXÉN, O. **Histological findings characteristic of rickets in foetuses and young infants.** *Acta paediat.*, 1956, **45**, 114–138. [Child. Hosp., Sundsvall, Sweden.] French, German and Spanish summaries.

The material consisted of 527 infants and foetuses from hospitals at Malmö, Upsala and Sundsvall. They were arranged in weight groups: from 0 to 300 g., which included foetuses up to the 6th month, most of them obtained by legal abortion; from 310 to 1000 g., which included foetuses obtained by legal abortion and non-viable premature infants; from 1010 to 2500 g., premature infants with viable birthweight; over 2500 g., full-term infants. Histories and many details of social conditions were taken from the mother.

In sections of the costochondral junctions of the ribs, signs characteristic of rickets were common at all ages and weights, in both sexes. Those without any sign were fewer than those with. The presence of osteoid tissue was the commonest sign, and was most frequent at the lowest weights, becoming less frequent with increasing weight up to full-term, stillborn infants; among full-term infants born alive and dying in the first week of life it was again more frequent. Hypertrophic cartilage with broadening and irregularity of the costochondral junction was found in all groups also, but was less frequently present than osteoid tissue. The full histological picture of rickets was, however, rare.

In 309 instances, X-ray pictures of the left wrist were obtained after death. Most of them were normal. Abnormality was most frequent at the lowest weights. It could occur without histological signs of rickets, and it is thought that it was associated with poor development of the skeleton rather than with rickets.

On analysis of the results no evidence was obtained that shortage of vitamin D or of minerals in pregnancy had been the cause of the rachitic changes. Twins had the same histological picture.

The meaning of the results is discussed, and it is concluded that "Apparently the changes in bone structure are caused by a discrepancy between bone growth and mineralization, but the cause of this discrepancy is open to discussion".

E. M. Hume.

4985

GIRARDET, P. Hypersensibilité à la vitamine D_3? [**Hypersensitivity to vitamin D_3?**] *Helv. paediat. Acta*, 1956, **11**, 118–124. [Serv. Pédiatrie, Hôp. de la Ville, Neuchâtel.] German, English and Italian summaries.

Two cases are described in which mild signs of vitamin D excess appeared after amounts of vitamin D no greater than normal.

A boy of 4 months had 4000 I.U. vitamin D_3 daily for 2 weeks and a single dose of 600,000 I.U. about 6 weeks later. He had transitory albuminuria with casts, and the existing craniotabes was unaffected.

The second boy was aged 21 months. At 19 months he received a single dose of 600,000 I.U. vitamin D_3. His development was arrested, he had slight hydrocephalus, and transitory albuminuria with casts. He was subsequently given a single dose of 600,000 I.U. every month, in all 4 times. Each time the signs returned but disappeared again in about 3 weeks.

Neither child had a blood Ca value above the high normal. The kidney defect is regarded as a primary defect, since it could not have been caused by high blood Ca, which is usually held responsible. It is suggested that the greater activity attributed to vitamin D_3 may have contributed to the effect.—E. M. Hume.

4986

GIRARDET, P. De l'extrême tolérance à l'hypersensibilité à la vitamine D. 3. [**From extreme tolerance to hypersensitivity for vitamin D_3.**] *Pédiatrie*, 1956, **11,** 277–281. [Serv. Pédiatrie, Hôp. de la Ville, Neuchâtel.]

The author complains of the difficulty of fixing the right dose of vitamin D for treatment of human rickets. Three cases are quoted in illustration. One boy, aged 4½ years, backward and rachitic, showed slow growth and gradual healing when given 600,000 I.U. vitamin D_3 once a week for 2 years. No sign of overdosage was seen. At the other extreme are the 2 cases described in the preceding Abst.

The question is posed whether the last two cases should be regarded as the result of overdosage or of hypersensitivity. Whatever the explanation they are put forward as a warning.—E. M. Hume.

4987

SCHIAVINI, C. A. Cystinurie, cystinose et maladie de de Toni-Debré-Fanconi. [**Cystinuria, cystinosis and de Toni, Debré and Fanconi's disease.**] *Pédiatrie*, 1956, **11,** 181–203. [Osp. Maggiore, Sez. Pediat., Novara, Italy.]

The article seeks to clarify the differential diagnosis of cystinuria, cystinosis and the syndrome of de Toni, Debré and Fanconi, but it is left in doubt whether the last two, in both of which rachitic changes of the bone and low blood phosphate are present, are the same or not.

E. M. Hume.

4988

Hoo, L. K. Bijdrage tot de ziekte van Lignac-Fanconi of het syndroom van Debré-de Toni-Fanconi. [**The disease of Lignac and Fanconi or syndrome of Debré, de Toni and Fanconi.**] *Maandschr. Kindergeneesk.*, 1956, **24,** 37–48. [Kinderklin., Univ. Amsterdam.] English summary.

The case described is that of a child 6 years old, very backward, severely rachitic and with cataract. Albumin and cystine were present in the urine with an abnormally high amount of other amino acids. Crystals of cystine or tyrosine were not found in the bone marrow. The serum value for Ca was 11·5, and for inorganic P 2·1, mg. per cent. The general state improved with 50,000 "units" vitamin D daily, and drinks of Na and K citrate solution, but development was no better.

E. M. Hume.

4989

JEAN, R. Syndrome biologique évoquant celui du syndrome de de Toni-Debré-Fanconi au cours d'une intoxication par le plomb. [**Biological syndrome giving rise to that of de Toni, Debré and Fanconi in the course of lead poisoning.**] *Pédiatrie*, 1956, **11,** 263–265. [Montpellier.]

A child three years old was admitted to hospital with vomiting, weakness and signs of intracranial pressure of one week's duration. The urine contained glucose, phosphates and 12 amino acids but not cystine. Blood inorganic P was low. The condition suggested the syndrome of de Toni, Debré and Fanconi but the X-ray showed no sign of rickets. A blood test for lead showed 0·25 mg. per 100 ml. The condition gradually subsided spontaneously in hospital. It is concluded that subacute lead poisoning produced an effect on renal tubular re-absorption like that characteristic of the syndrome of de Toni, Debré and Fanconi.

E. M. Hume.

4990

ALBRIGHT, F. **Hypoparathyroidism as a cause of osteomalacia.** *J. Clin. Endocrinol.*, 1956, **16,** 419–425. [Med. Serv., Massachusetts Gen. Hosp., Boston.]

4991

SEGAR, W. E., IBER, F. L. and KYLE, L. H. (with LAWSON, N. and HACKLEY, B.) **Osteomalacia of unknown etiology.** *New Engl. J. Med.*, 1956, **254,** 1011–1017. [Dept. Metabol., Div. Med., Walter Reed Army Med. Centre, Washington, D.C.]

Osteomalacia is described in a 25-year-old negro whose condition was studied in great detail. Vitamin D_2, 100,000 "units" daily, was at first without effect. After 6 weeks Ca absorption

improved, but never to an extent sufficient to heal the osteomalacia. Excretion of P in the urine was excessive and could not be attributed to renal tubular insufficiency.—D. Harvey.

Vitamin E

4992

NITOWSKY, H. M., GORDON, H. H. and TILDON, J. T. **Studies of tocopherol deficiency in infants and children. 4. The effect of alpha tocopherol on creatinuria in patients with cystic fibrosis of the pancreas and biliary atresia.** *Bull. Johns Hopkins Hosp.*, 1956, **98,** 361–371. [Dept. Paediat., Sinai Hosp., Baltimore, Md.]

For part 1 see Abst. 3633, Vol. 26.

The subjects of study were 5 boys, aged from 3 to 10½ years, with cystic fibrosis of the pancreas, and 2 male infants, aged 4½ and 9 months, with congenital biliary atresia. The extent of haemolysis of the erythrocytes by hydrogen peroxide and the values for tocopherol in the plasma and for creatine and creatinine in the urine were estimated before and after supplements of tocopherol esters were given while the patients were receiving diets low in creatine, with no meat, fish or soup which might directly affect creatine excretion. In all 7 patients tocopherol in the plasma rose when tocopherol esters were given, orally or intravenously, and the percentage of erythrocytes haemolysed fell. In one subject tocopherol in the blood rose from about 1·8 to about 7·0 mg. per 100 ml. in 22 days and percentage haemolysis fell from about 60 to 3. Creatine in the urine decreased, absolutely or in proportion to the amount of creatinine present, in all the patients with cystic fibrosis of the pancreas, but not in the infants with biliary atresia, whose excretion of creatine remained at about 30 to 35 per cent. of the total creatinine excreted. The significance of the findings is discussed in relation to the extreme muscular weakness of patients with cystic fibrosis.—I. M. Sharman.

4993

OPPENHEIMER, E. H. **Focal necrosis of striated muscle in an infant with cystic fibrosis of the pancreas and evidence of lack of absorption of fat-soluble vitamins.** *Bull. Johns Hopkins Hosp.*, 1956, **98,** 353–359. [Dept. Pathol., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

The case is reported of a male child who died at the age of 24 months with respiratory infection associated with congenital cystic fibrosis of the pancreas. The infant had no trypsin activity in the duodenal juice, but no estimation was made of tocopherol in the blood or of the amount of creatinine excreted during life, and there was no clinical proof of deficiency of vitamin E. Deficiency of other fat-soluble vitamins was shown by the anatomical lesions of rickets and by foci of squamous metaplasia in the bronchial epithelium, found at post-mortem examination performed 14 hr. after death. Photomicrographs showed that lesions in the psoas muscle resembled those in striated muscle of rabbits deprived of vitamin E. At a magnification of 100, the psoas muscle showed focal necrosis of fibres, proliferating sarcolemma nuclei and a few inflammatory cells; at a magnification of 150, loss of striae in hyaline fibres was evident.—I. M. Sharman.

4994

HORVÁTH, G., KOVÁCSOVICS, T. and POTONDY, A. Wirkung von Vitamin E auf den in vitro-Stoffwechsel der menschlichen Plazenta. [**Effect of vitamin E on the metabolism of the human placenta *in vitro*.**] *Acta physiol. hung.*, 1956, **9,** *Suppl.*, 41. [Pathophysiol. Inst., Med. Univ., Budapest.]

4995

SUCHAN, M. Vývojové poruchy tkání mesenchymového původu s projevy zvýšené krvácivosti. Úloha vit. E. [**Developmental disorders in tissues of mesenchymal origin with signs of increased haemorrhagic tendency. Part played by vitamin E.**] *Čas. Lék. čes.*, 1956, **95,** 177–182. [Central Haematol. Lab., Fac. Med., Prague.]

Vitamin B Complex

4996

SIMPSON, I. A. and CHOW, A. Y. **The thiamine content of human milk in Malaya. 1. The "normal" level of thiamine in milk from Malay, Chinese and Indian women.** *J. Trop. Pediat.*, 1956, **2,** 3–17. [Div. Biochem., Inst. Med. Res., Kuala Lumpur, Malaya.]

The thiochrome method was used after a study, of which details are given, of its applicability and especially of the possible production of an artefact during incubation with pepsin. There were 91 samples of milk from 36 Malay, 37 Chinese and 18 Indian mothers in full lactation from the second to the seventh month or longer. Samples were collected also during early stages from 1, 24 and 10 women in the same order of race in their first week and from 6, 3 and 4 during their second to fourth weeks of lactation. None had clinical signs of vitamin B_1 deficiency or other nutritional deficiency; some had anaemia, but its origin and cause were not investigated. As far as was known no mother had extra vitamin B_1 over and above that in her diet.

The mean vitamin B_1 content during full lactation was 11·3 μg. per 100 ml.; the range was from 3·0 to 20·4, but the range of the means for different

months of lactation was narrow, from 10·2 to 11·7. Only 18 samples had values above 15, which was considered satisfactory; the values for 65 were between 6 and 15 and for 8 were less than 6. It is concluded that the intake of vitamin B_1 in Malaya is insufficient to maintain an adequate concentration in breast milk.

For the early samples a mean of 3·2 μg. per 100 ml. during the first week and of 4·8 later in the first month confirmed earlier workers' findings of a gradual increase during early lactation.

D. Harvey.

4997

KIKODZE, I. A. O vliyanii vitamina B_1 na arterial'noe davlenie. [**The influence of vitamin B_1 on arterial pressure.**] *Klin. Med., Mosk.*, 1955, **33,** No. 10, 50–53. [Propedevt. Terap. Klin., Lenin Med. Inst., Moscow.]

The subjects were 81 men and 38 women with a variety of disorders. They were divided into 2 groups, 27 with arterial pressures above 140 mm. and 92 with normal pressures. First, 14 of the first group and 5 of the second received a single intramuscular injection of 15 mg. vitamin B_1. The others received more prolonged treatment with vitamin B_1 injected into vein or muscle in different doses, an average of 20 injections of 10 or 50 mg. each.

Although in some patients arterial pressure rose, in others it fell or was unchanged, and it was not possible to ascribe any definite effect to the vitamin.

D. Duncan.

4998

ZIELHUIS, R. L. **Enlargement of the heart to the right and nutritional deficiency.** *Doc. Med. geogr. trop.*, 1956, **8,** 179–184. [Billiton Maatschappij, Ltd., Indonesia.]

The incidence of right-sided enlargement of the heart was estimated by percussion in groups of Indonesian and Chinese labourers and their families in the Riau Archipelago. Enlargement was present in all the groups but was more frequent in the Indonesians than the Chinese; it was frequently found in several members of the same family. The basic ration given to the labourers was of polished rice and the incidence of enlargement varied inversely with the intake of supplementary foods supplying vitamin B_1. Classical signs of vitamin B_1 deficiency were frequent, and it was considered probable that the enlargement of the heart was a sign of the same deficiency.

L. Wills.

4999

BAUER, H. Die Brenztraubensäurekonzentration im Blut von multiplen Sklerosen und Kontrollfällen. Vergleichende Studien zur Methodik und klinischen Bedeutung der Brenztraubensäurebestimmung im Blut. [**Pyruvic acid in blood in patients with multiple sclerosis and control subjects. Comparative studies of the technique and clinical significance of estimation of pyruvic acid in the blood.**] *Biochem. Ztschr.*, 1956, **327,** 491–501. [Neurol. Klin., Univ. Hamburg, Eppendorf.] English summary.

A chromatographic method with dinitrophenylhydrazine and lactic acid dehydrogenase was used to estimate pyruvic acid in venous blood deproteinised with trichloroacetic acid. It was shown first that stasis of the blood and muscular exercise raised both pyruvic acid and lactic acid in blood to twice the resting value in free-flowing blood. There was no difference in pyruvic and lactic acid mean values and range between 33 patients with multiple sclerosis, per cent., pyruvic 0·55 mg. (0·23 to 0·82), lactic 7·5 mg. (4·1 to 13·9) and 42 healthy subjects, pyruvic 0·53 mg. (0·30 to 0·81) and lactic 8·1 mg. (5·4 to 11·0), a result which contradicts earlier reports. Nor was pyruvic acid higher in acute than in chronic sclerosis; indeed, the difference was the other way round and is attributed to the spasticity of muscle.

Vitamin B_1 phosphate, 100 to 250 mg., or vitamin B_1 pyrophosphate, 100 to 150 mg., was given by intravenous injection to healthy volunteers; there was no change in the blood sugar value but in 4 out of 5 tests blood pyruvic acid fell abruptly though never to a value below the lower limit of normal.

In comparison with the modification of the method used here to include an enzyme, the more usual form of the dinitrophenylhydrazine method gave values 30 to 40 per cent. higher, a difference which is ascribed to non-specific reaction with the reagent of other acids, particularly acetic and α-ketoglutaric.—I. Leitch.

5000

REYMOND, C., WILD, C., BÉRAUD, T. and VANNOTTI, A. Cocarboxylase et sclérose en plaques. [**Cocarboxylase and multiple sclerosis.**] *Schweiz. med. Wochenschr.*, 1956, **86,** 328–331. [Clin. Méd., Univ. Lausanne.]

Estimation of blood cocarboxylase by the method of Westenbrink and Stein-Parvé (see Title 330, Vol. 20), showed lower values for 15 patients with multiple sclerosis than for 36 normal subjects. Fasting values for lactate and pyruvate in the blood were similar in patients and normal subjects, but after intravenous injection of fructose both values rose higher in patients, and returned more slowly to normal. It is suggested that the disturbances of carbohydrate metabolism might be related to failure of phosphorylation of vitamin B_1 in multiple sclerosis and that treatment with cocarboxylase might be helpful.

A. M. Copping.

5001

ANTTONEN, V. M. and HEIKINHEIMO, H. **Does treatment with vitamin B_1 influence sero-resistant syphilis?** *Ann. Med. exp. Biol. Fenn.*, 1955, **33**, 372–377. [Lab. Serol. Bacteriol., Kupio.]

In 23 patients with sero-resistant syphilis, the administration of 500 mg. vitamin B_1 daily for 10 days had no consistent effect in weakening the results of the Wassermann and Kahn reactions.

L. Wills.

5002

MAINARDI, L. Considerazioni su nuovi aspetti biochimici e di alimentazione nella pellagra. [**New biochemical and nutritional aspects of pellagra.**] *Acta vitaminol.*, 1956, **10**, 49–55. [Lab. Direz. Med. Centrale, Lepetit S.p.A., Milan.] French, English, German and Spanish summaries.

A theoretical discussion of recent information.

5003

GOLDSMITH, G. A., GIBBENS, J., UNGLAUB, W. G. and MILLER, O. N. **Studies of niacin requirement in man. 3. Comparative effects of diets containing lime-treated and untreated corn in the production of experimental pellagra.** *Amer. J. Clin. Nutrition*, 1956, **4**, 151–160. [Div. Nutrit. Metabol., Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

For part 2 see Abst. 1043, Vol. 26.

Pellagra was produced in 4 women in repeated trials with a diet containing from 15 to 20 per cent. of unmilled maize from Guatemala; the maize was treated with lime in the traditional manner or was untreated. The respective nicotinic acid contents of the diets were 16 and 17·4 μg. per g. dry weight. As judged by the time when signs appeared, or by the daily urinary excretion of nicotinic acid metabolites while the deficient diet was being eaten or after more nicotinic acid and tryptophan had been given, treatment with lime had no effect on the pellagra-producing properties of the maize. In a previous study (Abst. 856, Vol. 23) pellagra was produced in 3 subjects by a diet containing unenriched milled maize from the United States with amounts of nicotinic acid and tryptophan similar to those in the Guatemalan diets, but signs appeared later with the United States maize than with the Guatemalan maize. Though deficiency of nicotinic acid and tryptophan may be of prime importance in the production of pellagra by maize diets, the findings in the present work support the view that other substances, possibly in the germ or bran, may operate also.

L. Wills.

5004

GOLDSMITH, G. A. **Experimental niacin deficiency.** *J. Amer. Dietetic Assoc.*, 1956, **32**, 312–316. [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

The description is summarised and discussed of nicotinic acid deficiency experimentally induced in 12 adult subjects by prolonged feeding with diets based on maize or wheat. Most of the results have been published in detail elsewhere (see Absts. 856, Vol. 23; 1043 and preceding Abst., Vol. 26).—A. M. Copping.

5005

SHPAK, V. M., KARSHENBAUM, R. I. and LYAKSUTKINA, M. F. Nablyudeniya nad ionoforezom nikotinovoi kisloty. [**Observations on ionophoresis with nicotinic acid.**] *Klin. Med., Mosk.*, 1955, **33**, No. 9, 92, [Kaf. Psikhiat., Med. Inst., Stalino.]

Treatment by ionophoresis with solutions of nicotinic acid was given to a number of patients with "hypertonic" disorders, including epilepsy, migraine and Ménière's syndrome. The results are said to be useful, but are not described.

D. Duncan.

5006

BESSEY, O. A., HORWITT, M. K. and LOVE, R. H. **Dietary deprivation of riboflavin and blood riboflavin levels in man.** *J. Nutrition*, 1956, **58**, 367–383. [Dept. Biochem. Nutrit., Univ. Texas Med. Branch, Galveston.]

Riboflavin, flavin mononucleotide and flavin dinucleotide were estimated fluorimetrically in red cells, white cells and blood plasma from men whose intake of riboflavin over long periods was known. For 10 men restricted to an intake of 0·55 mg. daily for 16 months the riboflavin content per 100 ml. red cells was from 10·0 to 13·1 μg. compared with from 20·2 to 27·6 μg. for 6 men taking from 2·55 to 3·55 mg. daily. Free riboflavin and mononucleotide in the plasma were generally less in men with restricted intake of riboflavin, but the values for dinucleotide in the plasma and for total riboflavin in the white cells were little changed. In another group of men riboflavin in the red cells was measured at intervals for 9 months on a diet containing only 0·5 mg. daily. Within 45 days there was a significant decrease, which progressed throughout the period of restriction. It was concluded that the riboflavin content of the red blood cells is a useful index to the state of riboflavin nutrition.

A. M. Copping.

5007

SCHAUS, R. and KIRK, J. E. **The riboflavin concentration of brain, heart, and skeletal muscle in individuals of various ages.** *J. Gerontol.*, 1956, **11**, 147–150. [Div. Gerontol., Sch. Med., Washington Univ., St. Louis.]

Riboflavin was estimated fluorimetrically by the method of Bessey *et al.* (Abst. 3377, Vol. 19) in

tissues obtained at autopsy. Results are tabulated for 89 samples of cerebral cortex, 86 of heart and 88 of pectoral muscle from persons aged from 7 days to 92 years. The average concentration of riboflavin in μg. per g. wet tissue was 2·72 in brain, 12·38 in heart and 2·48 in skeletal muscle. No correlation between concentration and age was obtained except for a decrease of riboflavin in heart tissue in subjects over 80 years of age.

A. M. Copping.

5008

HIRASHIMA, H. **[Studies on angular stomatitis in Tokushima prefecture. 2. Angular stomatitis in schoolchildren and middle-school students.]** *Shikoku Acta med.*, 1955, **7,** No. 6, 7–11. In Japanese: English summary. [Dept. Paediat., Sch. Med., Tokushima Univ.]

For part 1 see Abst. 3653, Vol. 26.

In the years 1952 to 1954 children numbering 17,152 were examined, 50 boys and 51 girls in kindergartens, 7237 boys and 6895 girls in elementary schools and 1499 boys and 1420 girls in middle schools. Angular stomatitis was commoner in boys than girls, the percentage incidence for the groups in the above order being 10·0, 18·9 and 19·1 for boys and 5·9, 9·9 and 9·4 for girls. Except for the small numbers in kindergartens the children were grouped also according to place of abode. For those in elementary schools of whom 2797 were in towns and 7419, 2488 and 1428 in villages described, respectively, as agricultural, mountain and fishing, the percentage incidence was 5·0, 17·1, 17·8 and 13·9. For the middle-school populations, 1623, 676 and 620, respectively, in agricultural, mountain and fishing villages, the incidence was 12·4, 20·0 and 13·5 per cent. The data are tabulated with headings in English. (From summary.)

D. Harvey.

5009

VOELKEL, A. Über die Wirkung von insulinsynergetischen Substanzen und von Pantothensäure im Insulinschock. **[Effect of insulin-synergetic substances and pantothenic acid in insulin shock.]** *Naturwissenschaften*, 1956, **43,** 208. [Nervenklin. Waldhaus, Berlin-Nikolasse.]

The insulin-synergic sulphanyl urea compounds and pantothenic acid increased the effect of insulin and decreased the time taken to produce complete shock, and with both the recovery time after administration of glucose was shortened.

L. Wills.

5010

WRIGHT, L. D., CRESSON, E. L. and DRISCOLL, C. A. **Biotin derivatives in human urine.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 248–252. [Res. Labs., Sharp and Dohme, Div. Merck and Co., West Point, Pa.]

Free biotin in 4 samples of human urine was estimated with *Lactobacillus arabinosus* and total biotin with *Neurospora crassa*. Direct microbiological methods and bio-autographic procedures were used. There were relatively large amounts of free biotin in all samples and very small additional amounts of biotin that could be measured with *Neurospora crassa*. Chromatographic studies suggested that the substance additional to free biotin might be " biocytin sulphoxide ". All the biotin in urine was capable of being combined with avidin. The results are discussed with reference to reports by other workers of unusual biotin derivatives in urine.—A. M. Copping.

5011

NELSON, E. M. **Association of vitamin B_6 deficiency with convulsions in infants.** *Pub. Health Rep., Washington*, 1956, **71,** 445–448. [Div. Nutrit., Food and Drug Admin., Dept. Health, Educat. Welfare, Washington, D.C.]

The part is outlined that was played by the Food and Drug Administration in establishing that deficiency of vitamin B_6 was the cause of an outbreak of convulsions in infants fed on a proprietary infant food (see Abst. 2690, Vol. 25).

F. C. Aitken.

5012

HARRIS, J. W., WHITTINGTON, R. M., WEISMAN, R. (Jr.) and HORRIGAN, D. L. **Pyridoxine responsive anemia in the human adult.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 427–432. [Dept. Med., Cleveland City Hosp., Ohio.]

A man of 27 had severe hypochromic anaemia without disturbances of the skin, tongue or nervous system. He had an adequate diet providing about 3 mg. pyridoxine daily. His signs and symptoms were abolished by transfusions and there was a spontaneous remission lasting 5 years and then a relapse. No haemolysin or agglutinin was found and red cell fragility was normal, but red cell survival time was low. There was no response to different liver extracts given by intramuscular injection or by mouth, to brewer's yeast, ferrous sulphate, Co, folic acid, ascorbic acid, leucovorin, cyanocobalamin, pantothenic acid, cortisone, human plasma, or a preparation containing vitamins A, D, B_1, ascorbic acid, riboflavin and nicotinic acid, but the Hb level was maintained by repeated transfusion of whole blood. Pyridoxine hydrochloride, 200 mg. by intramuscular injection daily, produced rapid subjective improvement, a reticulocyte peak of 50·8 per cent. and a rapid rise in Hb and haematocrit. When pyridoxine was withdrawn there was another relapse, but resumption of treatment with 10 mg. pyridoxine daily was successful. Tryptophan metabolism was abnormal, as shown by the abnormal metabolites in the urine.—D. Duncan.

5013

WEIDEMANN, J. Über zentrale psychophysiologische Veränderungen nach oralen Folsäuregaben. [**Central psychophysiological changes after oral administration of folic acid.**] *Arch. Psychiat. Nervenkrankh.*, 1955, **193**, 383–390. [Klin. Berufserkrankungen Kloster Grafschaft, Hochsauerland.]

To test the possible effect of folic acid on the central nervous system, a daily dose of a preparation of the vitamin B complex devoid of folic acid, or of 1·2 mg. folic acid was given for 19 days to 2 groups each of 10 healthy young men. Critical flicker fusion frequency was measured throughout the test and for a week afterwards. The preparation of vitamin B complex produced a small but constant decrease in the critical frequency which persisted during the week after treatment, but folic acid produced a marked and significant increase in the frequency, which showed 2 peaks, one on the third day of treatment and the other in the week after treatment. The significance of the results is discussed.—L. Wills.

5014

SILVERMAN, M. and GARDINER, R. C. **Labile citrovorum factor in urine.** *J. Bacteriol.*, 1956, **71**, 433–438. [Nat. Inst. Arthritis Metabol. Dis., Nat. Insts. Health, Bethesda, Md.]

Urine from human subjects from 3 to 5 hr. after they had taken 5 or 15 mg. folic acid by mouth contained a growth factor for *Leuconostoc citrovorum*. It was rapidly destroyed in samples stored at room temperature or autoclaved, but not if ascorbic acid was added. Chromatographic studies showed that the labile compound was a reduced N^{10} formylfolic acid derivative. The implications of the findings are discussed with reference to studies of the identity of citrovorum factor from liver, from *Streptococcus faecalis* and from urine.—A. M. Copping.

5015

CRAIGMILE, D. A., PRESTON, J. E. and BERRY, W. T. C. **Similarity of growth and health in day nursery children with and without vitamin B_{12} supplements.** *Monthly Bull. Minist. Health and Pub. Health Lab. Serv.*, 1956, **15**, 78–79. [Dept. Pub. Health, Birmingham.]

The gains in height and weight of 22 nursery schoolchildren given 50 μg. vitamin B_{12} each day of attendance for 6 months were not significantly different from those of a group of 25 children given dummy doses. The average time of absence due to colds and measles was about the same in the 2 groups. Previous administration of vitamin B_{12} apparently did not hasten recovery.

F. C. Aitken.

5016

GIRDWOOD, R. H. **The megaloblastic anaemias: their investigation and classification.** *Quart. J. Med.*, 1956, **25**, 87–119. [Dept. Med., Univ. Edinburgh.]

Over 1000 patients with megaloblastic anaemia were examined, in India, Burma, Great Britain and the United States. In many, vitamin B_{12} in the serum was estimated with *Lactobacillus leichmannii*, and folic acid output in the urine was studied after test doses given by mouth and subcutaneously. Illustrative histories of 15 patients are given.

Estimation of vitamin B_{12} in the serum is considered especially valuable for early diagnosis of Addisonian anaemia and anaemia after gastrectomy. Nutritional anaemias need more investigation by modern methods. Tropical megaloblastic anaemia of pregnancy is considered to be probably the same as nutritional megaloblastic anaemia. The form occurring in Britain is associated with a normal serum value for vitamin B_{12} and normal absorption of folic acid, and interference with folic acid metabolism is postulated as the cause. Reasons for failure of some patients to respond to treatment are discussed.—D. Duncan.

5017

VINKE, B. and VAN DER SAR, A. **Megaloblastic nutritional anaemia in Curaçao.** *Doc. Med. geogr. trop.*, 1956, **8**, 151–163. [Dept. Int. Med., Pub. Health Serv., Netherlands Antilles.]

Megaloblastic anaemia, confirmed by sternal puncture, was found in 16 negroid women, 1 negroid man and 1 European. Pernicious anaemia and sprue were excluded by examination of stomach contents and stool, the clinical history and the results of treatment. Signs of subacute combined degeneration of the cord were absent in all the patients. The basis of the diet was maize; few vegetables were eaten. All the patients were undernourished. The results of therapeutic trials with iron, Marmite and folic acid given by mouth and with vitamin B_{12} and citrovorum factor given parenterally showed that most of the patients lacked iron, 17 were deficient in vitamin B_{12} and 1 had a simple deficiency of folic acid. Deficiency of vitamin B_{12} and folic acid was present in 3 patients and probably also in another 5. Analysis of the serum of 2 patients showed low values for vitamin B_{12} and folic acid. The influence of diet and of the body's stores of vitamin B_{12} and folic acid on the development of megaloblastic anaemia is discussed.—L. Wills.

5018

HARRISON, R. J., BOOTH, C. C. and MOLLIN, D. L. **Vitamin B_{12} deficiency due to defective diet.**

Lancet, 1956, **270**, 727–728. [St. James' Hosp., London.]

A woman of 77 with megaloblastic anaemia had a low value for vitamin B_{12} in the serum and the anaemia responded when vitamin B_{12} was given by intramuscular injection. Despite a gastro-enterostomy made 35 years previously, fat balance was normal, and so was absorption of radio-active vitamin B_{12} given by mouth. The findings of gastric biopsy were not consistent with a diagnosis of Addisonian pernicious anaemia. For the past 10 years the woman had lived on a diet of bread and margarine, tea with a little milk, and potatoes. Vitamin B_{12} intake, from the milk, was estimated to be 0·4 μg. daily. It was concluded that the case was one of dietary deficiency.—F. C. Aitken.

5019

DHOPESHWARKAR, G. A., TRIVEDI, J. C., KULKARNI, B. S., SATOSKAR, R. S. and LEWIS, R. A. **The effect of vegetarianism and antibiotics upon proteins and vitamin B_{12} in the blood.** *Brit. J. Nutrition*, 1956, **10**, 105–110. [Pharmacol. Res. Unit, C.S.I.R., Seth G.S. Med. Coll., Bombay.]

The volume of packed red cells and the content of albumin and of α- and β-globulin were measured in the blood of 5 vegetarian and 5 non-vegetarian students. The vegetarians took milk but no other animal protein. Albumin values were low and globulin high compared with those of the non-vegetarians. No difference was found between haematocrit values, but the vitamin B_{12} content of the blood was 12 mμg. per 100 ml. in the vegetarians and 41 in the non-vegetarians. Aureomycin, 50 mg. daily for 2 months, raised the albumin, reduced the globulin, and significantly increased the vitamin B_{12}, in the plasma of the vegetarians.—A. M. Copping.

5020

LÁZNIČKA, M. Antiperniciosní princip pivovarských kvasnic v léčbě makrocytových anemií. **[Anti-pernicious-anaemia principle of brewer's yeast in the treatment of macrocytic anaemias.]** *Čas. Lék. čes.*, 1956, **95**, 217–225.

5021

ROSENBLUM, C., YAMAMATO, R. S., WOOD, R., WOODBURY, D. T., OKUDA, K. and CHOW, B. F. **Comparative absorption of vitamin B_{12} analogues by normal humans. 2. Chloro-, sulfato-, nitro- and thiocyanato- *vs* cyanocobalamin.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91**, 364–367. [Merck, Sharp and Dohme Res. Labs., Rahway, N.J.]

It was confirmed that the rate of absorption of cyanocobalamin was greater than that of chlorocobalamin, as reported previously (Abst. 1068, Vol. 26). It had been found also that sulphato-, nitro-, thiocyanato- and nitro-cobalamin derivatives were less well absorbed than cyanocobalamin by both man and the rat. In the present experiments excretion was measured in the urine and faeces of human subjects and in the faeces of rats. The amount of vitamin B_{12} or its analogue was measured in the serum of some subjects and the results confirmed those of the excretion tests.

A. M. Copping.

5022

MACLEAN, L. D. and SUNDBERG, R. D. **Incidence of megaloblastic anemia after total gastrectomy.** *New Engl. J. Med.*, 1956, **254**, 885–893. [Dept. Surg., Med. Sch., Univ. Minnesota, Minneapolis.]

Of 13 patients shown by microscopic examination of the tissue removed at operation to have undergone complete gastrectomy, who survived for 3 years or longer, and for whom all the necessary information was available, megaloblastic anaemia indistinguishable from pernicious anaemia developed in from 2 years 8 months to 7 years 5 months in 10; 2 patients received prophylactic treatment and remained well, and the remaining patient examined after 2 years and 5 months did not then show any macrocytosis. In 4 patients at another hospital megaloblastic anaemia developed 3 or more years after total gastrectomy. The condition for which the operation was performed and the mode of reconstruction of the intestinal canal varied. In the whole series 5 of the patients had free HCl in the gastric juice before operation. All responded to parenteral vitamin B_{12}. The results and the literature are discussed and it is concluded that production of intrinsic factor is the only indispensable activity of the stomach in man.—L. Wills.

5023

BADENOCH, J., EVANS, J. R., RICHARDS, W. C. D. and WITTS, L. J. **Megaloblastic anaemia following partial gastrectomy and gastro-enterostomy.** *Brit. J. Haematol.*, 1955, **1**, 339–344. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

Five patients developed megaloblastic anaemia from 2 to 12 years after partial gastrectomy and one 17 years after gastro-jejunostomy. None had a family history of pernicious anaemia. All excreted subnormal amounts of uropepsinogen, and none had free HCl in the gastric juice, though 4 out of 5 were known to have had it before operation. In 5 of the 6 patients, gastric biopsy material showed severe or moderate atrophy of the glands, though in material removed at operation normal gastric-body glands were present; these 5 patients responded to treatment with vitamin B_{12}. Three patients had mild steatorrhoea, but

in the others the absorption of fat was nearly normal and the steatorrhoea was not considered of etiological importance. In 2 patients the serum vitamin B_{12} concentration was like that in pernicious anaemia, but in the others it was within normal limits. In all the patients the absorption of vitamin B_{12} was low, but was increased by the addition of intrinsic factor to the test dose. In the patient with no gastric atrophy, however, the absorption of the vitamin without addition of intrinsic factor was greater than is usual in pernicious anaemia and the etiology of that case remains obscure.—L. Wills.

5024

GARDNER, F. H. **Observations on the cytology of gastric epithelium in tropical sprue.** *J. Lab. Clin. Med.*, 1956, **47,** 529–539. [Trop. Res. Med. Lab., U.S. Army, San Juan, Puerto Rico.]

Samples of mucosal cells were obtained from the stomach with a rotating brush inserted through the mouth. Nineteen patients with untreated sprue and 22 without gastro-intestinal disease were studied. Abnormalities of squamous and columnar cells resembling those seen in pernicious anaemia were found in the patients with sprue. In 16 patients with sprue treated with folic acid or vitamin B_{12} the macrocytic anaemia disappeared after one month or longer; abnormal squamous cells disappeared after 3 months of treatment in all except 3 patients, but abnormal columnar cells persisted.—F. C. Aitken.

5025

BASTRUP-MADSEN, P. **Granulopoietic maturation disturbances as a sign of incipient pernicious anaemia. Illustrated by the clinical course in three cases.** *Acta med. scand.*, 1956, **154,** 325–332. [Dept. Med., Amtssygehus, Aarhus.]

In 3 patients with clinical signs and symptoms suggesting pernicious anaemia the diagnosis was at first rejected because the anaemia was mild and red cell formation in the bone marrow was normal. All 3 showed some abnormality in maturation of neutrophilic granulocytes. All 3 subsequently developed the neurological picture of true pernicious anaemia, and one after 8 years had typical megaloblastic anaemia. The importance of apparently slight changes in the bone marrow for early diagnosis of pernicious anaemia is suggested.

D. Duncan.

5026

ESTREN, S. and WASSERMAN, L. R. **Pernicious anemia. 1. Remission by small oral doses of purified vitamin B_{12}.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 499–503. [Dept. Haematol., Mount Sinai Hosp., New York.]

In 11 trials on 8 patients with pernicious anaemia in relapse, complete or partial remission followed the oral administration of purified, crystalline vitamin B_{12} in daily doses ranging from 5 to 16·8 μg. When treatment was stopped the remissions tended to be brief. Certain patients failed to respond a second time and 3 other patients failed to respond at all to the same oral doses. The findings, in the authors' opinion, support the view that the changes in gastric secretion in pernicious anaemia are quantitative rather than qualitative.

L. Wills.

5027

BRIGEAU, J., LAMBIN, S. and GERMAN, A. Sur la résorption de la vitamine B_{12} administrée par voie rectale. [**Absorption of vitamin B_{12} given by rectum.**] *C.R. Soc. Biol.*, 1956, **150,** 78–82.

Administration to human subjects of 1000 μg. vitamin B_{12} daily for from 5 to 7 days in a rectal suppository caused a rise in the vitamin B_{12} content of the blood as estimated with *Bacterium coli*. Small doses by rectum had no significant effect. Absorption appeared to be improved in 2 subjects when intrinsic factor or folic acid was given with vitamin B_{12}.—A. M. Copping.

5028

BAST, G. Beitrag zur Therapie der perniziösen Anämie mit oralen Kombinationspräparaten. [**Treatment of pernicious anaemia with combined oral preparations.**] *Ztschr. ges. inn. Med.*, 1956, **11,** 241–247. [Med. Klin., Univ. Rostock.]

For 22 patients, 2 oral preparations, Bifacton and Pylovit, each containing vitamin B_{12} and a preparation of intrinsic factor, were as effective as vitamin B_{12} given parenterally for treatment of decompensated pernicious anaemia in daily amounts containing from 15 to 50 μg. vitamin B_{12}. The effectiveness of the preparations for maintenance and treatment of subacute combined degeneration of the cord could not be judged as the periods of observation were too short.—L. Wills.

5029

BAKER, H., SOBOTKA, H., PASHER, I. and HUTNER, S. H. **Comparative study of vitamin B_{12} assay in urine.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 636–638. [Dept. Chem., Mount Sinai Hosp., New York.]

The vitamin B_{12} content of human urine was measured with *Ochromonas malhamensis*, *Euglena gracilis* and *Lactobacillus leichmannii*. In tests for recovery of vitamin B_{12} added to urine, satisfactory results were obtained with *Ochromonas* and *Euglena*. True vitamin B_{12} appeared to be measured by *Ochromonas*; higher results were obtained with *Euglena* and *L. leichmannii*, which responded to other members of the vitamin B_{12} group or to

other metabolites. Total output of vitamin B_{12} in 8 hr. after a dose of 50 μg. ranged from 0·6 to 28·7 μg. in 23 subjects. From the results of estimations by the 3 organisms amounts of interfering substances in urine could be estimated.

A. M. Copping.

5030

RABINER, S. F., LICHTMAN, H. C., MESSITE, J., WATSON, R. J., GINSBERG, V., ELLENBOGEN, L. and WILLIAMS, W. L. **The urinary excretion test in the diagnosis of Addisonian pernicious anaemia.** *Ann. Int. Med.*, 1956, **44,** 437–445. [Dept. Med., State Univ. New York Coll. Med., Brooklyn.] Interlingua summary.

A modification of Schilling's test was used in which the parenteral flushing dose of non-radioactive vitamin B_{12} was given on 2 successive days and the total urinary excretion of radio-activity during that period was estimated. The mean total excretion for 24 normal subjects was 13·3 with range 5·0 to 34·2 per cent. of the test dose of 2·0 μg. vitamin B_{12} ^{60}Co, and for 36 patients diagnosed as suffering from pernicious anaemia 0·85, with range 0·5 to 3·0 per cent. After the addition of intrinsic factor to the test dose the mean excretion for the 33 patients re-tested was 8·2 with range 1·8 to 19·2 per cent. Of the 33 patients, 26 had values within normal limits, 5 showed values above the upper limit for pernicious anaemia patients given the vitamin alone, but below the lower limit for normal subjects, and 2 patients continued to show very low rates of excretion. For the diagnosis to be one of true pernicious anaemia it is concluded that not only must the initial excretion of radio-activity after the test dose be outside the normal limits, but also it must be significantly raised when adequate amounts of a potent preparation of intrinsic factor are added to the test dose of vitamin B_{12} ^{60}Co.—L. Wills.

5031

BAKER, S. J. and MOLLIN, D. L. **The relationship between intrinsic factor and the intestinal absorption of vitamin B_{12}.** *Brit. J. Haematol.*, 1955, **1,** 46–51. [Dept. Pathol. Haematol., Postgrad. Med. Sch., Ducane Rd., London, W.12.]

Absorption of vitamin B_{12} was measured from the radio-activity of the faeces after a test dose of ^{58}Co-vitamin B_{12} in patients with pernicious anaemia in remission. Over a certain range of dosage there was a straight line relationship between the amount of vitamin B_{12} absorbed and the amount of intrinsic factor given; the slope of the line was termed the vitamin B_{12} absorption gradient. The gradient varied greatly from patient to patient and in some was flat, suggesting that absorption was poor and that oral treatment would not be effective. Beyond a certain level of dosage, which differed in different patients, further increase in the amount of intrinsic factor given did not increase absorption of vitamin B_{12}. If the amount of vitamin B_{12} given was varied and the dose of intrinsic factor was kept constant the total amount of vitamin absorbed remained the same. Very large intramuscular doses of vitamin B_{12} inhibited absorption of the vitamin given orally.—L. Wills.

5032

REISNER, E. H. (Jr.), GILBERT, J. P., ROSENBLUM, C. and MORGAN, M. C. **Applications of the urinary tracer test (of Schilling) as an index of vitamin B_{12} absorption.** *Amer. J. Clin. Nutrition*, 1956, **4,** 134–141. [Dept. Med., St. Luke's Hosp., New York.]

Absorption of vitamin B_{12} was estimated by Schilling's method after a standard oral dose of 2 μg. vitamin B_{12} ^{60}Co with a specific activity of 200 μC. per mg.

In 27 patients with pernicious anaemia the mean urinary excretion was 0·5 per cent. of the test dose; the addition of from 42 to 62 ml. of normal gastric juice increased the excretion to from 4·1 to 12·8 per cent. Trials with preparations of intrinsic factor in different doses showed that a net excretion of 2·5 per cent. or more of the test dose after the addition of intrinsic factor was generally a sign that the best clinical effect would be produced by that preparation given in the same dose.

In 13 patients with sprue the mean excretion was 1·1 per cent. of the test dose; the addition of a potent preparation of intrinsic factor to the test dose did not increase absorption in 9 of these patients or in another 7 with megaloblastic anaemia with achlorhydria, of whom 5 were from the tropics and had been diagnosed as having pernicious anaemia but who, as the result of the test, were considered to have some other condition.

L. Wills.

5033

CHOW, B. F., GILBERT, J. P., OKUDA, K. and ROSENBLUM, C. **The urinary excretion test for absorption of vitamin B_{12}. 1. Reproducibility of results and agewise variation.**

CHOW, B. F., WILLIAMS, W. L., OKUDA, K. and GRASBECK, R. **2. Effect of crude and purified intrinsic factor preparation.** *Amer. J. Clin. Nutrition*, 1956, **4,** 142–146; 147–150. [Dept. Biochem., Sch. Hyg. Pub. Health, Johns Hopkins Univ., Baltimore, Md.]

1. Absorption of vitamin B_{12} was studied in 40 normal men aged from 19 to 85 years by Schilling's urinary excretion test and by microbiological tests. Most of the vitamin B_{12} ^{60}Co, given by mouth, was excreted during the second half of the day and the mean 24-hr. excretion was

11·4 per cent. of the test dose; a microbiological test showed that most of the injected non-active vitamin B_{12} was excreted during the first 12 hr. and that excretion was almost complete in 24 hr. There was no significant difference in the excretion of vitamin B_{12} ^{60}Co between age groups, and repeat tests on 8 subjects aged from 20 to 26 years were reproducible within from 10 to 15 per cent. of the first value. Repeat tests on 8 older subjects showed greater variability but no significant increase in excretion after the addition of intrinsic factor to the test dose. In a few of the older subjects little of the radio-active vitamin was excreted.

2. Three preparations of intrinsic factor were tested on some of the younger subjects; 2 had potencies such that 25 and 50 mg., each with 15 μg. vitamin B_{12} ^{60}Co, equalled 1 U.S.P. unit, and one highly purified preparation had a potency such that 1 mg. with the same dose of the vitamin equalled 1 U.S.P. unit. Extensive trials showed that, after a dose of 2·0 μg. vitamin B_{12} ^{60}Co alone, urinary excretion in 24 hr. ranged from 204 to 240 mμg., and after 50 μg. from 442 to 491 mμg. One of the 2 crude intrinsic factor preparations in amounts equivalent to 4 U.S.P. units given with 50 μg. of the vitamin produced a statistically significant decrease in excretion to a value below the lower limit of excretion after the vitamin alone, but the addition of an equivalent amount of the purified extract produced a significant rise in excretion. Smaller doses of the crude extracts had no inhibitory effect on absorption after oral administration. The purified extract when tested by the microbiological or the dialysis method was shown to bind vitamin B_{12}. It is concluded that the binding property of the crude extracts was caused by an extraneous factor and not by the intrinsic factor itself.—L. Wills.

5034

BEST, W. R., WHITE, W. F., ROBBINS, K. C., LANDMANN, W. A. and STEELMAN, S. L. **Studies on urinary excretion of vitamin B_{12} Co^{60} in pernicious anemia for determining effective dosage of intrinsic factor concentrates.**

BEST, W. R., LANDMANN, W. A. and LIMARZI, L. R. **Time pattern of vitamin B_{12} Co^{60} urinary excretion in man after oral administration and parenteral "flushing".** *Blood, J. Hematol.*, 1956, **11,** 338–351; 352–356. [Dept. Med., Univ. Illinois Coll. Med., Chicago.] Interlingua summary.

(a) Schilling's urinary excretion test was made on patients with pernicious anaemia given 2·0 or 15·0 μg. vitamin B_{12} ^{60}Co with or without concentrates of intrinsic factor in doses of from 10 to 1600 mg. With both doses of the vitamin, excretion of radio-activity increased with intrinsic factor in small amounts, but showed little increase with moderate amounts and frequently a decrease with large amounts; excretion of the vitamin with both doses appeared to be linearly related to the logarithm of the dose of intrinsic factor. Thirteen of the patients who were in relapse were given one or other of the doses of vitamin B_{12} ^{60}Co with different amounts of the intrinsic factor under test and progress was assessed haematologically. At the end of each clinical trial urinary excretion was tested with the dose of vitamin and intrinsic factor used in that trial. The results of clinical trials and excretion tests showed fair correlation. The values for excretion of vitamin B_{12} ^{60}Co in the urine suggested that a mean between 500 and 550 mμg. per 24 hr. indicated a degree of absorption that would produce a remission in most cases. Techniques are discussed.

(b) Repeated serial estimations of the urinary output of radio-activity during the 28 hr. after an oral test dose of 2·0 μg. vitamin B_{12} ^{60}Co followed in 2 hr. by a parenteral flushing dose of 1000 μg. non-radio-active vitamin B_{12} were made on 5 control subjects, and 10 patients with pernicious anaemia to whom the oral test dose was given alone or with a potent preparation of intrinsic factor. In all the tests there was little difference in the time pattern of excretion even when no intrinsic factor was given and the amount of radio-activity excreted was very small. In the 4 hr. after the oral dose little radio-activity was excreted in the urine; excretion then rose to a peak or peaks between the sixth and twelfth hours and then fell to a low level. Almost all the radio-activity was excreted in the first 24 hr.—L. Wills.

5035

ELLENBOGEN, L. and WILLIAMS, W. L. **Improved urinary excretion test for assay of intrinsic factor. 2. Sensitive counting technic.** *Proc. Soc. Exp. Biol. Med.*, 1956, **91,** 617–619. [Nutrit. Physiol. Sect., Res. Div., Amer. Cyanamid Co., Lederle Labs., Pearl River, N.Y.]

A modification of the method of measuring radio-activity in the urine of human subjects given vitamin B_{12} containing ^{60}Co (Abst. 1073, Vol. 26) introduced a beaker fitting into the well of a scintillation counter. Large volumes of urine with a low count could be examined, and so smaller doses of radio-active vitamin B_{12} could be given in successive tests on the same patient.

A. M. Copping.

5036

GLASS, G. B. J., GOLDBLOOM, A. A., BOYD, L. J., LAUGHTON, R., ROSEN, S. and RICH, M. **Intestinal absorption and hepatic uptake of radioactive vitamin B_{12} in various age groups**

and the effect of intrinsic factor preparations. *Amer. J. Clin. Nutrition*, 1956, **4**, 124–133. [Dept. Med., New York Med. Coll.]

Absorption of vitamin B_{12} from the intestine was estimated by measurement of uptake in the liver after a dose of 0·5 μg. vitamin B_{12} ^{60}Co with or without intrinsic factor; the counts of radio-activity were made on the sixth and seventh days after the test dose. The method used is described. Tests were made with 60 subjects aged from 18 to 90 years, and free from anaemia and organic disease of the digestive tract or liver. Gastric acidity was estimated in 41 of them. A scatter diagram of the values for radio-activity in the liver showed no obvious decrease with advancing age and in all age groups the range of values was wide. The range was greater in subjects with normal acidity than with hypo- or anacidity, and in 30 subjects over the age of 60 years the counts were significantly lower in those with defective acidity than in those with normal acidity. There was a significant increase of uptake in the liver when intrinsic factor was given with vitamin B_{12} in 20 of 44 subjects; of these 10 out of 14 tested had hypo- or anacidity.—L. Wills.

5037

Milevskaya, Yu. L. Soderzhanie vitamina B_{12} v krovi u bolnykh pernitzioznoi anemiei. **[Concentration of vitamin B_{12} in the blood of patients with pernicious anaemia.]** *Klin. Med., Mosk.*, 1955, **33**, No. 12, 53–58. [Moscow.]

Twenty patients were studied, 18 with pernicious anaemia, 1 with chronic enterocolitis with anaemia of the type found in European sprue, and 1 with anaemia after resection of the small intestine. All had severe anaemia with Hb from 13 to 35 or 40 per cent. [standard not quoted] and erythrocytes from 840,000 to 2,000,000. All were treated with vitamin B_{12} only, except one with Hb 13 per cent. and erythrocytes 840,000 who required transfusion. Haematological tests of bone marrow were made on 12 patients before and 24 and 28 hr. after treatment, 4 with 15 μg. and 8 with 30 μg. vitamin B_{12}. In all, blood formation changed from megaloblastic to normoblastic, and in peripheral blood reticulocytes were between 6 and 35·6 per cent., in one case 53 per cent. The speed and completeness of remission were not strictly related to dosage; on the average, the amount of vitamin B_{12} required to raise the erythrocyte count to 4 or 4·5 million was from 30 to 120 μg. Hb and erythrocyte values in a given patient reached a maximum which was not exceeded when more vitamin B_{12} was given. In most patients remission occurred after from 18 to 28 days. They were not treated after discharge and, within the first year, 3 patients relapsed after 6 or 7 months and returned for further treatment.

Vitamin B_{12} in large doses, 240 μg. in the case described, was found beneficial also in subacute combined degeneration.

In blood from 5 healthy persons concentrations of vitamin B_{12} ranged from 0·6 to 1·15 mμg. per 100 ml., which is in fair agreement with values obtained by other investigators. Patients with severe megaloblastic anaemia and Hb from 13 to 35 per cent. had concentrations below 0·008 mμg. per ml. Vitamin B_{12}, 15 μg. by injection, raised the concentration to normal or above within from 3 to 6 hr., but the rise was not maintained. There was considerable individual variation in response to the same amount of vitamin B_{12}.

In Fe-deficiency anaemia vitamin B_{12} was said to improve the utilisation of Fe.—F. Billewicz.

5038

Karlin, R. and Dumont, M. Sur le taux de vitamine B_{12} dans le sérum sanguin chez la femme au cours de l'accouchement, dans celui du cordon et dans le placenta. **[Vitamin B_{12} in the blood serum of women during labour, in the cord blood and in the placenta.]** *C.R. Soc. Biol.*, 1955, **149**, 1986–1988. [Inst. Pasteur.]

In 30 women delivered at term and 9 delivered after between 6 and 8 months' gestation, the vitamin B_{12} content of the serum was estimated during labour. The vitamin was estimated also in the cord blood at birth and in an aqueous extract of the placenta. The average content of vitamins B_{12} in mμg. per ml. was for maternal blood at term 0·31 with range 0·08 to 0·62 and for the cord blood 0·56 with range 0·26 to 1·55. In only one woman at term was the value for maternal blood higher than for cord blood, 0·31 and 0·28, respectively.

Of the 9 women delivered prematurely, the maternal and cord blood had the same vitamin B_{12} content in 4, and the maternal value was higher in 1; in the remainder the maternal value was lower.

The placenta contained on the average 18·4 mμg. vitamin B_{12} per g. fresh tissue, range 6·3 to 36·3, and is considered to be a poor storage place for the vitamin.—F. E. Hytten.

5039

Chow, B. F., Wood, R., Horonick, A. and Okuda, K. **Agewise variation of vitamin B_{12} serum levels.** *J. Gerontol.*, 1956, **11**, 142–146. [Dept. Biochem., Sch. Hyg., Johns Hopkins Univ., Baltimore, Md.]

Vitamin B_{12} was estimated with *Lactobacillus leichmannii* in blood serum from 65 subjects aged from 19 to 40 and from 145 aged from 58 to 89 in 5 institutions, and from 114 randomly selected subjects aged from 10 to over 70 years. In all

groups there was less vitamin B_{12} in the serum with increasing age. When the values were grouped by decades a statistically significant regression was obtained.

A study of 70 rats on stock diet gave a similar result with steady decrease in vitamin B_{12} content of the blood serum with increase in age from 2 weeks to 36 months.

Differences between successive estimations of vitamin B_{12} in the same samples of blood from some of the human subjects, or in separate samples from the same subject, were investigated and were found to be less than the differences due to age.

A. M. Copping.

5040

ALLEGRA, G. and NIUTTA, R. Ricerche sui bilanci e sulle relazioni di equilibrio di alcune vitamine (riboflavina, acido folico, vitamina B_{12}) in soggetti normali e in pazienti con sindromi intestinali croniche. 2. Il bilancio della vitamina B_{12}. [**Studies of the balance and equilibrium relationships of some vitamins (riboflavin, folic acid, vitamin B_{12}) in normal subjects and patients with chronic intestinal disturbances. 2. Vitamin B_{12} balance.**] *Acta vitaminol.*, 1956, **10**, 71–77. [Clin. Malatt. Infett., Univ. Messina.] French, English, German and Spanish summaries.

For part 1 see Abst. 3638, Vol. 24.

Vitamin B_{12} was estimated with *Lactobacillus leichmannii* 7830 ATCC in the blood serum before and 1, 2, 4 and 7 hr. after, and in the urine also 24 hr. after, intramuscular injection of 100 μg. vitamin B_{12} in 3 normal subjects, 5 with chronic diarrhoea and 4 with acute diarrhoea.

In the blood serum, the mean value before injection was highest in the normal subjects and lowest in those with acute diarrhoea. After injection of vitamin B_{12} the mean value rose at once, and began to fall again after the first hour except in those with acute diarrhoea, where it was higher in the fourth than in the first hour; after 7 hr., in all 3 groups the mean value was near that before injection.

In the urine, less of the whole dose of vitamin B_{12} was excreted in 24 hr. by those with chronic diarrhoea than by the normal subjects, and still less by those with acute diarrhoea. In those with diarrhoea, urinary excretion was greatest in the first hour but in the normal subjects it was highest in the third and fourth hour. In all groups there was a temporary drop in the second hour. Between the seventh and twenty-fourth hours there was little change in the rate of excretion.

E. M. Hume.

5041

THOMAS, J. W. and ANDERSON, B. B. **Vitamin B_{12} content of normal and leukaemic leucocytes.** *Brit. J. Haematol.*, 1956, **2**, 41–43. [Dept. Pathol., Postgrad. Med. Sch., Ducane Rd., London, W.12.]

There was no significant difference in the concentration of vitamin B_{12}, as estimated with *Euglena gracilis*, between leucocytes from the blood of normal subjects and those of 8 patients with different types of leucaemia, whether the plasma vitamin B_{12} value was within normal limits or raised as it was in those with myeloid leucaemia. With the exception of one of the 4 patients with myeloid leucaemia, in whom a high value was found, there was no significant difference in vitamin-B_{12}-binding power of the homogenised leucocytes from the different subjects.—L. Wills.

5042

MOLLIN, D. L. and ROSS, G. I. M. **Serum vitamin B_{12} concentrations in leukaemia and in some other haematological conditions.** *Brit. J. Haematol.*, 1955, **1**, 155–172. [Dept. Pathol. Haematol., Postgrad. Med. Sch., Ducane Rd., London, W.12.]

The concentration of vitamin B_{12} was considerably higher than normal in the serum of patients with untreated, chronic, myeloid leukaemia; there was no correlation between the leucocyte count or proportion of mature and immature cells in the blood or bone marrow and the concentration of vitamin B_{12} in the serum, but in patients who responded well to treatment there was a fall in the vitamin B_{12} concentration approximately parallel to the fall in the leucocyte count, though the initial fall in the vitamin concentration was often delayed; the vitamin value fell to within the normal limits in a few patients only.

In patients with subacute myeloid leukaemia, polycythaemia rubra vera, myelosclerosis and chronic non-leukaemic leucocytosis, all conditions with increased granulocyte counts, the mean serum vitamin B_{12} concentration was raised, though many values fell within the normal range. In patients with undifferentiated leukaemia, acute or chronic lymphatic leukaemia, " acute stem-cell " leukaemia, myelomatosis, agranulocytosis or aplastic anaemia, the serum vitamin B_{12} concentration was normal. There was no increase in the concentration in the tissues of a patient with a high serum concentration and the concentration in leucocytes was low compared with that in other tissues. The vitamin B_{12} binding capacity of the serum of patients with chronic myeloid leukaemia was very high and was not saturated; the increase was always associated with increased granulocyte proliferation, and it is suggested that the binding material is liberated by the breakdown of granulocytes and that once released it remains for some considerable time in the serum.—L. Wills.

5043

TRUSCOTT, B. and HOOGLAND, P. L. **The constituents of cod liver with vitamin B_{12} activity for *Lactobacillus leichmannii*.** *Canad. J. Biochem. Physiol.*, 1956, **34**, 191–196. [Fish. Res. Board Canada, Halifax, N.S.]

A cod liver residue almost free from oil was found to be a rich source of vitamins of the B complex and of protein. Its total vitamin B_{12} activity was estimated microbiologically with *Lactobacillus leichmannii*. Vitamin B_{12} components were identified by physico-chemical fractionation, and the presence of cyanocobalamin, hydroxocobalamin and deoxyribosides of several purine and pyrimidine derivatives was demonstrated. In total activity and distribution of vitamin B_{12} components the residue resembled beef liver. The use of cod liver residues in pharmaceutical and stock feeding preparations is considered.—A. M. Copping.

Vitamin C

5044

AMERICAN MEDICAL ASSOCIATION, COUNCIL ON FOODS AND NUTRITION. **Importance of vitamin C in the diet : food standards.** *J. Amer. Med. Assoc.*, 1956, **160**, 1470–1471.

The importance of citrus and tomato juices as sources of vitamin C led the Council to formulate specifications which the processed juices should meet. Specified minimum values for vitamin C, in mg. per 100 ml. single strength juice, are for orange juice 40, grapefruit juice 30, and tomato juice 17·5. The values should be maintained by careful selection and processing rather than by addition of synthetic ascorbic acid.—F. C. Aitken.

5045

SUSMAN, E. and DELLER, D. J. **The history of scurvy in the navy.** *Med. J. Austral.*, 1955, ii, 965–968. [Royal Prince Alfred Hosp., Sydney.]

The article is devoted chiefly to a brief account of James Lind.—E. M. Hume.

5046

WOODRUFF, C. **Infantile scurvy: the increasing incidence of scurvy in the Nashville area.** *J. Amer. Med. Assoc.*, 1956, **161**, 448–456. [Dept. Paediat., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

According to records made at Vanderbilt University Hospital between 1926 and 1954 scurvy was diagnosed in 103 infants of whom 70 were aged from 7 to 11 months. The incidence per 1000 visits to the outpatients' department was found to have increased during the period from 0·10 to 0·94. There was no evidence that the incidence was seasonal. The commonest physical finding was costochondral beading, seen in 80 patients. X-ray examinations of the long bones showed, in 88 patients, changes at the junction of the cartilage and shaft, where cortical atrophy, atrophy of the trabecular structure or thickening of the zones of provisional calcification were common. Ninety-eight infants had been artificially fed and 5 had been fed on a proprietary mixture.

Diet histories suggested lack of ascorbic acid in 92 ; there were doubts about the truth of statements that the remaining 11 had been having adequate amounts of ascorbic acid. Possible causes for the increase in incidence of scurvy are considered.—D. Harvey.

5047

ANDERSSON, M., WALKER, A. R. P. and FALCKE, H. C. **An investigation of the rarity of infantile scurvy among the South African Bantu.** *Brit. J. Nutrition*, 1956, **10**, 101–105. [Human Biochem. Res. Unit, S. African Inst. Med. Res., Johannesburg.]

Records of admissions to 2 hospitals in Johannesburg disclosed among 9000 Bantu children under 2 years of age only 4 with infantile scurvy. Thirty-three admitted for malnutrition and 29 with only minor complaints selected as controls were chosen for study. Of the first group, none was breast fed and almost all were having cereal mixtures usually prepared with water. Of the second group 16 were breast fed and 13 got little or no breast milk. Vitamin C was estimated in the blood plasma and in some samples of the food prepared by the mothers.

No evidence of scurvy was found by X-ray examination. Mean values for vitamin C were $0{\cdot}36 \pm 0{\cdot}18$ and $0{\cdot}63 \pm 0{\cdot}33$ mg. per 100 ml. plasma in the malnourished and control groups, respectively. For 16 severely malnourished infants the mean was 0·26, and for 13 in the control group, who were artificially fed, it was 0·42 mg. The vitamin content of the food mixtures ranged from 0 to 0·93 mg. per 100 ml.

It is suggested that the endogenous production of vitamin C cannot be excluded.—D. Harvey.

5048

BROWN, A. **Megaloblastic anaemia associated with adult scurvy : report of a case which responded to synthetic ascorbic acid alone.** *Brit. J. Haematol.*, 1955, **1**, 345–351. [Univ. Dept. Med., Royal Infirmary, Glasgow.]

Severe clinical scurvy and a high degree of megaloblastic anaemia were found in a man known to be suffering from cirrhosis of the liver. Histamine-resistant achlorhydria was present. The megaloblastic anaemia responded completely to treatment with synthetic ascorbic acid while the patient was still having a low-protein, scorbutogenic diet. It is suggested that the anaemia was

due partly to lack of vitamin C and partly to faulty folic acid metabolism resulting from a defect in liver function caused by the cirrhosis.

L. Wills.

5049

MORSE, E. H., POTGIETER, M. and WALKER, G. R. **Ascorbic acid utilization by women. Response of blood serum and white blood cells to increasing levels of intake.** *J. Nutrition*, 1956, **58,** 291–298. [Sch. Home Econ., Univ. Connecticut, Storrs.]

Nineteen mentally retarded women aged from 27 to 64 years were given a diet restricted in ascorbic acid (see earlier work, Abst. 4163, Vol. 25) for 6 weeks and then received daily supplements of 25, 50 and 100 mg. ascorbic acid for successive periods of 5 weeks. The average daily intake of ascorbic acid from the diet, estimated from 32 random samples taken near the beginning and end of the experiment, was 33 mg. with a range from 24 to 44 mg. The average value for ascorbic acid in the serum on the unsupplemented diet fell from 0·97 to 0·47 mg. per 100 ml., then rose to 0·74, 1·47 and 1·69 at the ends of the successive periods with supplements. Corresponding values for the white blood cells were from 29·94 to 19·55, 26·67, 34·55 and no further increase with the highest supplement. The fluctuations in the white blood cell values reflected those in the serum but were less wide and, with a daily intake of between 33 and 83 mg. ascorbic acid, the average serum value was a good indicator of the concentration in the white cells.—A. Hepburn.

5050

NAMYSŁOWSKI, L. Spostrzeżenia nad zapotrzebowaniem na witaminę C u sportowców w zależności od wysiłku fizycznego. [**Investigations of the vitamin C requirement of athletes during physical exertion.**] *Rocz. Państwowego Zakł. Hig.*, 1956, **7,** 97–122. Russian and English summaries.

The influence of physical exertion on the values for ascorbic acid in the urine and blood serum of athletes, varying from 4 to 13 in number at different stages of the investigation, and on the results of saturation tests was studied while the men were maintained on a constant diet. In most of them there was a periodic deficiency of ascorbic acid, and the loss in the urine and the concentration in the blood serum tended to decrease with a daily dose of 100 mg. during skiing exercise and during normal activities at a physical culture academy. With an intake of 300 mg. the ascorbic acid concentrations tended to increase. One skier supplied with adequate ascorbic acid showed a sharp decrease in ascorbic acid excretion. The daily amount of ascorbic acid recommended at skiing camps was from 200 to 250 mg. and during normal activities at a physical culture academy from 100 to 150 mg. (From English summary.)—A. Hepburn.

5051

ARENDT, E. C. and PATTEE, C. J. **Studies on obesity. 3. Effect of ascorbic acid on the insulin-glucose tolerance curve.** *J. Clin. Endocrinol.*, 1956, **16,** 653–661. [Clin. Invest. Unit, Queen Mary Veterans Hosp., Montreal.]

For parts 1 and 2 see Abst. **4642**, Vol. 26.

3. Twenty-one obese patients, 13 with normal and 8 with abnormal glucose tolerance curves, who showed an abnormal response to glucose after treatment with insulin, were given 500 mg. ascorbic acid by mouth every 6 hr. for at least 3 weeks. After that time insulin-glucose tolerance curves were significantly nearer normal in the 13 patients with normal glucose tolerance curves but in the other group any effect was of doubtful significance. Six obese patients given for the same time a reducing diet instead of ascorbic acid, who lost from 5 to 15 lb., showed no improvement in their insulin-glucose tolerance curves. Most of the patients ate a diet rich in carbohydrate and with little fruit and vegetables, but routine estimations of ascorbic acid in the blood before the experiments began revealed no deficiency.—A. Hepburn.

5052

RÄIHÄ, N. **Effect of ascorbic acid upon the hemolysis of human blood caused by oxygen. Preliminary report. 2.** *Acta paediat.*, 1956, **45,** 176–179. [Child. Clin., Helsinki.] French, German and Spanish summaries.

For part 1 see Abst. 5598, Vol. 25.

In samples from 5 women haemolysis of cord blood *in vitro* increased with rising oxygen tension to values greater than those for adult blood. When blood ascorbic acid was raised by giving ascorbic acid by mouth to 3 normal adults and to 5 women before delivery, haemolysis was inhibited in the blood from both sources.—A. Hepburn.

5053

KRAMÁR, J., MEYERS, V. W. and SIMAY-KRAMÁR, M. **Contribution to the physiology of capillary resistance in the human.** *J. Lab. Clin. Med.*, 1956, **47,** 423–436. [Dept. Paediat., Sch. Med., Creighton Univ., Omaha, Nebr.]

A detailed study was made of variations in the capillary resistance of 450 healthy subjects over 4 years, and it was found that as many as 18·3 per cent. had a low resistance for which a constitutional abnormality was postulated. The finding, and the wide range of values in normal subjects under varying conditions, are important in interpreting the results of capillary resistance studies.

L. Wills.

Other Vitamins

5054

BOUND, J. P. and TELFER, T. P. **Effect of vitamin-K dosage on plasma-bilirubin levels in premature infants.** *Lancet*, 1956, **270**, 720–722. [Child. Dept., University Coll. Hosp., London.]

A group of premature infants given a total of 30 mg. Synkavit by intramuscular injection within 3 days had, on the fifth day of life, significantly more bilirubin in the plasma than a group given a single injection of 1 mg. on the first day. In the first group there were 2 deaths from kernicterus, in the second group none.—F. C. Aitken.

5055

SCAGLIONE, G. and COCCIANTE, G. Osservazioni sull'azione di alcuni fattori di accresimento (vitamin T Goetsch, vitamina B_{12}, metilandrostendiolo) negli immaturi. [**Effect of certain growth factors, vitamin T Goetsch, vitamin B_{12} and methylandrostenediol, on premature infants.**] *Pediatria*, 1955, **63**, 1038–1054. [Ist. 1. Clin. Pediat., Univ. Rome.] English, French, Spanish and German summaries.

Of 70 premature infants weighing from 1570 to 2450 g. at birth, 3 groups of 20 were given daily, for 28 days from the second day of life, vitamin T Goetsch or vitamin B_{12} or methylandrostenediol, and the remaining 10 were left untreated. None of the supplements caused disturbance. The infants were fed on human milk, most of them being breast fed. The range of the mean daily weight increase in g. was for those given vitamin T Goetsch from 17·85 to 41·72, for those given vitamin B_{12} from 10·00 to 30·71, for those given methylandrostenediol from 10·00 to 39·28, and for those given no supplement from 6·00 to 18·90. All the infants lost weight for the first 2 days; the average number of days in which the birth-weight was regained was, in the same order, 9, 13, 15 and 19.—E. M. Hume.

5056

EAGLE, H., OYAMA, V. I., LEVY, M. and FREEMAN, A. **Myo-inositol as an essential growth factor for normal and malignant human cells in tissue culture.** *Science*, 1956, **123**, 845–847. [Sect. Exp. Therap., Lab. Infect. Dis., Nat. Inst. Allergy Infect. Dis., Nat. Insts. Health, Bethesda, Md.]

Inositol was found to be essential for the growth in tissue culture of 16 strains of human tissue and tumour cells, but not for mouse fibroblasts. Two other human tumour strains gave inconsistent results. See Abst. 3416, Vol. 26.—D. Duncan.

5057

PETUELY, F. Über das Bifidus-Problem. [**The bifidus problem.**] *Münch. med. Wochenschr.*, 1956, **98**, 263–266; 304–307. [Biochem. Lab., Zool. Inst., Univ. Graz.] English and French summaries.

The present knowledge of the bifidus problem is reviewed in a lecture. The stools of a breast-fed infant yield an almost pure culture of an organism called *Lactobacillus bifidus*, but the stools of an artificially fed infant yield a mixed culture. A gut flora is not accepted as being a bifidus flora unless from 60 to 70 per cent. of the organisms can be Gram-stained. If a breast-fed infant develops a local infection, perhaps in the middle ear, the bifidus flora is replaced by a mixed flora like that in the artificially fed infant. When the infection is past the bifidus flora is restored. It is concluded that it must be some change in the host that brings about the change, and the state of the bifidus flora in the gut of a breast-fed child is regarded as diagnostic of that child's condition in relation to infection.

Imitation human milk has not been found successful in maintaining a bifidus flora. If about half the breast milk is replaced by milk with semolina or maize starch, the bifidus flora disappears, but if the supplementary feed contains 7 per cent. lactose, and if as little as from one-fifth to one-sixth of the food is human milk, the bifidus flora can be maintained. If, however, there is no human milk, the presence of lactose does not suffice. It is, therefore, argued that human milk must contain an unknown factor which is present in an amount about five times the minimum requirement. Human milk from which protein, fat and carbohydrate have been removed is still able to initiate a bifidus flora in artificially fed babies, but the lactose content must be at least from 2·6 to 3 times greater than the protein content, which may be very low indeed; the lactose content can then be very low also.

The factor in human milk that promotes the bifidus flora is regarded as a means of protecting the infant against intestinal infections until it has developed a natural resistance to them.

A distinction is made between the true bifidus factor and a Penn factor which promotes the growth of a variant of *L. bifidus*, called *L. bifidus* var. Pennsylvania. It was isolated in the U.S. but is not the essential organism of the bifidus flora in the breast-fed infant.

The lecturer describes his own attempts to ascertain the nature of the bifidus factor and to find other sources for it. Materials were tested for their activity on artificially fed babies. A test should include 5 infants and last for 5 or 6 days. From such tests it was concluded that the bifidus factor contains no nitrogen and is of the nature of a carbohydrate. Concentrates of bifidus factor could change the gut flora in as little as 8 hr., but usually from 24 to 96 hr. were required. Children

up to 1½ years could respond, and some change was brought about even in adults.

L. bifidus could grow in a simple synthetic medium without bifidus factor. No evidence was obtained that *L. bifidus* maintains the purity of its cultures by excreting some bacteriostatic substance, or by producing an acid medium, for the medium is often alkaline.

Sudden changes in the weather and mild respiratory infections caused spontaneous fluctuations in the purity of the bifidus flora.—E. M. Hume.

DENTAL DISEASES

5058

GOOSE, D. H. and JONES, H. P. A. **An introductory study of the self-cleansing action of the mouth.** *Brit. Dent. J.*, 1956, **100,** 272–275.

Children between 8 and 9 years of age and 36 in number were given 10 g. white or brown bread to eat and were asked to say when it had gone from their teeth. Their mouths were then examined for food particles. They could be arranged in 2 groups, one described as aware, whose average time was 5·26 min. and who were correct in their statement, the other described as unaware, whose average time was 10·08 min. and who still had debris clinging to their teeth. Muscle action was recorded, by palpation, as good, fair or poor in 22, 12 and 2 subjects, respectively, for whom mean cleansing times were 5·4, 7·3 and 11·5 min. There was no relation between cleansing time and DMF rate.

Instruction may be necessary in this self-cleansing of the mouth as well as in brushing the teeth.—D. Harvey.

5059

DAVIS, H. C., PARFITT, G. J. and JAMES, P. M. C. **A controlled study into the effect of dental health education on 1,539 school children in St. Albans.** *Brit. Dent. J.*, 1956, **100,** 354–356.

A one-term systematic campaign improved toothbrushing habits, especially among girls, but had little effect on the habit of eating sweets or biscuits between meals.—W. M. Deans.

5060

HERRMAN, C. **Dental caries as a cause of disease in children. Preventive measures — dental clinics.** *Arch. Pediat.*, 1956, **73,** 20–29. [Dept. Paediat., Lebanon Hosp., New York.]

5061

PALFER-SOLLIER, M. Étude de la carie dentaire dans un groupe d'enfants d'âge scolaire de la région parisienne. [**Study of dental caries in a group of schoolchildren in Paris.**] *Bull. Inst. nat. Hyg., Paris*, 1956, **11,** 151–160. [Sect. Stomatol.]

5062

GREINER, E. Die Bekämpfung der Zahncaries im Kindesalter. [**Prophylaxis of dental caries in childhood.**] *Neue Öst. Ztschr. Kinderheilk.*, 1956, **1,** 215–224. [Schulzahnklin., Vienna.]

The problems of the pre-school child as well as of the child who comes to the school dental clinic are reviewed. The development of dental services and the use of fluorine in prophylaxis of caries are discussed.—A. M. Copping.

5063

HÜRNY, T. Die Entwicklung der Trinkwasserfluoridierung in den USA. [**Development of fluoridation of drinking water in the United States.**] *Schweiz. med. Wochenschr.*, 1956, **86,** 627–629. [Amthausgasse 1, Berne.]

5064

FORREST, J. R. **Caries incidence and enamel defects in areas with different levels of fluoride in the drinking water.** *Brit. Dent. J.*, 1956, **100,** 195–200. [Minist. Health.]

Complete dental examinations were made of schoolchildren aged 12 to 14 years who had spent all their lives in areas where water supplies had different F contents. The fluoride areas were West Mersea, Burnham-on-Crouch and Harwich, all in Essex, with 5·8, 3·5 and 2·0 p.p.m. in their water supplies and Slough, in Buckinghamshire, with 0·9 p.p.m.; non-fluoride areas were Saffron Walden in Essex and Stoneleigh in Surrey with from 0·1 to 0·2 p.p.m. The numbers of children were 324 in fluoride and 259 in non-fluoride areas.

Average numbers of decayed, missing and filled teeth were 2·8, 1·4, 1·5, and 2·6 in the fluoride and 6·6 and 6·1 in the non-fluoride areas, respectively. In the same order of groups the percentages of children free from caries were 24, 50, 35, 30, 4 and 8 and the percentages of first permanent molars which were sound 61, 76, 68, 59, 22 and 22. In the fluoride areas the indices of mottling of enamel, excluding idiopathic spots, were 2·5, 1·9, 0·7 and 0·2; in the non-fluoride areas there were defects resembling fluoride mottling but, to a dentist, distinguishable from it.

The conclusion is that 1 p.p.m. F in a water supply is the optimum amount for prevention of caries and formation of good teeth. The relation of mottling of teeth to the nutritional state of the child will be the subject of a later report.

D. Harvey.

5065

FORREST, J. R. **Fluoridation of water supplies.** *Roy. Soc. Promotion Health J.*, 1956, **76,** 244–247 (with discussion 247 – 248). [Minist. Health.]

5066

FINN, S. B. and DEMARCO, C. **The effect of artificial water fluoridation on the solubility of tooth enamel.** *J. Dent. Res.*, 1956, **35,** 185–188. [Bur. Dent. Health, New York State Dept. Health, Rochester.]

Deciduous teeth, free from caries and lost naturally, were examined from 3 groups of children. Two groups were in Newburgh, N.Y., one of children whose teeth had erupted before fluoridation of water began but who had had treated water for 5 years, the other of children who had been born since fluoridation began. The amount of F was from 1 to 1·2 p.p.m. The third group, in Rochester, N.Y., drank water relatively free from F. Solubility of the powdered enamel in acetic acid : sodium acetate buffer solution, *p*H 4, was measured by a modification, which is described, of the method of Volker (*Thesis, Univ. Rochester*, 1939 : see also Abst. 927, Vol. 10). From 50-mg. samples numbering 10, 5 and 15 in the above order the average amounts undissolved were 36·65, 38·60 and 36·12 mg., respectively.

The difference between the second and each of the other means was significant ; that between the first and third was not so. In a brief discussion it is suggested that the effect of F is topical and that water treatment is the best means of providing F.—D. Harvey.

5067

BLACKWELL, R. Q. and FOSDICK, L. S. **Studies on the physicochemical phenomena related to dental caries. 3. The effect of sucrose upon the solubility of human dental enamel.** *J. Dent. Res.*, 1956, **35,** 210–219. [Dept. Chem., Northwestern Univ. Dent. Sch., Chicago, Ill.]

3. For parts 1 and 2, physico-chemical studies of effects of sucrose on ion diffusion through semi-permeable membranes, see Forscher and Fosdick, *J. Dent. Res.* 1954, **33,** 206 ; 212.

Dental enamel pooled from non-carious adult molars and in amounts of 50 mg. was shaken at 37° C. with 20 ml. buffered lactate solution alone or with 0·5 or 1·0 *M* sucrose ; amounts were measured of Ca going into solution during 7 periods of time from 5 to 240 min. and 5 *p*H values from 4·0 to 6·0 at 0·5 unit intervals and of P with the same solutions at *p*H 5·0, 5·5 and 6·0. Data for these are tabulated with the values for Ca : P ratio.

The effect of sucrose was to reduce the amounts of both Ca and P which went into solution ; that effect was least at *p*H 4·0 and 6·0. The Ca : P ratio ranged from 2·0 to 4·1, mean 2·7, but the findings followed no pattern in relation to time, *p*H or concentration of sucrose.

Possible mechanical or physical roles of sucrose are discussed in terms of viscosity of the solution, a coating effect of the sugar molecules, formation of Ca-sugar complexes and a reduction *in vivo* of free water molecules with consequent increase of H ions.—D. Harvey.

5068

KRIDAKARA, O., BOOZAYAANGOOL, R., YUKTANANDA, I. and VOLKER, J. F. **Dental survey of selected Thai children : nutritional observations.** *Amer. J. Clin. Nutrition*, 1956, **4,** 280–284. [Dent. Sch., Univ. Med. Sci., Bangkok.]

See Title 2287, Vol. 23.

The dental health of children between 4 and 18 years of age attending different types of school in Bangkok was studied ; 552 were in Thai, 239 in Chinese and 225 in Islamic schools. There was some evidence that Chinese schools had fewest children free from caries ; for numbers of decayed and filled teeth and for state of health of gums and of occlusion of teeth differences between groups were small.

The Thai children in Bangkok were compared with 2 other groups of Thai children, 673 Chiengmai and 652 Lampang, living up-country under conditions with less contact with western civilisation. The percentages of children free from caries were, respectively, 8, 55 and 38 ; the difference between the 2 up-country groups was accounted for largely by the data for a single mission school in Lampang. In all 3 groups condition of gums was comparable, the percentage recorded as normal never exceeding 50. Occlusion was best at Chiengmai where 60 per cent. of the children were normal ; records of poor occlusion were commonest in Bangkok, where only 24 per cent. of the children were normal.

The high rate of incidence of caries in Bangkok may be the result of the great increase in use of sugar and imported wheat. Official estimates of these for 1945 and 1949 are sugar 7270 and 28,424 and flour 100 and 10,210 metric tons. Most was used in the Bangkok area.—D. Harvey.

5069

KNIZHNIKOV, V. A. O vzaimosvyazi mezhdu soderzhaniem ftora v vode, flyuorozom i kariesom. [**The interconnection between the fluorine content of water and fluorosis and caries.**] *Gigiena Sanit.*, 1955, No. 10, 13–17. [Kazakh. Inst. Epidemiol., Mikrobiol. Gigien.]

In a study in Central Kazakhstan of dental fluorosis in 2202 persons, mainly schoolchildren, 4 degrees were recorded. Estimations were made also of F, I and Ca in drinking water, which was from lakes and wells. In general severity of fluorosis was associated positively with the F content of the water, but in some areas there was inconsistency. In 2 districts each with 4 mg. F per litre the incidence of Type 1 fluorosis, slight spots or stripes distributed symmetrically, was 1½ times greater in one than in the other ; of 2 others,

one with 2·2 mg. and the second with 6 mg. F per litre, Type 1 fluorosis was commoner in the first.

Among children the relations of incidence of caries to F content of drinking water was not consistent. When, for districts with different amounts of F, subjects were arranged according to severity of fluorosis, the incidence of caries was greater among those with severe fluorosis, Type 3, showing multiple erosion and yellow-brown staining, and among those without fluorosis than in those with mild, Type 1 fluorosis. Within each fluorosis group caries increased with rise in F content of water; for the group with Type 1 the increase was small.

Among persons who migrated to a district where drinking water contained 4 mg. F per litre, the younger the age at entry the greater the incidence and severity of fluorosis; if the age had been from 8 to 12 years, fluorosis was absent and the incidence of caries low.—F. Billewicz.

5070

SHAW, J. H., GUPTA, O. P. and MEYER, M. E. **High fluoride content of teeth from communities with low fluoride water supplies.** *Amer. J. Clin. Nutrition*, 1956, **4,** 246–253. [Harvard Sch. Dent. Med., Boston, Mass.]

The findings in a number of surveys in India and the United States are summarised to show that the proportion of children free from caries is much higher in India.

Analytical data are presented for 161 teeth from 52 persons in Delhi, for 75 teeth from 36 in Bombay and for 58 teeth from 35 in Boston. The Delhi population could be subdivided into 2 groups, one of 28 permanently resident there and drinking water with 0·25 p.p.m. F, the other of 24 who came from other parts and who in their earlier life had had water of unknown composition. For these 2 groups, respectively, the average amounts of F were in enamel 299, 305 and in dentine 710, 706 p.p.m. For the Bombay population with 0·04 p.p.m. F in its drinking water the averages were 184 p.p.m. for enamel and 456 p.p.m. for dentine. For the Boston population investigations were in two stages with a considerable interval, but at each stage the F content of the water was 0·12 p.p.m. The averages in the first stage for 30 teeth from 17 persons were enamel 40 and dentine 85 p.p.m., and in the second, for 28 teeth from 18 residents, enamel 58 and dentine 109 p.p.m. F. Also the Indian teeth were less carious, had higher gloss and translucency and had roots more resistant to cutting.

The differences in favour of the Indian teeth could not be explained from what is known about amounts of water drunk by Indians (*cf.* Pandit *et al.*, Abst. 3695, Vol. 10) or from the use of sea salt. There is, it is suggested, need for more analyses of local foods and further study of absorption and utilisation of F by Indians.—D. Harvey.

See also Absts. 4919, 5424.

POISONS: PATHOGENIC ORGANISMS: FOOD LAWS

5071

STRONG, F. M. **Lathyrism and odoratism.** *Nutrition Rev.*, 1956, **14,** 65–67. [Dept. Biochem., Univ. Wisconsin, Madison.]

5072

MILLS, A. R. **Poisonous fish in the South Pacific.** *J. Trop. Med. Hyg.*, 1956, **59,** 99–103. [New Hebrides.]

5073

ROMEYN, T. and HANEVELD, G. T. Vergiftigingen door het eten van schildpadvlees (Eretmochelys imbricata) op Nederlands Nieuw-Guinea. [**Poisoning from eating turtle flesh (*Eretmochelys imbricata*) in Netherlands New Guinea.**] *Nederland. Tijdschr. Geneesk.*, 1956, **100,** 1156 – 1159. [Hollandia, Netherlands New Guinea.] English summary.

The poisoning is attributed to the coral vegetation on which the hawk's bill turtle feeds.

See also Absts. 4197, 4204.

THERAPEUTIC AND PREVENTIVE DIETETICS

GENERAL

5074

ARKHANGEL'SKII, G. V. Iz istorii primeneniya moloka kak lechebnogo sredstva v Rossii XIX veka. [**The medicinal use of milk in Russia in the nineteenth century.**] *Vop. Pitan.*, 1956, **15,** No. 3, 37–40. [Moscow.]

5075

SHARPENAK, A. E., AREF'EVA, A. S. and KARPYSHEVA, V. S. Belki krovi kak dopolnitel'nyi istochnik gistidina i triptofana v lechebnykh dietakh. [**Blood proteins as a source of supplementary histidine and tryptophan in therapeutic diets.**] *Vop. Pitan.*, 1956, **15,** No. 3, 22–26. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

Samples of dried blood from slaughterhouses and blood from donor cattle were analysed and values for total protein, arginine, histidine, lysine, tyrosine, cystine and tryptophan are tabulated. The blood protein was richer than meat in histidine

and tryptophan. It could be widely used in invalid diets. Two recipes are given, one for a chocolate jelly and the other for meat and blood patties.—D. Duncan.

5076

McCann, M. B., Trulson, M. F. and Stulb, S. C. **Non-caloric sweeteners and weight reduction.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 327–330. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

5077

Molina Nuñez, J. El factor psíquico en la nutrición. [**Psychic influences on nutrition.**] *Medicamenta*, 1956, **25,** 253–254. [Hosp. Psiquiát., Guadalajara.]

Nutrition cannot be considered in isolation, but the general bodily and mental condition of the subject must be taken into account. Vomiting in pregnancy, obesity and other disturbances should be dealt with in this way, but a plea is made that the separate classification of "psychosomatic" disorders should be abandoned.—D. Duncan.

DIABETES

5078

Read, C. H. and Baer, P. E. **Diabetes in children.** *Pediatrics*, 1956, **17,** 605–611. [Dept. Paediat., Coll. Med., State Univ. Iowa.]

5079

Larsson, Y. and Ström, L. **Treatment of juvenile diabetes, with particular reference to diet.** *Ann. paediat.*, 1956, **186,** 270–281. [Paediat. Clin., Crown Princess Lovisa's Hosp., Stockholm.] German and French summaries.

In the paediatric clinics in Stockholm clinical rather than chemical or symptomatic control of diabetes is advocated. The necessity for careful medical treatment with adequate insulin is stressed, a normal diet being allowed. Glycosuria to the extent of from 20 to 40 g. per 24 hr. and post-alimentary blood sugar up to 300 mg. per 100 ml. are permitted.

Arguments for and against different methods of treatment are discussed critically.—F. C. Aitken.

5080

Hundley, J. M. **Diabetes-Overweight: U.S. problems.** *J. Amer. Dietetic Assoc.*, 1956, **32,** 417–422. [Lab. Biochem. Nutrit., Nat. Insts. Health, Bethesda, Md.]

5081

Wolf, H. J. and Priess, H. Erfahrungen mit fettfreier Kost beim Diabetes mellitus. [**Trials with fat-free diet in diabetes mellitus.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 514–515. [Städt. Krankenhaus, Bielefeld.]

Diabetics who had for 8 to 10 days been having a diet with 140 to 225 g. carbohydrate, some with insulin, were given for 18 days an almost fat-free diet of potatoes, rice and fruit; towards the end gelatine and white of egg were added, and subsequently, for 8 to 10 days, protein foods low in fat, *e.g.*, haddock, cod, lean veal, and 30 to 50 g. fat in the form of vegetable oil and butter. In evaluating the results, patients who improved so much on the fat-free diet that their insulin had to be cut down were excluded; this left 60, of whom 33 had insulin. The results are shown graphically.

Mean blood sugar fell from 218 mg. per cent. to 163 on the fat-free diet and rose to 181 on the fat-restricted diet; urinary sugar from 37·1 g. in 24 hr. to 4·1, rising to 9·1. The effects were irrespective of sex, duration of diabetes, or use of insulin or not, but the effect on blood sugar was less in those over 60. In 10 patients tested with both 30 and 50 g. fat, the rises were almost proportional to the amounts of fat. Ten of the 60 had acetonuria, which speedily vanished, and 8 had gangrene of the feet, which improved. At first the fat-restricted diet was unpopular, but the immediate benefits changed the patients' attitudes.

The amount of fat allowed is about the average consumption found by Voit in Munich at the turn of the century and used by him as a standard for mass feeding.—W. M. Deans.

5082

Joelson, R. H. **The effect of oral dextran on blood glucose.** *Amer. J. Clin. Nutrition*, 1956, **4,** 279. [Diabetes Clin., Mount Sinai Hosp., New York.]

Four subjects with mild diabetes and 1 subject with hyperinsulinism were given 400 ml. of 5 per cent. unhydrolysed dextran. No significant increase in blood sugar occurred in any patient.

F. C. Aitken.

5083

Ridolfo, A. S. and Kirtley, W. R. **Clinical experiences with carbutamide, an orally given hypoglycemic agent. Preliminary report.** *J. Amer. Med. Assoc.*, 1956, **160,** 1285–1288. [Lilly Lab. Clin. Res., Gen. Hosp., Indianapolis, Ind.]

Carbutamide or BZ 55 (1-butyl-3-sulphanilylurea) lowered the blood sugar of 9 of 11 diabetics treated in hospital and of 7 treated as outpatients, their diets remaining unaltered; the amounts given were generally 2·5, 1·5 and 1 g. on successive days, with 1 g. daily for maintenance. Six case histories are given. Only 1 of 31 patients had undesirable side effects. Favourable indications

were maturity, obesity and relatively mild diabetes of short duration ; the drug was useless for patients with diabetic acidosis or young people with unstable diabetes.—W. M. Deans.

5084

BOULIN, R. Essais de traitement du diabète sucré par le BZ 55. [**Treatment of diabetes mellitus with BZ 55.**] *Presse méd.*, 1956, **64,** 643–645. [Paris.]

The hypoglycaemia-inducing sulphonamide BZ 55 was used in the treatment of 15 diabetic patients aged between 37 and 80 years. Treatment, as judged by effect on blood sugar and glycosuria, was successful in 13 cases.—F. C. Aitken.

5085

RAVINA, A. Étude d'un nouveau sulfamide antidiabétique : indications cliniques et posologie. [**A new antidiabetic sulphonamide : clinical indications and dosage.**] *Presse méd.*, 1956, **64,** 646–649. [Paris.]

N_1-sulphanilyl-N_2-*n*-butylcarbamide (BZ 55) reduced glycosuria and levels of blood sugar in 9 elderly diabetic patients.—F. C. Aitken.

5086

BLANCO-SOLER, C. La nueva terapéutica peroral de la diabetes. (Nota clínica previa.) [**The new peroral treatment of diabetes. Preliminary clinical note.**] *Medicamenta*, 1956, **25,** 247–252. [Serv. Med. Nutrición, Hosp. Central Cruz Roja.]

There were 5 control subjects, healthy or with disorders other than diabetes, and 10 adults with compensated diabetes, never very severe. Blood sugar was estimated before and after treatment and sugar in urine during treatment for 6 days with BZ 55 (see Abst. 2402, Vol. 26).

The treatment had no significant effect on the 5 non-diabetic subjects. In 8 diabetic subjects treatment with BZ 55 produced a slow but considerable fall in sugar in blood and urine, beginning about 48 hr. after the first dose. One subject with disturbed carbohydrate metabolism, but not diabetes, had after treatment symptoms of hypoglycaemia. In one normal and one diabetic subject treatment did not affect the response to a double blood sugar tolerance test. No subject showed any significant change in blood cholesterol or urea, plasma proteins, pulse, temperature or arterial pressure. Subjectively they were well, except that 1 patient had gastric pain which responded to alkali. The dose of BZ 55 must be decided by the reactions of the patient. Protocols are reproduced for each subject.

Treatment with BZ 55 seems to offer promise, at least in adult subjects not severely affected.

D. Duncan.

5087

BÄNDER, A. *et al.* Über die orale Behandlung des Diabetes mellitus mit N-[4-Methyl-benzolsulfonyl]-N′-butyl-harnstoff (D 860). Klinische und experimentelle Untersuchungen. [**Treatment by mouth of diabetes mellitus with N-[4-methylbenzenesulphonyl] - N′ - butylurea (D 860). Clinical and experimental studies.**] *Deutsch. med. Wochenschr.*, 1956, **81,** 823–846 ; 887–906. English and Spanish summaries.

D 860 (N-[4-methylbenzenesulphonyl]-N′-butylurea, Rastinon (Hoechst A.G., Frankfurt), Artosin (C. F. Boehringer und Söhne G.m.b.H., Mannheim)) has the same chemical structure as BZ 55 except that a methyl group replaces the amino group attached to the benzene ring. Results are reported of very extensive co-operative clinical, chemical and experimental studies (animal studies pp. 889–904) of the effects of D 860 given by mouth, made in medical clinics of the universities of Frankfurt, Freiburg and Munich and of the municipal hospitals of Augsburg and in diabetes institutes at Garz (Rügen) and Karlsberg, as well as in the pharmaceutical laboratories of Hoechst A.G. In all, 751 diabetic patients have been treated since August 1955.

In brief, D 860 does not cure diabetes, but in doses of 3 g., falling generally to 0·5 g. daily, can partly or wholly replace insulin for certain patients, especially the middle-aged and elderly, the obese, those with diabetes of short duration and those requiring only small amounts of insulin (or none). Diet remains important, though some were allowed 240 or 264 g. carbohydrate daily. Post-mortem examination of the pancreas of 6 diabetic patients dead from other causes, who had had D 860, showed no sign of damage to the alpha cells, and 4 in whom the diabetes had responded to D 860 had numerous beta cells, though there was no clear evidence that D 860 stimulated the activity of these. A decrease in lactic acid in the blood of patients successfully treated with D 860, and an increase in liver glycogen in animals, suggested that D 860 may act by affecting liver enzymes.

W. M. Deans.

5088

POCHE, R. and SCHUMACHER, K. T. Über Zusammenhänge zwischen Diabetes mellitus und Leberzirrhose. [**Association between diabetes mellitus and cirrhosis of the liver.**] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselkr.*, 1956, **16,** 68–78. [Pathol. Inst., Med. Akad., Düsseldorf.]

Analysis of 5079 records of post-mortem examinations of subjects over 20 years of age at death gave 217 with diabetes. Cirrhosis, all types, was found in 47 of these, cirrhosis with small nodules of unknown etiology in 26. On either basis,

incidence was roughly three times expectation and diabetes is therefore thought to predispose to cirrhosis of the liver.—I. Leitch.

See also Absts. 5425, 5426.

GASTRO-INTESTINAL CONDITIONS

5089

MARKOVA, G. F. Vliyanie udlinennogo medikamentoznogo sna v sochetanii s lechebnym pitaniem na techenie yazvennoi bolezni. [**Influence of prolonged induced sleep in conjunction with therapeutic diet on the course of ulcers.**] *Vop. Pitan.*, 1956, **15,** No. 3, 12–16. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

The patients were 45 men and 5 women from 21 to 60 years old, 9 with gastric and 41 with duodenal ulcers. Most of them had been affected for a long time and 28 had had massive haemorrhage, perforations or peritonitis. They were treated with rest in bed and diet and given luminal, sodium amytal or chloral hydrate in doses sufficient to induce sleep for 11 or 12 hr. nightly for 2 or 3 weeks.

The sleep was considered an extremely valuable adjunct to diet and gave good results with most of the patients. They gained in weight up to 6·3 kg., average 1·3 kg.—D. Duncan.

5090

WINKELSTEIN, A. and SCHWEIGER, E. **Complete nutriment for the therapy of peptic ulcer.** *J. Amer. Med. Assoc.*, 1956, **160,** 1111–1113. [Dept. Med., Mount Sinai Hosp., New York.]

The neutralising properties of Sustagen, a proprietary high-calorie powder, given with water, were tested in 30 patients, most of whom had gastric hypersecretion. The excellent results suggested the possible value of the product in the treatment of peptic ulcer by diet.—F. C. Aitken.

5091

SÁNCHEZ AGESTA, A. and ESPINAR LAFUENTE, M. Tetania con hipopotasemia en la estenosis pilórica. [**Tetany with low blood potassium in pyloric stenosis.**] *Rev. clín. española,* 1956, **60,** 296–304. [Clín. Méd., Univ. Granada.] English, German and French summaries.

An elderly man, thought to have pyloric stenosis resulting from an ulcer, entered hospital but refused operation. He was undernourished after liquid diet and continual vomiting and was given a bland diet with atropine, liver extract and vitamin C. In hospital he suddenly developed severe tetany, which lasted for 3 days and was followed by paralysis and confusion. Serum Ca was not low, but calcium gluconate was given from the second day of tetany, and also isotonic saline. Serum P was low initially, but rose with treatment; serum K, which was about 4·5 m. equiv. per litre, fell below 4 as the tetany subsided, and reached 4·5 again only when the paralysis ended 16 days after the onset of tetany. Changes in the electrocardiogram are discussed. Depletion of K, probably aggravated by administration of Na, was an important if not the only cause of the tetany.

D. Duncan.

5092

BOSCH HERNÁNDEZ, J. Complicaciones de la medicación alcalina en el ulcus. 1. La alcalosis aguda. [**Complications of alkaline treatment for ulcer. 1. Acute alkalosis.**] *Rev. clín. española,* 1956, **60,** 321–324. [Inst. Invest. Clín., Madrid.]

A review with 38 references.

THYROID DISEASE

5093

HETTCHE, H. O. Epidemiologie und Ätiologie der Struma in 100 Jahren Forschung. [**Epidemiology and etiology of goitre in one hundred years of research.**] *Arch. Hyg., Berlin,* 1956, **140,** 79–105. [Intersuchungsanst. Städtehyg., Hyg. Inst., Hamburg.] French and English summaries.

In a review of endemic goitre the aspects considered include geography, topography, local hygiene, hygiene of water, bacteriology and epidemiology. The author concludes that endemic goitre is caused by an injurious substance which occurs in contaminated water supplies. The toxic substance belongs to the urochrome group, it binds copper in the serum and, in animal experiments, it produces goitre which can be prevented by simultaneous administration of iodine.

E. M. Hume.

5094

HUBBLE, D. **Thyroid disorders in childhood.** *Brit. Med. J.*, 1956, i, 875–879. [Derbyshire Hosp. Sick. Child.]

The relations of thyroxine, triiodothyronine and thyroid-stimulating hormone (TSH) to growth and function of the thyroid are discussed. Cretinism is often of genetic origin and inborn errors of metabolism probably account for a high proportion of disorders in children.

The enlargement of the gland at puberty is possibly caused or aggravated by insufficient supply of iodine. Although ample iodine may prevent endemic goitre, its cure requires both iodine, to augment the supply, and thyroxine, to depress TSH activity. Causes of sporadic goitre may be administration of Co for anaemia, or *p*-aminosalicylic acid. Antithyroid drugs and radioactive iodine should be used sparingly for children and pregnant women.—I. Leitch.

5095

RODRÍGUEZ MORENO, F., IBÁÑEZ GONZÁLEZ, R. and ORTIZ DE LANDÁZURI, E. El tiroides de los escolares como control de la endemia bociosa y de la profilaxis. [**The thyroids of schoolchildren as an index of endemic goitre and its control.**] *Rev. clín. española*, 1956, **60**, 154–160. [Dept. Profilaxis Bocio, Clin. Méd., Univ. Granada.] English, German and French summaries.

A study was made in 3 places in Granada; Castaras on the south of Sierra Nevada, Güejar Sierra on the north, where iodised salt had been supplied since 1953, and Granada, the capital. Schoolchildren aged from 5 to 13 years were classified by size of thyroid and the incidence was compared with that in the whole population of the district.

In Castaras 518 of the 840 inhabitants were examined; 54·7 per cent. had frank goitre, 11·7 were borderline. Of 111 schoolchildren 54 had frank goitre and 14 were borderline, *i.e.*, 48 and 12 per cent., about the same as for the general population.

In Güejar Sierra at the beginning of 1953 (see Abst. 1290, Vol. 25) 53 per cent. of the inhabitants had goitre and 23·1 potential goitre [not defined]; in 209 children under 15 the percentages were 51·6 and 26·9. After 2½ years of treatment with iodised salt the percentages in the schoolchildren were 29 and 27 and the absolute numbers 32 and 30 out of 109, and in 36 children aged 6 to 8 only 3 had goitre and 9 potential goitre.

In Granada 217 schoolchildren were studied, 147 boys and 70 girls. The numbers with goitre and potential goitre were 27 and 25 boys, 9 and 21 girls, or, as percentages of all the children, 16 and 21. In Granada city the drinking water contains 1 μg. I per litre, which is apparently not enough to prevent goitre. The beneficial effect of table salt with 20 mg. KI per kg. is shown by the study in Güejar Sierra.—D. Duncan.

See also Abst. 5224.

ANAEMIA

5096

BUSH, J. A. **The rôle of trace elements in hemopoiesis and in the therapy of anemia.** *Pediatrics*, 1956, **17**, 586–595. [Dept. Med., Coll. Med., Univ. Utah, Salt Lake City.]

This is a review of the roles of Cu, Co and Mo in blood formation and of the possible occurrence of deficiencies in infants. In those with anaemia diagnosed as due to Fe deficiency, values for Cu in serum and red cells were high, not low as expected. Cu deficiency was not produced in 2 infants after 4 and 5 months on diets which produced deficiency in pigs. Values for Cu in serum were found to be low in newborn infants, but their stores of Cu were not low. It was thought that patients with nephrotic syndrome or sprue might be partly depleted of Cu, but no haematological response to Cu has been demonstrated. Doubt is expressed about the clinical value of treatment of anaemia with Co or Mo, and there is danger with Co.

There are 55 references.—D. Duncan.

5097

BROWN, A. **Iron therapy.** *Practitioner*, 1956, **176**, 434–440. [Muirhead Dept. Med., Royal Infirmary, Glasgow.]

5098

SCHLEISNER, P. **Cobalt in anaemia.** *Acta med. scand.*, 1956, **154**, 177–185. [Med. Dept., Horsens Kommunehosp., Denmark.]

After Fe had been given for some weeks without success, Co at the rate of about 30 mg. daily was given to 16 patients with anaemia resulting from glomerulonephritis, pyelonephritis or diabetic nephropathy. In one patient after only 2 doses treatment had to be stopped because of nausea and in 3 others it was given up for the same reason. Ten patients had no nausea.

In 11 of the 15 patients considered, Hb rose significantly, by from 17 to 68 per cent. of its initial value. Successful treatment lasted from 1 to 40 weeks. The patient treated for 40 weeks, with about 14 g. Co in all, complained finally of sore throat and deafness. As she died soon after treatment stopped, it is not known whether hearing would have returned spontaneously.

It is considered that Co is indicated chiefly in disorders like renal anaemia, where the prognosis is bad and late side-effects are relatively unimportant.—D. Duncan.

5099

STIJNS, J. Le traitement de l'anémie ferriprive chez l'enfant par une préparation de fer injectable par voie intramusculaire. [**Treatment of iron-deficiency anaemia in children by intramuscular injection of an iron preparation.**] *Ann. Soc. belg. Méd. trop.*, 1956, **36**, 165–178. [Service Biol. Clin., Inst. Méd. Trop. "Princesse Astrid", Léopoldville.] Flemish summary.

In African infants aged from 5 months to 4½ years microcytic, hypochromic anaemia, generally associated with hookworm infestation, was successfully treated by intramuscular injection, generally in divided doses, of the calculated requirement of iron as Imferon, a complex of iron and dextran. There were no general and only very trivial local reactions to the injections. Early and adequate

treatment of the hookworm infestation was necessary to maintain a normal blood picture. In a few infants smaller doses than those calculated gave satisfactory results.—L. Wills.

5100

CALVO MELENDRO, J. and CALVO MORALES, J. Anemia por leche de cabra. [**Anaemia from goat's milk.**] *Rev. española Enferm. Apar. digest. Nutrición*, 1956, **15**, 41–47. [Hosp. Provincial, Soria.] English summary.

There is a brief review of the literature. An infant received goat's milk from about 15 days of age. He was seen when 9 months old after having had, for a month, diarrhoea, vomiting and loss of weight. He was pale and cachectic and the spleen was palpable. Red cell count was 1·8 million and Hb 28 per cent. [standard not stated]; the blood showed anisocytosis, poikilocytosis and 10 per cent. of megaloblasts; the bone marrow was megaloblastic. The infant was given cow's milk, fruit juice and cereals with injections of vitamin C, liver extract and folic acid. He recovered in a few weeks.

The mother, who also took about 1 litre of goat's milk daily, was pale and had a red cell count of 3·2 million, but her anaemia was normochromic and microcytic. Another woman was seen with the same signs. Her 2-year-old son, who had received nothing but goat's milk for a year, was pale and undernourished and had diarrhoea and chronic blepharitis. His red cell count was 1·4 million, Hb 32 per cent., and megaloblasts were common in blood and bone marrow. Like the other child he responded to mixed diet, liver extract and folic acid.

It is suggested that the goats' feed may have had some bearing on the anaemia.—D. Duncan.

5101

FOY, H. and KONDI, A. **Nutritional and intestinal factors and iron losses in the genesis of tropical anaemias.** *Lancet*, 1956, **270**, 423–424. [Wellcome Trust Res. Labs.]

Hypochromic microcytic anaemia in tropical areas often occurs where there is plenty of Fe in the diet. Hookworm is not considered to be an important cause; in India there was no significant relation between the incidences of anaemia and of hookworm. It is thought that an unbalanced diet or an unbalanced intestinal flora caused by unsuitable diet may limit absorption of Fe. If loss of Fe in sweat is high, and it is estimated to reach 2·3 mg. daily, more Fe may be lost than is absorbed. A large proportion of patients respond to Fe by mouth, others need protein, folic acid or vitamin B_{12}, and deficiencies of these substances may become apparent only after Fe is given.

D. Duncan.

5102

BJÖRKMAN, S. E. **Chronic refractory anemia with sideroblastic bone marrow. A study of four cases.** *Blood, J. Hematol.*, 1956, **11**, 250–259. [Dept. Med., Univ. Lund.] Interlingua summary.

5103

KEELEY, K. J. and POLITZER, W. M. **Aminoaciduria in the megaloblastic anaemias.** *J. Clin. Pathol.*, 1956, **9**, 142–143. [Baragwanath Hosp., Johannesburg.]

The subjects with megaloblastic anaemia were Africans, 7 women in the puerperium, 2 older women and 2 infants with malnutrition. All of them had normal amounts of amino acids in the urine. A man with Addisonian anaemia in relapse showed abnormal excretion of tyrosine, taurine, lysine, alanine and glycine, which disappeared after treatment with vitamin B_{12} and intrinsic factor. In consideration of the work of Weaver and Neill (Abst. 1299, Vol. 25), it is suggested that estimation of amino acids in urine could be used for differential diagnosis of megaloblastic anaemias.—D. Duncan.

5104

EDGAR, W. and RICE, H. M. **Administration of iron in antenatal clinics.** *Lancet*, 1956, **270**, 599–602. [Pub. Health Dept., Luton, Beds.]

Pregnant women numbering 179 were in 2 groups, to one of which with 89 subjects tablets of ferrous sulphate were given throughout pregnancy.

In the control group without tablets Hb, red cell count, packed cell volume and M.C.H.C. all fell [the fall in M.C.H.C. was small and seems not to have been tested statistically]; in the group given Fe, indices on the average remained steady although in 20 subjects Hb did fall.

It is suggested that as a routine measure every expectant mother should be given Fe.

F. E. Hytten.

5105

READ, A. E. and ASHER, R. **Weight loss and pernicious anaemia.** *Lancet*, 1956, **270**, 882–884. [Central Middlesex Hosp., London.]

In 14 of 50 patients with pernicious anaemia there had been substantial weight loss which was corrected by vitamin B_{12} therapy. Such loss has led, in some instances, to a misdiagnosis of malignant disease; its frequency in pernicious anaemia needs, therefore, to be re-emphasised.

F. C. Aitken.

5106

MACCAFERRI, A. Le anemie senili e loro comportamento nella terapia epatica e marziale. [**Anaemia in old age and its response to treatment with liver and iron.**] *Acta gerontol.*, 1956, **6**, 20–36. [Osp. "M. Malpighi", Bologna.]

The subjects were 6 men and 8 women from 70 to 86 years old, free from signs of disease, but with hyperchromic or normochromic anaemia ascribed to senescence. They received for 15 days large doses of liver extract by subcutaneous injection and then 2 g. reduced iron daily for another 15 days. Blood samples were taken initially and at the end of each treatment. The response of each subject is described in full.

Treatment with liver caused increases in the red cell count in 12 subjects, but the increase was sometimes very small. Treatment with Fe further increased the count in 10 subjects, and the increase was often larger than with liver. Hb was increased by liver in 5 subjects and fell or was unchanged in 8; it was increased by Fe in 10. White cell counts increased in half the subjects and decreased in half on each treatment.

Possible interpretations of the results are discussed.—D. Duncan.

See also Absts. 4755, 5012, 5016, 5028.

OTHER CONDITIONS

5107

KLINKE, K. Zur Therapie des rekurrierenden ketonämischen Erbrechens. [**Treatment of recurrent ketonaemic vomiting.**] *Deutsch. med. Wochenschr.*, 1956, **81**, 819–820; 849. [Kinderklin., Med. Akad., Düsseldorf.]

The etiology of recurrent ketonaemic vomiting in children is discussed. Disturbance of the regulation of metabolism by the autonomic nervous system is suggested as the ultimate cause. Treatment is by sedatives, supply of carbohydrate and restoration of water, Cl and K balance. In slight cases teaspoonfuls of ice-cold sweetened fruit juice, with 5 drops HCl per 100 ml., may suffice. If dehydration is marked, a 50 : 50 mixture of Ringer solution and 10 per cent. glucose solution, with 1 g. KCl per litre, may be given by drip; or, if the child is too restless, 40 to 50 ml. of the same mixture, with 50 mg. Berolase (cocarboxylase) but without K, by vein.—W. M. Deans.

5108

HAASE, K. E. and HOSENFELD, H. Zur Fettsucht im Kindesalter. [**Obesity in childhood.**] *Ztschr. Kinderheilk.*, 1956, **78**, 1–27. [Kinderklin., Univ. Frankfurt a.M.]

Much of this paper is polemical. In the authors' opinion, endocrine disorder as a cause of obesity in children is greatly overemphasised.

The number of new cases of obesity seen yearly at the Frankfurt Kinderklinik, after remaining low during the war, began to rise in 1948 and in 1954 was nearly five times that before the war. The effect of more abundant food is seen also from the dates of onset of obesity in 181 children seen since 1948 for whom reliable information was got.

Findings are reported for 335 obese children (158 boys, 177 girls) treated as in- or out-patients between 1936 and 1954. The results are shown graphically.

The obese children tended to be tall for their age, and this was true for younger children as well as for those at or just before puberty. A distinction between types of obesity according to age of onset is considered arbitrary. Doubt is cast on the belief that delayed puberty is associated with obesity in boys, and there was some evidence of early menarche in obese girls. It is considered that obese children represent an extreme form of the modern tendency to acceleration of growth.

No connection could be found between birthweight (mean 3497 g. for 135 boys, 3426 g. for 128 girls) and subsequent degree of obesity. There was no conclusive evidence of a connection with diabetes. There was little difference between obese children whose parents and grandparents were obese and those from families which denied a history of obesity (numbers compared small, about 20 of each) in birthweight, age of onset of obesity, excess height or degree of excess weight, except that obese infants were found only among the former.

A follow-up study of 21 males and 29 females, mostly in their twenties, who had been patients before the war, showed that obesity had generally persisted; some had lost weight for a time after puberty, or by dieting, or during the war, but had reverted when food became plentiful again. In view of the bad effects on health of obesity in adults, it is considered that treatment of obesity in children is essential; and that dieting is the most effective and the only safe method.

W. M. Deans.

5109

JOHNSON, M. L., BURKE, B. S. and MAYER, J. **The prevalence and incidence of obesity in a cross-section of elementary and secondary school children.** *Amer. J. Clin. Nutrition*, 1956, **4**, 231–238. [Dept. Maternal Child Health, Harvard Sch. Pub. Health, Boston, Mass.]

Heights and weights of over six thousand children in the towns of Brookline and Newton were obtained from school health records. Wetzel's grid limit for obesity, channel A_4 or above, was the criterion. The overall prevalence rate for boys was $9{\cdot}0 \pm 2{\cdot}5$ per cent. and for girls $12{\cdot}5 \pm 2{\cdot}5$ per cent.

Records of children classed as obese were traced back through the school grades. This showed that there was a history of persistent obesity in one-third of the overweight girls and in about half of the overweight boys. Late obesity accounted for 12 per cent. of the overweight girls and over a third of overweight boys.—F. C. Aitken.

5110

SHAH, N. J., SATOSKAR, R. S. and LEWIS, R. A. **Use of coco-nut water in treatment of congestive cardiac failure.** *Indian J. Med. Res.*, 1956, **44,** 341–351. [K.E.M. Hosp., Bombay.]

Coconut water, because of its low Na and high K content, was given as a diuretic to 5 patients for 5 days in amounts ranging from 1650 to 2000 ml. daily. Another group of 5 patients was given the same amount of fluid as milk, 800 ml. daily, and water. Response to coconut water was better than to milk and water as judged by clinical signs, urine output, weight loss and urinary excretion of Na.

The results are of practical importance in parts of India where fresh coconut water is easily obtainable.—F. C. Aitken.

5111

BEYCHOK, S., KATCHMAN, A., BARON, H. and KLEINER, I. S. **Practical methods for preparing diets low in sodium and high in protein.** *Amer. J. Clin. Nutrition*, 1956, **4,** 254–260. [Dept. Biochem., New York Med. Coll.]

Sodium was reduced in meat, fish and cheese by soaking and in milk, cream and eggs by dialysis. The method and results obtained are tabulated. A diet containing as little as from 100 to 500 mg. Na with a satisfactory protein content may be made up of these and other low-Na foods.

Electrolyte and N excretion and bodyweight and blood pressure data before and after treatment with such a diet are tabulated for 12 patients. The diet was palatable and reduced blood pressure in all except 1 patient.—F. C. Aitken.

5112

GORDON, E. S. **The treatment of cirrhosis of the liver.** *Arch. Int. Med.*, 1956, **97,** 340–351. [Dept. Med., Univ. Wisconsin, Madison.]

5113

GABUZDA, G. J. **Clinical and nutritional aspects of lipotropic agents, with special reference to their role in the pathogenesis and treatment of fatty cirrhosis of the liver.** *J. Amer. Med. Assoc.*, 1956, **160,** 969–975. [Dept. Med., Sch. Med., Western Reserve Univ., Cleveland, Ohio.]

A review (references not reproduced except in author's reprints).

5114

PHEAR, E. A., RUEBNER, B., SHERLOCK, S. and SUMMERSKILL, W. H. J. **Methionine toxicity in liver disease and its prevention by chlortetracycline.** *Clin. Sci.*, 1956, **15,** 93–117. [Dept. Med., Postgrad. Med. Sch., London.]

Patients with liver disease were given 8 to 20 g. *dl*-methionine by mouth daily for up to 7 days. In a group of 9 patients with portal cirrhosis and chronic portal systemic encephalopathy, of whom 8 had extensive portal systemic collateral circulation, methionine caused neurological deterioration in 7. The changes occurred after total doses of from 11 to 46 g. methionine. Seven patients with portal cirrhosis, 3 with extensive collateral circulation, of whom none had previously shown neurological signs, tolerated 50 to 102 g. methionine without neurological change. Intravenous methionine was without effect in 3 of 4 patients who reacted to methionine by mouth; in the fourth, deterioration occurred 2 hr. after the infusion. Neurological signs after methionine by mouth were not associated with change in blood ammonia, *p*H or serum bilirubin nor related to level of methionine, which rose whether there was neurological deterioration or not. Five patients sensitive to methionine by mouth were given chlortetracycline before and during a second course of methionine; neurological deterioration was prevented or delayed. This suggested that the toxic substance might be derived from methionine by the action of intestinal bacteria susceptible to this antibiotic, and bacteriological investigations were made *in vivo* and *in vitro*. The results, presented in detail and discussed, gave no positive explanation of the mechanism of methionine toxicity.

F. C. Aitken.

5115

STAPLETON, T., MACDONALD, W. B. and LIGHTWOOD, R. **Management of "idiopathic" hypercalcaemia in infancy.** *Lancet*, 1956, **270,** 932–934. [Paediat. Unit, St. Mary's Hosp. Med. Sch., London.]

Treatment of an infant with a low-Ca diet caused both the high serum Ca and the high blood pressure to revert to normal; a cardiac murmur disappeared.—F. C. Aitken.

5116

DIDDLE, A. W., DAVIS, M., O'CONNOR, K. A. and BROWN, B. **Importance of nutrition in the irradiation treatment of cervical carcinoma.** *Amer. J. Obstet. Gynecol.*, 1956, **71,** 768–775. [E. Tennessee Baptist Hosp., Knoxville.]

Of 191 women with squamous carcinoma and 2 with adenocarcinoma of the cervix, those who were treated in hospital received a well-balanced diet and were given blood transfusions to correct anaemia. They remained in better condition during and after radiation treatment and had fewer complications than those without these advantages.—A. M. Thomson.

5117

BELLOMO, A. and VARNIER, M. Osservazioni e rilievi sull'impiego in geriatria di un principio attivo di cuore embrionale. [**The use in**

geriatrics of an active extract of embryonic heart.] *Acta gerontol.*, 1956, **6**, 37–43. [Osp. S. Giovanni Battista, Turin.]

The subjects were 18 men and 12 women 55 to 80 years old, with heart disorders of several types. Each was treated for from 20 to 30 days with corhormone (extract of embryonic heart) by intramuscular injection daily.

Local and general tolerance were excellent. The treatment was considered useful in several patients, especially in those with moderate decompensation. Subjective improvement was reported by a patient with atrioventricular block and 5 with recent or old infarcts. It is recommended as a temporary substitute when digitalin has to be suspended.

D. Duncan.

5118

EMANUEL, R. W. **The clinical diagnosis, prognosis and treatment of anorexia nervosa.** *Postgrad. Med. J.*, 1956, **32**, 238–242. [Middlesex Hosp.]

A review of the literature and of data from the hospital records relating to 24 cases are presented as a guide to the practitioner in the diagnosis of *anorexia nervosa*. Methods of treatment have been many and varied and all equally disappointing in their results. At present the usual treatment is reassurance of the patient and attempts to increase energy intake with small meals high in energy, supplemented, if necessary, by an intragastric drip.—F. C. Aitken.

See also Absts. 4834, 4997, 4998, 5088, 5091.

6. FEEDING OF ANIMALS

GENERAL, INCLUDING DIGESTIBILITY TRIALS

5119

BELL, J. M. **Newer developments in live stock feeding.** *Agric. Inst. Rev., Canada*, 1956, **2**, 18–20; 28. [Dept. Animal Husb., Univ. Saskatchewan, Saskatoon.]

5120

TYUTYUNNIKOV, A. I. Svoevremenno ubrat' i pravil'no ispol'zovat kul'tury sochnogo korma. [**Modern conservation and the correct use of succulent fodders.**] *Zhivotnovodstvo*, 1955, No. 8, 11–14.

5121

ZUBRILIN, A. A. Ratzionalizatziya podgotovki kormov k skarmlivaniyu. [**Proper use of prepared feeds.**] *Zhivotnovodstvo*, 1956, No. 3, 11–18. [Vses. Nauch.-Issled. Inst. Korm. Sel'skokhoz. Zhivotn.]

5122

GERI, G. Come calcolare la digeribilità, là relazione nutritiva ed il valore nutritivo degli alimenti. [**Calculation of the digestibility, nutritive ratio and nutritive value of feeds.**] *Riv. Zootec.*, 1956, **29**, 107–115.

A discussion without references.

5123

MÄKELÄ, A. **Studies on the question of bulk in the nutrition of farm animals with special reference to cattle.** *Acta agral. fenn.*, 1956, pp. 139.

With reference to the literature, appetite, hunger and repletion, palatability, the role of bulk in animal feeding, the capacity of the digestive tract and the rate of passage of feed through it, and the relation of plane of nutrition to digestibility of the ration are discussed. Experiments with cattle, horses and pigs are reported.

Palatability trials with cattle showed concentrates, potatoes and sugar beet tops to be equal, followed by swedes and A.I.V. silage, then molasses silage, hay and oat straw.

Slaughter trials were made to investigate the capacity of the digestive tract of cows and young bulls given hay to appetite for 10 days. The bulls had less in the reticulo-rumen than the older animals. Changes in the amount of hay given to cows resulted in comparatively small changes in contents of the reticulo-rumen. Of the total contents of the digestive tract 75 per cent. was in the reticulo-rumen. The capacity of the tract was restricted by the gravid uterus and by accumulation of abdominal fat.

When cows were fed to appetite dry matter was retained in the rumen for 24 hr., but for 2 to 3 days when only one-third full-feeding was allowed. With young bulls given the same quantity of feed per 100 kg. liveweight as the cows, feed was retained in the rumen for somewhat longer. Lignin was retained 1·7 times as long as total dry matter at all levels of feeding.

Digestibility of the dry matter of the ration decreased by about 1·5 per cent. when the intake of dry matter increased by 1 kg. per 100 kg. liveweight. N-free extract was thought to be digested and absorbed mostly in the reticulo-rumen.

Bulk or filling capacity of a feed was found to be more closely related to its dry matter content

than to fibre, ballast, or water content. In concentrates 1 kg. dry matter was equivalent to 0·5 kg. dry matter in hay, in potatoes and swedes to 0·6 kg., in fodder cellulose to 0·7 kg., in beet tops to 0·8 kg., and in sugar beet pulp to 0·9 kg. Grass A.I.V. silage, hay and oat straw were similar in this respect.

Wood wool was given to cows getting concentrates and a decreasing amount of roughage, and the amount eaten was taken to indicate the desire for roughage. The minimum requirement of roughage was 0·5 kg. per 100 kg. liveweight. With swedes or beet pulp instead of concentrates the requirement of roughage was considerably less.

Working horses ate from 12 to 14 kg. hay in addition to 3 kg. concentrates. On the first day of rest after working an extra kg. hay was eaten, but after 3 days consumption was the same as on working days. Oats and hay were of equal filling value. The gravid uterus just before foaling reduced the capacity for hay by 5 kg.

Pigs were given concentrates, potato silage and grass, with a small quantity of skimmed milk. Average intake of dry matter of the pigs, 6 months old, was 3·40 kg. per 100 kg. liveweight. The feeds were all given free choice, and about 1·1 kg. grass was eaten per 100 kg. liveweight. The total dry matter taken had 4·2 per cent. fibre. When the amount of concentrate was varied and grass was given to appetite, the intake of the latter was reduced by 0·5 to 0·75 kg. for each additional kg. concentrate. When 7-month-old pigs were given concentrates and grass to appetite they ate 4·20 kg. concentrates and 0·3 kg. grass daily, the fibre content of the dry matter being 3·7 per cent. When grass was withheld, intake of concentrates decreased. When grass and concentrates were given to appetite on alternate days, the pigs did not eat enough grass to satisfy their requirements, but took more concentrates than necessary.

T. D. Bell.

5124

LOFGREEN, G. P. and MEYER, J. H. **A method for determining total digestible nutrients in grazed forage.** *J. Dairy Sci.*, 1956, **39**, 268–273. [Dept. Animal Husb., Univ. California, Davis.]

It is suggested that when the digestibility coefficient for organic matter is known it is possible to determine total digestible nutrients by multiplying the digestion coefficient by a factor calculated from the formula $F = M(0{\cdot}01 + 0{\cdot}000125E)$, where M is the percentage organic matter in the dry matter of the feed and E is the ether extract as a percentage of the organic matter. Estimates of the digestibility of organic matter may be obtained from the formula $D = 100 - (100AY/BX)$, where D is the digestion coefficient for organic matter, A is the organic matter per g. dry matter in the faeces, B is the organic matter per g. dry matter in the forage, X is the chromogen per g. dry matter in the faeces and Y is the chromogen per g. dry matter in the forage. The validity of the formulae was confirmed by a pasture utilisation study with 18 steers.—J. N. Aitken.

5125

THOMAS, B., ROGERSON, A. and ARMSTRONG, R. H. **The influence of mineral-rich herbs on the yield and nutritive value of swards. 1. Dry matter production and composition under pasture conditions. 2. Yield, composition, digestibility and feeding value under meadow conditions.** *J. Brit. Grassland Soc.*, 1956, **11**, 10–15; 82–85. [King's Coll. (Univ. Durham), Newcastle upon Tyne.]

1. A complex grass and clover seeds mixture was sown with or without a herb seeds mixture on four ½-acre plots. The resulting swards included a 0, 7, 15 or 22 per cent. ground cover of sown herbs. There was no significant difference between plots in the liveweight gains of groups of lambs which grazed them for 6 weeks during summer. Herbage dry matter yields measured over one year fell as the proportion of herbs increased. A similar trend appeared in the data for crude protein, digestible crude protein (estimated *in vitro* by Wedemeyer's method), carotene, Fe and Mn. Lignin, Ca, P, Mg, Cu and Co contents tended to increase as the proportion of herbs rose.

2. A small area of each of the 4 plots described above was cut for hay. The presence of herbs made curing difficult. The yield of hay from the plot containing most herbs was only 57 per cent. of that from the no-herb plot. Trends in composition were similar to those described above except for the trace elements, where no differences appeared. In a trial with 2 sheep no difference was found in the digestibility of the organic matter of the 4 hays, but digestibility of crude protein fell steeply as the proportion of herbs increased. The aftermath was cut and given to guineapigs. Their mean gains in liveweight per 100 g. grass eaten or digested fell with increasing herb content.

J. L. Corbett.

5126

BRUNDAGE, A. L., SWEETMAN, W. J., HODGSON, H. J. and BULA, R. J. **The utilization of smooth bromegrass (*Bromus inermis*) under rotational and strip grazing systems of pasture management. 1. Animal and pasture production.**

BRUNDAGE, A. L., SWEETMAN, W. J. and BULA, R. J. **2. Digestibility-intake studies.**

BRUNDAGE, A. L. and SWEETMAN, W. J. **3. Animal behavior.** *J. Dairy Sci.*, 1956, **39**,

280–286 ; 287–296 ; 297–302. [Dept. Animal Husb., Alaska Agric. Exp. Stat., Palmer.]

1. Two trials, in 1953 and 1954, were made in which equal areas of smooth bromegrass pastures were used for grazing dairy cattle either rotationally or by strip grazing : one half was divided into 4 for the rotation and a new strip of the other half was grazed every 24 hr. The total area was 4 acres in 1953, of a pasture seeded down 5 years previously ; the grazing period was 55 days and 4 cows were grazed on each system. In 1954, 6·4 acres seeded in 1953 were used, again with 4 cows for each system, and the period was 76 days. The cows were allocated between systems so as to be as nearly equal as possible in age, stage of lactation and milk yield. There was a slightly better utilisation of the pasture when it was strip grazed, but the difference was not significant, and under efficient rotational management there was no waste of herbage. In 1953 the cows ate somewhat less grain when strip grazing, and in 1954 considerably more. Estimated total digestible nutrients supplied per acre by the pasture were higher, but not significantly so, for the stripgrazed area.

2. One cow in each system of the 1954 trial was used in digestibility trials, during which the cows had pasture only. A combined chromogen and chromium oxide technique was employed. It was found that the milk and faeces were produced from forage eaten after the same interval of time. Under strip grazing, digestibility of the dry matter of the herbage and yield of milk were positively correlated, but this was not found under rotational grazing. Utilisation of pasture was estimated from intake and digestibility, from calculated total digestible nutrient requirements, and from clippings taken before grazing. All methods are of value, but for investigations over short periods, such as the one reported, the last two are not as good as the first.

3. During the 1953 trial observations of the grazing cows during 9 periods of 6 hr., between morning and evening milking, were made. The time spent grazing seemed to be related to the stage of maturity of the grass, especially in strip grazing. In both systems the time spent grazing increased with the season, as did the time so spent during the morning. In strip grazing the time spent grazing in the afternoon was fairly constant. but in the other system it increased. This may have been due to the greater need for more careful selection of palatable herbage unsoiled by droppings. The grazing of the rotational areas, when pasture was becoming sparser as well as less palatable, was more intense in the afternoons, and when turned on to the pasture in the morning the cows gave audible expression to their dissatisfaction, grazing intensely only when absolute necessity dictated that they should.—T. D. Bell.

5127

PIGDEN, W. J. and BRISSON, G. J. **Effect of frequency of administration of chromic oxide on its fecal excretion pattern by grazing wethers.** *Canad. J. Agric. Sci.*, 1956, **36**, 146–155. [Canada Dept. Agric., Ottawa, Ont.]

In three 4-day field trials, each with 4 sheep, the average recoveries of Cr_2O_3 were 101 per cent. (range 95 to 108), 94 per cent. (range 89 to 106) and 87 per cent. (range 80 to 93). Individual variation in recovery was considerable whether the chromogen was administered once or twice daily.

In an 8-day trial with 2 sheep the recoveries were 100 and 102 per cent. when the chromogen was administered twice and 6 times daily, respectively.

The daily pattern of chromogen excretion measured at 2-hr. intervals was relatively constant for individual sheep but varied considerably from animal to animal. The Cr_2O_3 content of faecal grab samples taken at 2-hr. intervals throughout the day varied from 45 to 180 per cent. of the daily average with 1 dose daily and from 65 to 135 per cent. with 2 doses daily. There was no distinct excretion pattern with 6 doses daily.

The preliminary period required for average daily excretion to equal intake was 10 days.

J. Davidson.

5128

KAMEOKA, K., TAKAHASHI, S. and MORIMOTO, H. **Variation in the excretion of chromic oxide by ruminants.** *J. Dairy Sci.*, 1956, **39**, 462–467. [Nat. Inst. Agric. Sci., Chiba, Japan.]

When goats were fed at 9 a.m. and 4 p.m. on hay and concentrates containing Cr_2O_3 the pattern of chromogen excretion appeared to show only one peak concentration daily (*cf.* Absts. 1034, Vol. 23 ; 2451, Vol. 24 ; 4658, Vol. 25). The excretion pattern was similar whether hay plus concentrates or concentrates alone were given. When the animals were fed at 12-hr. intervals there appeared to be 2 peak concentrations of Cr_2O_3 in the faeces. The effect of time of feeding on faecal excretion pattern is discussed.

Daily variation of up to 10 per cent. in the concentration of Cr_2O_3 in faeces was shown to be common, and the implications of this finding are discussed.—J. Davidson.

5129

CHARLET-LERY, G. and LEROY, A. M. Influence d'une méthode de pulvérisation à sec du son de blé sur l'utilisation digestive de cet aliment par le porc. [**Effect of a method of dry grinding of wheat bran on its digestibility by pigs.**] *Ann. Zootech.*, 1955, **4**, 333–339. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

In a digestibility trial with 3 pigs, initial liveweight 30 kg., a basal ration of barley 73, yeast 5, meatmeal 6, fishmeal 8, groundnut cake 8 and

minerals 3 per cent. was used, and a replacement of 30 per cent. wheat bran, either treated or untreated, was given. The treatment of the bran consisted in alternating periods under pressure or at reduced pressure with exposure to ultrasonic force. Experimental periods were of 12 days, with intermediate periods of 9 days. The pigs were given as much as they would clean up in 20 min. twice a day. They gained well, though with so few pigs no significance is attached to the actual gains. At the end of the experiment liveweights were from 65 to 70 kg.

Treatment of the bran increased its feeding value by 13 per cent., from 0·65 to 0·74 feed unit per kg. dry matter. Digestibility of crude protein was increased from 65 to 77 per cent., that of other constituents of the ration was increased but not significantly.—T. D. Bell.

5130

WALKER, D. M. and HEPBURN, W. R. **The nutritive value of roughages for sheep. 2. The relationship between the gross digestible energy and the chemical composition of silages.** *J. Agric. Sci.*, 1956, **47,** 172–186. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

For part 1 see Abst. 4245, Vol. 25.

2. In an 8-month study, 9 Cheviot wethers in metabolic cages were given grass silages differing widely in chemical composition. Volatile acids and bases, proximate nutrients and lignin and true cellulose were estimated. The gross digestible energy content of the silage was found to be closely related to the lignin content and was best predicted from the lignin, cellulose and crude protein contents. Metabolisable energy was closely related to digestible energy.—J. C. Gill.

5131

ROGERSON, A. **Feeding values of local barley, maize and oat straws.** *E. African Agric. J.*, 1956, **21,** 159–160. [Joint Animal Indust. Div., E.A.A.F.R.O. and E.A.V.R.O.]

A proximate analysis of dry matter and digestibility data are given for barley, maize and oat straws. The East African straws had a higher crude protein content than British straws (Woodman, Abst. 1419, Vol. 19). The digestibility coefficients estimated with wethers were 26·1, 6·8 and 23·8, the barley straw being slightly more digestible and the oat straw less digestible than British straws. The values for starch equivalent, 21·4, 27·6 and 16·0, were lower than the British values.—A. Hepburn.

5132

TRIMBERGER, G. W., KENNEDY, W. K., TURK, K. L., LOOSLI, J. K., REID, J. T. and SLACK, S. T. **Effect of curing methods and stage of maturity upon feeding value of roughages. 1. Same levels of grain.** *Cornell Univ. Agric. Exp. Stat. Bull.* No. 910, October 1955, pp. 43.

1. Silage and hay were made from a timothy and legume crop in its first and second years. Early silage was cut in early June, barn-dried hay a week later, and late silage and field-cured hay in mid-July. In the second year the mixture had a higher proportion of grass. Yield, composition and digestibility of the 4 roughages in each year were estimated, and losses of nutrients for each method of preservation were calculated. The roughages were given to dairy cows, all of which received the same allowances of grain and concentrates, and the effect on milk yield and weight changes was studied. The carotene content of the roughages and its effect on levels of carotene and vitamin A in blood and milk of the cows were also studied.

There was a greater yield of dry matter per acre when the forage was cut later. Of this available dry matter 84·8, 84·1, 80·4 and 77·5 per cent. was available for feeding of the barn-dried hay, late silage, early silage and field-cured hay, respectively, the differences being due to shattering and loss of leaf during harvesting.

The quality and composition of the forages cut earlier were reflected in the preserved roughages, which had a higher percentage of protein, and were more palatable and digestible. The late silage was also more digestible then field-cured hay. Intakes of dry matter by the cows were higher because of the greater palatability.

Milk yield was highest on early silage, but the yield of milk per acre, when allowance was made for the grain given, and for maintenance requirements, was about the same for early silage and barn-dried hay, and these were better than the late-cut crop preserved in either way.

Carotene was higher in the earlier cuts, and was higher in the first than the second-year crop, in the latter because of the different proportion of clover. During harvesting and storage the loss of carotene was great, and in early silage 39·4, late silage 38·9, barn-cured hay 5·5, and field-cured hay 4·7 per cent. remained in the roughage as eaten. All the roughages provided more carotene than was required by the cows, but some difference was found in vitamin A and carotene content of blood plasma and milk. The advantages of the 3 methods which are least dependent on the weather, and which involve less loss in harvesting, are discussed.

T. D. Bell.

5133

BREIREM, K., HVIDSTEN, H. and HØIE, J. **Antibiotics in animal nutrition.** *Roy. Agric. Coll. Norway, Div. Animal Nutrit., Repr.* No. 152; *Div. Poultry Fur Animals, Repr.* No. 22, 1955, pp. 22.

The literature on antibiotics is briefly reviewed. Experiments with chickens, mink and foxes, pigs, calves and lambs are reported.

With chickens growth to 4 weeks of age was improved when supplements of bacitracin, aureomycin, terramycin and penicillin were given, but there was no improvement in efficiency of feed utilisation. The growth response was variable and smaller than those reported from other countries, and no constant difference was found between the different antibiotics. In one experiment efficiency as well as growth from 4 to 7 weeks of age was improved by antibiotic supplements.

Antibiotics had no effect in mink and foxes on reproduction or growth of young animals.

In 16 experiments with pigs from weaning to 90 kg. liveweight, growth response to aureomycin, penicillin and a combination of bacitracin and penicillin was obtained in most cases, but not all, and response varied greatly. The experiments were made in different environmental conditions. Efficiency was improved when growth was. Bacitracin implanted in sucking pigs had no effect.

With calves in one experiment growth from 2 days to 14 weeks of age was improved by supplements of aureomycin and penicillin, but in another, growth stimulation by penicillin ceased after 11 weeks, possibly because the antibiotic had deteriorated during storage.

Neither aureomycin by mouth nor bacitracin by implantation improved the growth rate of thrifty lambs. With unthrifty lambs a small but non-significant advantage was recorded for both treatments.

In Norway the law now permits the inclusion of penicillin, terramycin and aureomycin in commercial concentrate mixtures, but these mixtures must be available also without antibiotics. The conditions, economic and environmental, under which antibiotics are advantageous are discussed.

T. D. Bell.

5134

BREIREM, K., HVIDSTEN, H. and HØIE, J. Antibiotika i husdyrenes ernaering. [**Antibiotics in the feeding of domestic animals.**] *Landbrukshøgsk. Inst. Husdyrernæring Fôringslaere*, 1955, *Særtrykk* No. 152, pp. 15.

A semi-popular summary of experimental results with chickens, pigs, calves and lambs. The pros and cons of regular use are discussed.—I. Leitch.

5135

BRÜGGEMANN, J. and ZUCKER, H. Zur Frage moglicher Gefahren und Nachteile der Antibiotikafütterung. [**Possible dangers and disadvantages of feeding of antibiotics.**] *Ztschr. Tierernährung Futtermittelk.*, 1956, **11**, 65–88. [Inst. Physiol. Tiere, Univ. Munich.]

A review.

5136

MAJNONI, F. Gli antibiotici nella nutrizione animale. [**Antibiotics in animal nutrition.**] *Riv. Zootec.*, 1956, **29**, 78–79.

A review.

5137

DONSKOI, P. G. Ratzional'noe ispol'zovanie steblei kukuruzy. [**Proper use of maize stalks.**] *Zhivotnovodstvo*, 1955, No. 12, 102.

Maize stalks were chopped and ensiled with succulent fodders such as pumpkins, water melons, beet tops, fodder beet and cabbage leaves. All these increased the moisture and improved the palatability of the silage.—H. Scherbatoff.

5138

ISTOMIN, M. N. Ispol'zovanie ozimykh kolosovykh i ikh smesei s bobovymi v zelenom konveiere. [**The use of winter cereals and mixtures with beans in green feeds.**] *Zhivotnovodstvo*, 1955, No. 8, 15–17. [Sel'skokhoz. Inst., Krasnodar.]

5139

MAKRINOVA, A. N. Kukuruza na korm skotu v kolkhozakh krasnoyarskogo kraya. [**Maize for stock feeding on collective farms of the Krasnoyarsk district.**] *Zhivotnovodstvo*, 1956, No. 1, 6–11.

5140

KOROLEV, N. A. and SALTYKOV, F. I. Kukuruza v ratzionakh sel'skokhozyaistvennykh zhivotnykh. [**Maize in livestock feeding.**] *Zhivotnovodstvo*, 1955, No. 8, 30–33. [Vses. Nauch.-Issled. Inst. Gibridizatzii.]

5141

ROGERSON, A. **Nutritive values of locally prepared pollards and dried brewers' grains.** *E. African Agric. J.*, 1956, **21**, 161–162. [Joint Animal Indust. Div., E.A.A.F.R.O. and E.A.V.R.O.]

Except for a lower value for ether extract, pollards had a similar composition to British second grade, coarse middlings. Digestibility trials with wethers on a mixture of hay of known feeding value and pollards showed that the latter had amounts of digestible constituents similar to those of the British product except for ether extract, which was about 60 per cent. less. The starch equivalents of the local and British products are given as 63·6 and 65·5. Similar experiments showed that brewer's grains, apart from lower ether extract, were similar in composition to British samples. Both had a starch equivalent of 56·7.

A. Hepburn.

5142

BLAXTER, K. L. and GRAHAM, N. M. **The effect of the grinding and cubing process on the**

utilization of the energy of dried grass. *J. Agric. Sci.*, 1956, **47**, 207–217. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Six sheep were used in 18 trials in metabolism apparatus to investigate the energy retention from 3 different forms of the same dried grass, at 2 levels of intake. The grass was chopped, coarsely ground and cubed or finely ground and cubed, and 600 or 1500 g. daily were given. Energy retention, calculated from C and N retention and from energy exchange agreed well.

No significant difference in energy retention was found between levels of feeding or between methods of preparation. At the lower level of feeding calculated net energy of the feed was higher, but this was not of importance within the normal range of feeding, and only at very high levels would cubing show any advantage.

Faecal losses of energy and methane losses seemed to be reciprocal: with cubes the former were higher and the latter lower, and at the lower level of feeding faecal losses were less. Urine losses were not affected. Heat losses were higher at the higher level of feeding and lower with cubes. The compensatory nature of the losses in relation to the net energy of the feeds is discussed.

Digestibility of the carbohydrates of cubed was lower than of chopped grass, but it was mainly the structural material of the cells which was affected. It is suggested that this is related to the rate of passage of the feed through the intestinal tract.

T. D. Bell.

5143

BLAXTER, K. L., GRAHAM, N. M. and WAINMAN, F. W. **Some observations on the digestibility of food by sheep and on related problems.** *Brit. J. Nutrition*, 1956, **10**, 69–91. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Finely ground cubed dried grass passed through the digestive tract of sheep more quickly than coarsely ground cubed, and coarsely ground cubed more quickly than long dried grass, and the quicker the rate of passage the less was the digestibility of the feed. Increasing the feed intake from 600 to 1500 g. daily also increased the rate of passage of the feed and decreased digestibility.

Using the results of this trial, in which 6 sheep were used in 18 tests, it was shown that in digestibility trials the length of the faecal collection period does not greatly influence the accuracy of the results. By mathematical analysis of results an equation was derived from which diurnal variation in the production of faeces could be estimated, and it was established that a preliminary period of 10 days before collection was adequate. Frequent feeding is desirable for accuracy in digestibility trials, and the importance of feeding at regular intervals was emphasised by the mathematical study. It was also shown that digestibility was closely related to and could be predicted from the rate of passage of the feed. The amount of ballast or "fill" in the gut estimated by mathematical study was found to agree well with results of slaughter trials. The effect of "fill", as influenced by the form of the feed and its digestibility, on the appetite of ruminants is discussed.

T. D. Bell.

5144

KORMANOVSKAYA, M. A. Opyt podgotovki solomy k skarmlivaniyu. [**Prepared straw for feeding.**] *Zhivnotnovdstvo*, 1955, No. 11, 21–24.

Different methods of preparing straw for feeding are described: straw may be chopped and given as it is, or the chopped straw may be steamed or fermented in pits, or treated with a 0·5 per cent. solution of wood ash with the addition of salt, 1 per cent. of the weight of the straw. The wood ash can also be boiled, at the rate of 2 kg. ash for 50 kg. straw, in 10 litres of water, then diluted in 30 buckets of warm water; the chopped straw is soaked in this for 10 to 15 min., then spread out for 10 hr. and given to cows at the rate of 20 to 30 kg. per cow daily.—H. Scherbatoff.

5145

KORMSHCHIKOV, P. A. O povyshenii pitatel'nosti solomy. [**Increasing the nutritive value of straw.**] *Zhivotnovodstvo*, 1955, No. 11, 91–93.

A discussion on the treatment of straw with alkalis.—H. Scherbatoff.

5146

HARDISON, W. A., LINKOUS, W. N., ENGEL, R. W., MOORE, W. E. C. and GRAF, G. C. **The effect of Fab and lecithin on the digestibility of an all-hay ration.** *J. Dairy Sci.*, 1956, **39**, 339. [Virginia Agric. Exp. Stat., Blacksburg.]

Six Holstein heifers were given a ration of alfalfa and oat hay, from 10 to 14 lb. daily, and some of them also got supplements of 10 or 20 g. Fab, a detergent, or 1 or 2 per cent. lecithin, both of which have been shown to reduce the incidence of bloat. Digestibility of the dry matter of the ration was reduced by Fab, but not significantly, and was unaffected by lecithin at both levels tested.

T. D. Bell.

5147

KOZLOVSKII, A. I. Vyvedenie novykh sortov kormovykh korneplodov. [**Production of new varieties of fodder roots.**] *Zhivotnovodstvo*, 1955, No. 10, 20–29. [Sibirsk. Nauch.-Issled. Inst. Zhivot.]

New varieties of fodder and sugar beet, turnips and fodder carrots are said to give higher yields than earlier varieties; the carrots produce 703 centners (1 centner = 50 kg.) per ha. and have an increased carotene content.—H. Scherbatoff.

5148

CHARLET-LERY, G., LEROY, A. M. and ZELTER, S. Z. (with DUMARY, C. and MARTIN, J.) Recherches sur l'efficacité alimentaire des marcs de pomme fermiers. 5. Étude chez le mouton et le porc, de la digestibilité apparente de constituants de marcs de pomme frais, ensilé ou deshydraté. [**The feeding value of cider apple residues. 5. Study with sheep and pigs of the apparent digestibility of the constituents of fresh, ensiled or dried apple residues.**] *Ann. Zootech.*, 1955, **4**, 321–332. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

For previous parts see Absts. 5330, Vol. 24; 243, 1419, Vol. 25; 1223, Vol. 26.

5. Digestibility trials with sheep and pigs are reported. The sheep, 4 mature Île-de-France of about 52 kg. liveweight, were given a basal ration of lucerne hay, and dried, ensiled or fresh cider apple residues supplying from 20 to 51 per cent. of the dry matter of the total ration. The digestibility of the organic matter of the residues was 56 per cent., regardless of whether they were dried, ensiled or fresh, which was slightly better than that of the organic matter of lucerne hay alone. Fibre of the residues was better digested than that of the hay. Protein was not digested, and gave a negative value for digestibility. The nutritive value of 1 kg. dry matter was from 0·55 to 0·62 feed unit.

Three Large White pigs of initial liveweight 26·5 kg. were given a basal ration of oat bran 20, included to give a crude fibre content similar to that of apple residues, barley 52, meatmeal 6, fishmeal 5, distiller's yeast 5, groundnut cake 8 and mineral mixture 4 per cent. The dried, ensiled or fresh residues formed from 13 to 22 per cent. of the ration. Individual differences were large. Digestibility of organic matter of the whole ration was depressed progressively by increasing amounts of residues by up to 4 per cent., although fibre was slightly better digested when the apples were included. Dried residues were better utilised than fresh or ensiled. Digestibility of organic matter was 54 per cent. As with sheep, crude protein was not digested. The nutritive value of the residues was from 0·51 to 0·60 feed unit per kg. dry matter.—T. D. Bell.

5149

KATKOV, B. P. Znachenie kormovykh bakhchevykh kul'tur v obespechenii skota sochnymi kormami. [**Importance of gourd cultivation in providing stock with succulent fodder.**] *Zhivotnovodstvo*, 1955, No. 8, 17–23.

Pumpkin is superior to water melon in dry matter content and digestible protein. For feed units beet, pumpkins and water melons with seeds are almost equal, but pumpkins and water melons have a higher digestible protein content than beet and carrots. Pumpkins and water melons produce excellent silage, usually with the addition of chopped hay or straw.—H. Scherbatoff.

5150

TODD, J. R. **Investigations into the chemical composition and nutritive value of certain forage plants at medium altitudes in the tropics. 3. The digestibility and nutritive value of grass and legume hays and 'standing hays'.** *J. Agric. Sci.*, 1956, **47**, 225–231. [E. African Vet. Res. Organiz.]

For previous parts see Abst. 2897, Vol. 26.

3. Digestion trials are reported with sheep for 7 grass and legume hays and for 7 "standing hays", *i.e.*, dried mature grass, which forms the bulk of the ration for animals during the dry season. At the flowering stage grass hay of good quality is obtainable; more mature grasses provide hay of only poor or very poor quality. Legume hays also were good. In the "standing hay" form grasses were generally poor; *Brachiaria brizantha*, a drought-resistant species, was best. The tentative conclusion is that, in the dry season, the extensive grazing areas of East Africa are capable of providing, at the most, for maintenance requirements of ruminants.—D. Harvey.

5151

ROGERSON, A. **Nutritive value of pineapple residues (dried).** *E. African Agric. J.*, 1956, **21**, 163. [Joint Animal Indust. Div., E.A.A.F.R.O. and E.A.V.R.O.]

Unmilled pineapple residues were given with hay of known feeding value to 4 sheep. The digestibility coefficients of crude fibre and N-free extract, present as 16·22 and 74·50 per cent. of the dry matter of the pineapple, were 76·7 and 79·2, respectively, but crude protein, true protein and ether extract, present as 3·53, 2·45 and 0·50 per cent., had negative digestibility values. The starch equivalent is given as 47·9.—A. Hepburn.

5152

DIJKSTRA, N. D. De verteerbaarheid en voederwaarde van kervelzaad. [**Digestibility and feeding value of garden chervil seed.**] *Landbouwk. Tijdschr.*, 1956, **68**, 609–611. [Rijkslandbouwproefstat., Hoorn.] English summary.

Three wethers had daily 600 g. hay of known composition and digestibility and 500 g. ground seeds of chervil (*Anthriscus cerefolium*). Per 100 g. dry matter the chervil meal had crude protein 20·37, ether extract 11·10, N-free extract 31·86, crude fibre 26·09, ash 10·58 and true protein 18·76 g. Mean digestibility coefficients in that order were 64·1, 71·2, 83·6, 57·4, 58·1, 11·9 and 69·0. The seed had therefore 13·02 per cent. digestible

crude or 11·62 per cent. digestible true protein and its starch equivalent was computed to be 52·2.

I. Leitch.

5153

MAHADEVAN, V. **Nutritive value of green manure crops. 2. *Gliricidia maculata*. 3. *Phaseolus aconitifolius* or Phillipesara.** *Indian Vet. J.*, 1956, **32,** 457–462 ; 463–465. [Dept. Animal Nutrit., Madras Vet. Coll.]

For part 1 see Abst. 5762, Vol. 25.

2. The mature leaves of *Gliricidia maculata* contained, per cent. : digestible protein 10·70, digestible ether extract 1·05, digestible fibre 2·54 and N-free extract 23·44, with a starch equivalent of 39·10 and a nutritive ratio of 2 : 7. The Ca content was 2·16 and that of P 0·35 per cent. The leaves were unpalatable to cattle and contained a phenolic compound. Reports from British West Indies, Malaya and Ceylon, however, state that the leaves are palatable to stock. Guineapigs fed on the leaves in place of cabbage and beet leaves ate less and lost weight.

3. *Phaseolus aconitifolius* (*trilobus*) cut at 3-monthly intervals had an average percentage composition on a dry matter basis of crude protein 23·91 (digestible 17·26), ether extract 2·76 (1·84), crude fibre 16·57 (8·29) N-free extract 43·56 (29·10) and ash 13·02. The Ca content was 1·57 and that of P 0·50 per cent. Its feeding value was similar to that of alfalfa hay. The Ca : P ratio is unbalanced and a supplement rich in phosphorus, such as bran, should be given.—J. S. Thomson.

5154

DAVIS, G. K. **Urea in cattle feeds.** *Vet. Med.*, 1956, **51,** 154 ; 162. [Florida Agric. Exp. Stat., Gainesville.]

5155

HUMPHREY, K. **The utilization of urea as a protein supplement for ruminants. A review of the literature.** *Rhodesia Agric. J.*, 1956, **53,** 241–256.

5156

SHULYUMOVA, E. S., FED'KO, P. A., ZHAVORONKINA, N. S., ROZUM, YU. G. and MURANOV, B. M. Primenenie tkanevykh preparatov s tzel'yu stimulyatzii rosta i razvitiya molodnyaka. **[The use of tissue extracts to stimulate growth and development of young animals.]** *Zhivotnovodstvo*, 1956, No. 4, 66–70. [Oskhi.]

Powdered dried placenta from cattle was given to different types of livestock, including poultry. The appetite of the experimental animals increased, food absorption improved and growth rate in young animals and birds rose. Best results were obtained after a prolonged period of 2½ to 5 months. The weight of experimental pigs was greater than that of controls by from 400 to 2000 g. Each pig was given 0·5 g. daily.—H. Scherbatoff.

5157

ALIPOV, V. V. Skarmlivanie fosforitov zhivotnym. **[Rock phosphates for animal feeding.]** *Zhivotnovodstvo*, 1955, No. 11, 98–100. [Nauch.-Issled. Inst. Sel'skokhoz. Yugo-Vostoka.]

Increased liveweight in calves and better bone development were noted when they were given rock phosphate. Accumulation of fluorine in their teeth and tissues made it necessary to limit continuous use of rock phosphate in the ration to not longer than 4 months. The amount of phosphate meal should not exceed an equivalent of 1 mg. F per calf or lamb and 3 mg. F for cattle and sheep daily. The phosphate was used as a substitute for bonemeal which had to be imported from other regions.—H. Scherbatoff.

5158

BAINTNER, K. Lehetőségek állatállományunk takarmányfehérje hiányának pótlására. **[Means of combating the protein shortage in animal feeding.]** *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1,** No. 4, 3–20. [Inst. Animal Nutrit., Univ. Agric. Sci., Budapest.] Russian, German and English summaries.

There is great difficulty in meeting the protein requirements of livestock in Hungary. Much of the protein-rich plant produce, such as sweet lupins, is needed for human food, though by-products such as beet pulp and brewery wastes are available for animals. Means of increasing the supply of protein must be found which do not call for an increase in arable land and which are as far as possible independent of the bad climate. Urea with molasses was found to be useful to replace some protein for dairy cows of medium yield and for fattening cattle, but is not recommended for young cattle. Studies are being made with different types of yeast. Penicillin mycelium was of value in experiments with pigs and poultry, but the quantities available are trifling. (From English summary.)

D. Duncan.

5159

WOLNY, P. Krew jako pasza i nawóz w gospodarstwie karpiowym. **[Blood as a feed and fertiliser in carp fisheries.]** *Rocz. Nauk rol.* [*B*], 1955, **69,** 559–571. Russian and English summaries.

Fresh blood, 18 per cent. protein, bloodmeal, 82 per cent. protein, and blood-potato flakes, 39 per cent. protein, were not used efficiently by carp. Fresh blood was better used as a fertiliser applied to the bottom of the pond before flooding. In this case 2·1 kg. blood was reckoned to produce 1 kg. fresh carp. (From English summary).—T. D. Bell.

See also Absts. 4171, 4172, 4177, 4261, 4300, 4390, 5258.

HORSES

5160

FERRARI, A. L'allattamento artificiale del puledro neonato. [**Artificial feeding of the newborn foal.**] *Riv. Zootec.*, 1956, **29,** 148. [Pavia.]

It is possible to rear foals with a bottle and teat. The average compositions of cow's and mare's milk, respectively, are : total protein 3·3, 1·6 to 2·1 ; fat 3·2, 0·4 to 1·1 ; lactose 4·6, 6·3 to 7·1. Cow's milk must be diluted and fortified with sugar or lactose. Vitamins A and D should also be given. A foal with a malformation of the mouth which prevented it suckling naturally was successfully reared by the artificial method.

T. D. Bell.

5161

SEIDLER, S. and ŻÓŁKIEWSKI, A. Żywienie koni roboczych paszami zastępczymi. [**Substitute feeding of work horses.**] *Rocz. Nauk rol.* [*B*], 1955, **69,** 381–398. Russian and English summaries.

In an experiment with working geldings 50 to 100 per cent. of the oats on which they were fed was replaced by a mixture of 1 part horse beans and 4 parts dried beet pulp or of 7 parts rye bran and 4 parts potato flakes. The maximum amounts of the mixtures were 5 kg. of the first and 5·5 kg. of the second. All the animals performed well compared with those getting oats and weight changes were similar in all groups. It was apparent that on soils and in conditions unsuitable for the growing of oats the mixtures investigated would be suitable replacements. To replace 1 kg. oats required 0·2 kg. horse beans and 0·8 kg. dried beet pulp or 0·7 kg. rye bran and 0·4 kg. potato flakes. (From English summary.)—T. D. Bell.

5162

MAGIDOV, G. Kormlenie loshadei silosom. [**Feeding silage to horses.**] *Konevodstvo,* 1956, **62,** No. 1, 24–28.

A discussion of the value for horses of silage of maize cobs at the milk-wax stage.

H. Scherbatoff.

See also Absts. 4337, 4338.

CATTLE

GROWTH AND FATTENING

5163

PATCHELL, M. R. **The use of dried buttermilk in a meal mixture as a feed for dairy calves.** *N.Z. J. Sci. Technol.* [*A*], 1956, **37,** 538–541. [Dairy Res. Inst. (N.Z.), Palmerston North.]

Calves were reared on whole milk for 3 weeks, and then, after a 2-week transition period, on a meal mixture containing dried buttermilk, pollard meal and either maizemeal or wheatmeal, dry or in the form of a gruel. Throughout the trial, which lasted for 10 weeks, the calves were rotationally grazed on pasture of good quality ; they were brought in for feeding twice daily and were allowed 2 hr. to eat their food. Growth rates of calves given the meals as a gruel were significantly higher than of those given the meals dry. There was no difference between results for the meal mixtures. Difficulty was experienced in coaxing the calves to eat the dry meal in the allotted time, and it is suggested that better results might have been obtained with dry meal if the calves had been allowed free access to it.—T. R. Preston.

5164

KESLER, E. M., MCCARTHY, R. D. and KNODT, C. B. **Nipple versus pail feeding of milk to Holstein calves.** *J. Dairy Sci.*, 1956, **39,** 542–546. [Dept. Dairy Sci., Pennsylvania Agric. Exp. Stat., University Park.]

Four methods of hand-feeding calves with milk were compared ; from metal pails on the floor ; metal pails 10 in. from the ground ; pails fitted with nipples and suspended so that the calf had to raise its head to suck ; 2-qt. bottles fitted with nipples and suspended at the same height as the nipple pails. The calves were given 1 gal. milk daily and water, hay and a dry calf starter to appetite.

In general, pail-fed calves took their milk much more rapidly, ate more hay and calf starter and gained in weight faster than calves fed from nipple pails or bottles.—T. R. Preston.

5165

LASSITER, C. A., SEATH, D. M., ELLIOTT, R. F. and BASTIN, G. M. **Use of distillers' grain solubles in calf starters.** *Univ. Kentucky Agric. Exp. Stat. Bull.* No. 623, March 1955, pp. 8.

Dry calf starters containing maize or milo distiller's dried solubles when given to calves reared according to a plan with limited milk were as satisfactory as a conventional starter containing dried skimmed milk. The growth rate of calves fed on starters containing rye distiller's solubles was 15 per cent. less than that of calves receiving the other starters.—T. R. Preston.

5166

MIKHALIN, A. I. Vyrashchivanie telyat na ponizhennykh normakh tzel'nogo moloka. [**Rearing calves on a reduced allowance of whole milk.**] *Zhivotnovodstvo*, 1956, No. 1, 59–64.

Results of several experiments confirmed the findings of experiments in other countries that calves can be satisfactorily reared on reduced allowances of whole milk, supplemented by skimmed milk, concentrates and other foods of vegetable origin. It is recommended that about 150 litres of whole milk should be given during the first 4 months of life.—H. Scherbatoff.

5167

HIBBS, J. W., CONRAD, H. R., POUNDEN, W. D. and FRANK, N. **A high roughage system for raising calves based on early development of rumen function. 6. Influence of hay to grain ratio on calf performance, rumen development, and certain blood changes.** *J. Dairy Sci.*, 1956, **39**, 171–179. [Ohio Agric. Exp. Stat., Wooster.]

For previous parts see Absts. 1266, 3860, 4401, Vol. 24; 1353, Vol. 25.

6. The effects of 3 different ratios of hay to grain (4 : 1, 3 : 2, 2 : 3) and an exclusive milk diet on growth, feed consumption and feed conversion efficiency were studied in an experiment with 12 Jersey and 9 Holstein calves. Whole milk was given to one group for 12 weeks; the remaining groups received milk up to 7 weeks and hay and a grain mixture throughout. Inoculations of cud taken from older cattle were given weekly for the first 6 weeks. Calves fed exclusively on whole milk showed the best skeletal development but did not differ significantly in total liveweight gain from those given the ration with hay : grain ratio 2 : 3. Weight gain, total digestible nutrient intake, and percentage protein digested increased as the amount of grain in relation to hay increased. There was no effect of the hay : grain ratio on the total volatile fatty acid content of the rumen juice. Rumen *p*H increased and establishment of indicator rumen micro-organisms developed with age. The *p*H of the rumen juice was lower when the proportion of grain was higher. Blood glucose was not affected by the hay : grain ratio. Blood cholesterol declined after the withdrawal of milk from the diet.—J. N. Aitken.

5168

HAWKINS, G. E. (Jr.) and AUTREY, K. M. **Effects of feeding grass and of sanitation on growth of young dairy calves under two systems of management.** *J. Dairy Sci.*, 1956, **39**, 196–203. [Dept. Dairy Husb., Alabama Polytech. Inst., Auburn.]

The value of grass for calves on a basal diet o milk and concentrates and housed indoors in conventional barns or outdoors in open, portable pens on clean ground was determined in an experiment extending over 2 years and involving 36 animals. The effect of rearing calves in open pens on ground contaminated by mature cattle was investigated in the second year only.

Calves housed conventionally grew slightly faster and required less feed per lb. gain than calves in outdoor pens on clean ground. Confining calves on contaminated ground resulted in significantly poorer growth compared with those reared on clean ground. Grass had no effect on weight gains of calves in either housing group.—T. R. Preston.

5169

JONES, W. G., BARTLEY, E. E., SWENSON, M. J., UNDERBJERG, G. K. L., ATKESON, F. W. and FRYER, H. C. **Effects of supplementing a calf ration with trace minerals, aureomycin, and other dietary constituents as measured by growth and feed consumption.** *J. Dairy Sci.*, 1956, **39**, 188–195. [Dept. Dairy Husb., Kansas Agric. Exp. Stat., Manhattan.]

Three groups of 9 Holstein and Ayrshire calves of both sexes were used. During the period from birth to 24 weeks the growth rate of calves on a basal ration was compared with that of calves on the same ration supplemented with Fe, Cu, Co, I, Mn and Zn and also with the growth of calves on the basal ration plus trace minerals with added Ca, P, Mg and NaCl, vitamins A, B complex, C, D, E and K and aureomycin. The calves in both supplemented groups grew at a significantly faster rate than those given the basal ration only. Animals receiving the trace minerals showed a dmininishing rate of growth in the later stages of the experiment. At 24 weeks of age the calves receiving the mineral, vitamin and aureomycin supplement were significantly heavier than those in the other groups.—J. N. Aitken.

5170

BARTLEY, E. E., PARRISH, D. B. and WHEATCROFT, K. L. **Antibiotics in dairy cattle nutrition. 6. The effects of aureomycin feeding on the apparent digestibility of certain calf rations.** *J. Dairy Sci.*, 1956, **39**, 319–325. [Dept. Animal Husb., Kansas Agric. Exp. Stat., Manhattan.]

For part 4 see Abst. 1352, Vol. 25.

6. Twelve calves were used to study the effects of orally administered aureomycin on the apparent digestibility of 3 rations: milk only, milk plus oats and milk plus alfalfa hay. For the first trial, when the calves were 9 weeks old, aureomycin slightly increased the digestibility of the nutrients of the diet of milk only, had little effect on the

digestibility of the milk and oats diet and significantly depressed the digestibility of crude fibre in the milk and hay diet. In the second trial, when the calves were 13 weeks old, the results for the milk diet were in agreement with those for the first trial; for the milk and oats diet, however, aureomycin reduced the digestibility of the crude fibre but had little effect on this or the digestibility of any other constituent of the milk and hay diet.

Growth and efficiency of feed utilisation were improved in calves given aureomycin.

T. R. Preston.

5171

KRÜGER, L., LÜSSE, W. and SCHULZE, G. Untersuchungen auf Eineiigkeit bei männlichen Fleckviehdrillingen. 1. Die Ähnlichkeitsdiagnose nach phänotypischen und physiologischen Merkmalen. [**Tests of uniovularity in male Spotted cattle triplets. 1. Diagnosis of identity from phenotypical and physiological characteristics.**]

PIESBERGEN, H. Blutuntersuchungen bei eineiigen Rinder-Drillingen. [**Blood investigations in uniovular cattle triplets.**] *Ztschr. Tierzücht. Züchtungsbiol.*, 1956, **67**, 53–67; 68–95. [Inst. Tierzucht, Justus Liebig Hochsch., Giessen.]

1. The 3 male calves were born on 1 September 1952 and received for study a month later, when they weighed 37, 40 and 40 kg. Since no diagnosis had been made at birth, the establishment of their uniovular origin depended on similarities in phenotype, feed intake and rate of drinking, growth and blood group.

A series of photographs illustrates their similarity in appearance and resemblances in hair whorls and noseprints. The calf called Bob differed more from Axel and Cito than they did from each other.

Feed intake in all 3 followed much the same pattern, but Bob ate less than the others from the 15th to the 21st week of age and more from the 34th to the 37th week. The rate of drinking was expressed in seconds per kg. fluid. The curves for all 3 calves were more similar than those of 3 unrelated calves, but again that of Bob differed from those of the other two. Their growth curves were closely similar, so were their body measurements. When they were killed at 2 years of age measurements were made on the skull, and slight differences in those of Bob again appeared. Development of teeth was similar in all.

A feeding experiment began when the calves were 63 weeks old and lasted 26 weeks. For 2 periods of 6 weeks Axel and Cito were maintained at constant bodyweight, but they quickly caught up again with Bob. All were fed on good hay, barleymeal, bran, fishmeal and dried beet pulp. The requirements for growth from between 370 and 390 kg. to between 410 and 430 kg. rose from 146 to 208 g. digestible protein and from 1183 to 1478 starch units.

2. [Not so numbered.] All 3 calves were of the same blood group, which is considered to be almost certain evidence that they were uniovular. Studies on other blood characteristics such as cell counts, mean corpuscular Hb concentration, haemolytic resistance of red cells and serological reactions confirmed the diagnosis.—D. Duncan.

5172

GREIG, W. A. and BOYNE, A. W. **The effect of high and low planes of nutrition on the haematology of monozygous twin calves.** *J. Agric. Sci.*, 1956, **47**, 150–153. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The Hb level in 8 pairs of 7- to 9-month-old monozygous twin heifer calves was higher for those reared on a high nutritional plane than for those reared on a low plane. The relative anaemia of the low-plane animals was due to a reduction in the size of the red cells; the Hb concentration in the cells was not affected by plane of nutrition.

T. R. Preston.

5173

KLOSTERMAN, E. W., BENTLEY, O. G., MOXON, A. L. and KUNKLE, L. E. **Relationships between level of protein, molasses, trace minerals and quality of hay in ration for fattening cattle.** *J. Animal Sci.*, 1956, **15**, 456–463. [Ohio Agric. Exp. Stat., Wooster.]

In an experiment with 12 Hereford steer calves given rations containing protein on two levels and hay of poor quality the addition of molasses or trace minerals significantly increased rate of liveweight gain. Without the supplements there was little difference in rate of liveweight gain between the calves on the different protein levels. The trace mineral supplement gave the better result with the higher level of protein. The addition of molasses was of equal benefit with both levels. It was concluded that there was little advantage in providing extra protein without added trace minerals and that molasses supplied the necessary trace minerals and also had a sparing effect on the protein requirement. A second experiment was made to study the relation between molasses, quality of hay and protein level when trace minerals were given with all rations. The differences between hay of good and poor quality and between protein levels and the interaction between quality of hay and protein level were all significant. Differences between the hays were accentuated as the protein level was reduced in the poor-hay ration. It was concluded that there is an unidentified factor in hay of good quality other than trace minerals or protein.—J. N. Aitken.

5174

MÜLLER, K. Vergleichende Untersuchungen über die Entwicklung von Jungrindern bei Offenstall- und Warmstallhaltung. [**Comparative studies of development of young cattle kept in open and in warm stalls.**] *Ztschr. Tierzücht. Zuchtungsbiol.*, 1956, **67**, 159–196. [Inst. Tierzucht., Tech. Hochsch., Munich.]

The farm where the study was made is near Munich, 500 m. above sea level and fully exposed to west and north-east winds. The annual rainfall is 700 to 750 mm., two-thirds of it in summer, and the mean annual temperature is 7·5° C. There are on the average 130 days with frost and only July and August are certain to be free of frost. There are 40 to 50 days with snowfall and about 40 days with snow cover. The experimental animals were kept in 2 open wooden sheds facing south, in unsheltered paddocks. In one shed were 7 young male cattle equivalent to 3·5 GVE [= adult cattle units], in the other 9 heifers equivalent to 6·0 GVE; in the sheds the air space per GVE was 35 and 21 c.m., respectively. As a control there were 7 (3·6 GVE) young male cattle tied up in winter in the main steading where they had 24 c.m. air space and little ventilation and the conditions were always warm. The study lasted from November 1953 to July 1954. The cattle were initially 7 months old, and some had been at pasture, others housed. They were fed on hay, silage, roots and minerals (Ramikal III). The indoor group had clean litter daily; the sheds were not cleaned but had fresh long straw daily.

In the indoor stall the air temperature varied from + 9·5° to + 17° C., in the sheds from − 4·6° to + 16·4° C., and the outdoor temperature from − 4·2° to + 14·9° C.

The animals from the sheds spent much time outside, even in the coldest weather. There was no illness. Initially 2 outdoor and 2 indoor animals gave positive tuberclin tests, but no new reactor appeared. Three animals in the open sheds had diarrhoea. The mean body temperature was, except on one occasion, lower in the indoor than in the outdoor groups, but the skin temperature was almost always higher indoors, whether it was measured above or without hair. The outdoor animals developed thicker hair coats, especially the woolly undercoat; otherwise the condition of skin and hair did not differ much.

Increase in weight was better and more even in the stall-fed cattle. From January to March the outdoor groups, especially the heifers, lost weight, but they began to catch up when they went to pasture in spring. The mean Hb values were 9·4 and 10·1 g. per 100 ml. (Hellige) in the outdoor groups and 8·3 g. in the indoor animals, and in the latter the Hb fell to little more than 7 g. in the 4 coldest months. The difference in red cell counts was less, and white cell counts were similar in all groups.

The animals in sheds needed less straw, on the average 2·75 and 3·0 kg. per GVE daily against 3·5 kg. indoors. But they wasted some hay by trampling it into the straw, and the indoor group used about a quarter less hay. The indoor group needed more labour for cleaning out and grooming, but less for feeding. The attendants disliked the open sheds because of the cold and the greater labour of carrying feed in bad weather.

D. Duncan.

5175

SPANN, J. Zur Entwicklung des Jungviehs auf Alpen. [**Development of young cattle on alps.**] *Züchtungskunde*, 1956, **28**, 229–232. [Weihenstephan.]

In 1905 and 1906 Oettle [reference not given] weighed 332 cattle of the Allgäu breed to find their gains during the alp season. He found that cattle on the highest alps gained less weight than those at lower altitude, that heifers 2 to 2½ years old grew better than other females, and bull calves better than older steers, and that the youngest animals suffered in bad weather so that it was not advisable to take them up to the alps. These results were confirmed in 1909 and 1910.

A fresh study shows that animals from the higher alps made the best growth in winter and in spring were much better than those which had not been on the alps at all. It is suggested that the improved cattle of today, such as the Swiss Brown, might give better results than were obtained earlier. It is advised that young cattle should be weighed before and after their summer on the alp, and even, if possible, during that time. Body measurements are useful also. Vitamin D production allows especially good bone formation on the high alps. A study is now in progress to compare cattle summered in a valley with those sent to alpine pasture.—D. Duncan.

5176

BUSEV, G. S. and UTKIN, V. P. Otkorm krupnogo rogatogo skota. [**Fattening cattle.**] *Zhivotnovodstvo*, 1956, No. 2, 48–53. [Vses. Nauch.-Issled. Inst. Zhivot.]

General principles are laid down for fattening beef cattle, with emphasis on homegrown fodder. Examples are given of successful methods in use on farms and experimental stations. Maize silage was particularly effective.—H. Scherbatoff.

5177

WHITING, F. **Feedlot finishing of cattle and sheep in the irrigated areas of Southern Alberta.** *Canada Dept. Agric., Ottawa, Publ.* No. 786, revised July 1955, pp. 55.

This publication is a practical guide to farmers in the irrigated areas of Southern Alberta, on all aspects of fattening cattle and sheep according to the feed lot system. It includes information on buying and selling of stock, feed lot equipment, selection and preparation of suitable feeds, and feeding and management as well as concise data on the nutritive value of the common feeds available.—T. R. Preston.

5178

FAGIOLI, A. Secondo contributo ai problemi della produzione della carne bovina di pregio con i vitelloni chianini-perugini. [**Second contribution to problems of high-class beef production with Chiana-Perugia calves.**] *Riv. Zootec.*, 1956, **29,** 143–147.

For previous part see Abst. 5808, Vol. 25.

For the second trial 8 bulls aged about 9 months, average liveweight 393 kg., fattened for 5 months to 586 kg. were studied. They required 5·15 feed units per kg. liveweight increase, compared with 5·90 feed units for the older bulls in the first trial. In spite of younger age they were considered mature at slaughter. Feed consumption per head was lower than standards recommended in the literature for fattening cattle of similar liveweight.

T. D. Bell.

5179

DYER, A. J. and WEAVER, L. A. **Corn substitutes for fattening cattle.** *Univ. Missouri Agric. Exp. Stat. Bull.* No. 641, January 1955, pp. 12.

Four substitute feeds, namely, wheat, barley, molasses and rough rice were compared with maize as sources of nutrients in rations for fattening cattle.

A mixture of equal parts ground wheat and shelled maize gave slightly better results than maize alone. When only ground wheat was given as grain, digestive disorders were common and liveweight gains and resulting carcases were poor. Whole wheat proved a wasteful feed, since much of it passed through the cattle without being digested. A mixture of ground oats or maize silage with ground wheat was better than the latter given alone.

Weight gains of fattening steers were greater for rations containing barley than for those containing maize ; feed utilisation and carcase grade were similar for both grains. A mixture of barley and maize gave results for weight gain and carcase grade intermediate between those for barley and maize given alone ; feed efficiency was least for the mixture.

Molasses either in limited amounts or full-fed produced slower liveweight gains than maize. Cattle given molasses required more feed per lb. gain and their carcases, particularly those from the limited feeding regime, commanded a lower selling price.

Ground rough rice had a value equal to 75 per cent. of its weight of maize ; it was palatable, but gains and carcase grades were in favour of maize.

T. R. Preston.

5180

RIEDEL, B. B. and ARNOLD, J. L. **The effect of pasture crops with and without supplemental corn feeding and dry-lot management for beef production and nematode control.** *J. Animal Sci.*, 1956, **15,** 537–542. [Mississippi Agric. Exp. Stat., State College.]

Similar groups of Hereford, Angus and Shorthorn steers were fed in dry lot or grazed on a fescue and ladino pasture ; a fescue and ladino pasture with a maize supplement ; a ryegrass pasture ; a ryegrass pasture with a maize supplement ; a wheat pasture. The cattle were weighed at 28-day intervals, when faeces samples were collected and nematode egg counts determined. At the end of the grazing season the incidence of larvae was estimated on the pastures.

Statistical analysis of the data showed that the average daily liveweight gains of the steers grazed on the fescue and ladino clover were significantly less than those on any of the other treatments. There was improvement when the pasture was supplemented with cracked maize, but there was no reduction in the parasite egg count. Supplementation of the ryegrass pasture did not improve the rate of liveweight gain, but reduced the egg burden. The best results were obtained from the wheat pasture, which compared well with dry lot feeding in regard to liveweight gain and reduction of the number of nematode ova shed by the animal.

J. N. Aitken.

5181

FRENCH, M. H. **The importance of water in the management of cattle.** *E. African Agric. J.*, 1956, **21,** 171–181. [Joint Animal Indust. Div., E.A.V.R.O. and E.A.A.F.R.O.]

A review of the role of water in the physiology of cattle living in tropical or sub-tropical environments.—J. N. Aitken.

5182

SWENSON, M. J., UNDERBJERG, G. K. L. and GOETSCH, D. D. **Effects of dietary trace minerals, excess calcium, and various roughages on weight gains of Hereford heifers.** *Amer. J. Vet. Res.*, 1956, **17,** 207–212. [Dept. Physiol., Sch. Vet. Med., Kansas State Coll., Manhattan.]

In 3 experiments with 36 Hereford calves, initial weight 300 to 400 lb., addition of excess Ca to a balanced basal diet adequate in P and vitamin D depressed growth over the first 6 months of the trial period. The effect was less marked after 12 months, suggesting that the calves had acquired

some tolerance to the high Ca intake. Addition of trace minerals or alfalfa hay to the basal diet had no effect on liveweight gains, although there was some indication that animals given supplements had a better hair coat, particularly when roughage of poor quality was given.—T. R. Preston.

5183

SYLVESTRE, P. E. **Changes in beef cattle management.** *Agric. Inst. Rev., Canada,* 1956, **2,** 29–32. [Div. Animal Husb., Central Exp. Farm, Ottawa, Ont.]

5184

LARKIN, R. M. **Behaviour of cattle under tropical conditions.** *Queensland Agric. J.*, 1956, **82,** 96–102.

5185

WHITING, F. **The management of cattle and sheep in the feedlot.** *Agric. Inst. Rev., Canada,* 1956, **2,** 24–28. [Div. Animal Husb., Exp. Farms Serv., Canada Dept. Agric., Lethbridge, Alta.]

5186

DAMMERS, J. Het gebruik van stilboestrol in rantsoenen voor mestvee. [**The use of stilboestrol in rations for fattening cattle.**] *Landbouwk. Tijdschr.*, 1956, **68,** 601–608. [Rijkslandbouwproefstat., Hoorn.]

A review.

5187

BULASHEVICH, M. E. Ispol'zovanie estrogennykh veshchestv pri otkorme zhvachnykh zhivotnykh. [**The use of oestrogens for fattening ruminants.**] *Zhivotnovodstvo*, 1956, No. 4, 63–66.

A review of American work and its application in the USSR.

5188

BUTLER, O. D., REDDISH, R. L., KING, G. T. and SIMMS, R. L. **Factors contributing to the difference in dressing percentage between Hereford and Brahman × Hereford steers.** *J. Animal Sci.*, 1956, **15,** 523–528. [Texas Agric. Exp. Stat., Agric. and Mech. Coll., College Station.]

The results were based on data from 18 Hereford and 20 Hereford × Brahman steers selected at random within sire groups and split between those receiving a 35 per cent. concentrate ration and those receiving a 65 per cent. concentrate ration. At slaughter an attempt was made to account for a 2 to 3 per cent. advantage in dressing percentage in favour of the cross steers; the dressing percentages were 60·25 and 62·98, respectively, for the Herefords and crossbreds. The main items contributing to the difference were the contents and weight of the empty digestive tract of the Herefords. In a feeding trial Hereford steers made better use of a ration high in concentrates than similar steers on a low-concentrate ration. Cross steers were unaffected by the type of ration.

J. N. Aitken.

5189

GARKAVI, O. V. and ERNST, L. K. Myasnye kachestva ostfrizskogo i pomesnogo molodnyaka. [**The yield of meat from young Friesian and crossbred cattle.**] *Zhivotnovodstvo*, 1956, No. 1, 30–37. [Vses. Nauch.-Issled. Inst. Zhivot.]

Crossbred cattle, Friesian × Hereford, although their liveweights were less than those of purebred Friesians, were more valuable producers of meat, since it was of higher quality than that of the Friesians. The crossbred carcases had also a much higher proportion of fat and it was better distributed than in the Friesians.—H. Scherbatoff.

5190

MÅNSSON, N. C. Vergleichende Untersuchungen hinsichtlich der Fleischleistung an Milch- und Fleischrinderrassen und ihren Kreuzungen. [**Comparative studies in beef production by milk and beef breeds of cattle and their crosses.**] *Züchtungskunde*, 1956, **28,** 168–180. [Hallands Läns Hushållningssällsk., Halmstad, Sweden.]

In 3 successive years purebred and cross calves were obtained from Aberdeen-Angus, Friesian and Swedish Red Spotted cows. The calves were of both sexes, the males castrated, and were brought to slaughter at about 18 months and 425 kg. liveweight. The Aberdeen-Angus calves were suckled by their mothers for 6 or 7 months, the other calves were reared in the usual way. All were outside for 6 or 7 months in summer and in stalls in winter.

Variations between groups tended to be greatest in winter and to disappear at pasture, after an initial fall of weight in all groups on going to pasture. For all 3 years the mean daily weight increase in g. was for Friesians 626, Aberdeen-Angus 616, Aberdeen-Angus × Friesian 605, Red Spotted 588 and Aberdeen-Angus × Red Spotted 558. The means of the first 3 groups were significantly higher than that of the last. Feed consumption, in Scandinavian feed units (F.U.) per kg. weight increase, was lowest for the Friesians and Friesian crosses; for the Aberdeen-Angus calves it was necessary to consider the feed intake of the mothers in the first 6 months, which made the mean for this group 10 F.U. per kg. against 6 to 7 F.U. for the other groups.

The losses at killing were least for the pure Aberdeen-Angus and greatest for the other pure breeds ; their carcases were of the highest quality, those of the other pure breeds were less highly classified. Meat samples from the Aberdeen-Angus carcases contained most fat, but the value of the carcases per kg. was slightly but not significantly less than that of the others.

Male animals gained slightly more weight than females and the meat from the females contained more fat. There was no significant difference in classification. Animals kept during the winter in exposed stalls gained less weight than those in proper winter quarters, but lost less in spring and were equal after a short time at pasture.

It is concluded that it would not be worth while on economic grounds to develop pure beef cattle in the dairy provinces of Sweden, since local dairy breeds can produce carcases of almost equal value and more cheaply.—D. Duncan.

5191

DYER, A. J. and WEAVER, L. A. **Fattening comparisons : steers vs heifers.** *Univ. Missouri Agric. Exp. Stat. Bull.* No. 646, February 1955, pp. 8.

Weaned steer and heifer calves were compared under 3 fattening systems : full-fed in dry lot over the first winter and marketed at about 700 lb. liveweight ; wintered so as to gain 1·5 lb. daily and then full-fed with concentrates on pasture and marketed at 880 to 940 lb. ; wintered to gain 1 lb. daily, grazed during the summer and then full-fed in dry lot to 950 to 1100 lb.

When marketed at light weights after one winter, heifers had superior carcases which yielded more beef : although the steers made the faster and more economical weight gains, the overall advantage was with the heifers. When allowed to grow during the first winter and then full-fed on grass, heifers were fat enough to be marketed after 86 days. Continued full-feeding for a further 83 days was to the advantage of the steers, which made 25 per cent. faster gains with better feed conversion efficiency and superior carcases. When fattened in their second winter steers produced carcases of higher grade, and made faster weight gains over the preceding winter and summer as well as during the final stage of fattening. It is suggested that heifers give the best results when fed for short periods and marketed at light weights.

T. R. Preston.

See also Absts. 4245, 4339, 4341, 4529, 4584.

MILK PRODUCTION

5192

HEWITT, A. C. T. **Dairy cattle feeding trials in Kiewa Valley.** *J. Dept. Agric., Victoria,* 1956, **54,** 97–109.

On each of 3 farms, the management of which is described, cows were given either pasture and homegrown roughage, pasture, hay and crushed oats, or pasture, hay, crushed oats and linseed meal in one of the 3 years 1949–50, 1950–51, 1951–52. As a measure of production the total butterfat produced was taken, since the milk was separated and the butterfat sold to factories.

Over the whole trial it was found that the extra cost of the low-protein concentrates was not balanced by the increase in production of butterfat. With the linseed meal and crushed oats supplements increased production showed a slight profit. On the whole it was economical to keep the cows on pasture and homegrown roughage, although the total butterfat produced was less than in the other systems. Information on the yield of green feed or dry matter per acre was inaccurate.—T. D. Bell.

5193

ISAACHSEN, H., ULVESLI, O. and BREIREM, K. **Experiments in underfeeding of dairy cows.** *Acta Agric. scand.*, 1956, **6,** 3–12.

Liveweight changes, milk yields and mineral and N balances were studied in 4 cows which were underfed for the first 3 months of a lactation and then fed normally for the remainder of that lactation and for the following lactation. At each feeding level, 2 cows received roughage in the form of early-cut hay and 2 received late-cut hay. Roots and concentrates made up the diet. Underfeeding on rations which supplied only 63 per cent. of the energy, 32 per cent. of the protein and 51 per cent. of the P given normally, reduced milk yields by 45 per cent. and liveweight by 12 per cent. compared with normal feeding. Milk from the underfed cows contained less fat and protein, and was produced less efficiently in terms of production feed units (corrected for weight loss) per unit of milk produced, than milk from cows fed normally.

Early-cut hay was superior to late-cut hay, particularly during the underfeeding period.

T. R. Preston.

5194

KVITKO, A. Z., AITMATOV, CH. A. and SOLOV'EVA, T. M. O kratnosti kormleniya i doeniya korov. [**Frequency of feeding and milking of cows.**] *Zhivotnovodstvo*, 1956, No 4, 29–35. [Kirgiz. Nauch. Issled. Inst. Zhivotnovodstva.]

5195

AZIMOV, G. I. Puti povysheniya soderzhaniya zhira v moloke sel'skokhozyaistvennykh zhivotnykh. [**Means of increasing the fat content of the milk of livestock.**] *Zhivotnovodstvo*, 1955, No. 10, 48–53.

5196

ILUS, A. E. Povyshenie zhirnomolochnosti chernopestrogo estonskogo skota. [**Increasing butterfat in Estonian Friesian cattle.**] *Zhivotnovodstvo*, 1955, No. 12, 63–73. [Inst. Zhivotnovodstva, Akad. Nauk Eston. SSR.]

5197

ROZHKOV, P. A. Kak my uvelichivaem proizvodstvo moloka. [**How we are increasing milk production.**] *Zhivotnovodstvo*, 1955, No. 12, 50–54. [Kolkhoz "Stalin".]

5198

PATERSON, R. **The milk-stimulating value of grass and its influence on animal health.** *J. Brit. Grassland Soc.*, 1956, **11**, 93–98. [Hatch Warren, Cliddesden, Basingstoke, Hants.]

The management of dairy herds of Jersey, Ayrshire and Friesian crosses from original Shorthorn stock is described. Since 1951 the use of concentrates has been gradually reduced, and in some herds is now discontinued, and the only feeds used are grass, silage and kale. The method of assessing the milk-producing value of the grass is discussed. The system of management has reduced the rate of decline of milk yield during the winter. The value of fresh grass in the spring is high, and in this respect the Italian type ryegrasses with early growth are specially valuable, though no other advantage of one seeds mixture over another in stimulating milk yield has been found. The figures reported for yield per acre and profit per acre and per cow would seem to justify the system.—T. D. Bell.

5199

SEATH, D. M., LASSITER, C. A., RUST, J. W., COLE, M. and BASTIN, G. M. **Comparative value of Kentucky bluegrass, Kentucky 31 fescue, orchard grass, and bromegrass as pastures for milk cows. 1. How kind of grass affected persistence of milk production, TDN yield and body weight.**

LASSITER, C. A., SEATH, D. M., WOODRUFF, J. W., TAYLOR, J. A. and RUST, J. W. **2. Effect of kind of grass on the dry matter and crude protein content and digestibility and intake of dry matter.** *J. Dairy Sci.*, 1956, **39**, 574–580; 581–588. [Dairy Sect., Univ. Kentucky, Lexington.]

1. Grazing trials were made over a 3-year period on eight 2-acre plots. Four duplicate plots selected at random were seeded to pure stands of Kentucky bluegrass, Kentucky 31 fescue, orchard grass and Lincoln bromegrass. All plots were given the same manurial treatments, namely, 3 dressings of 100 lb. ammonium nitrate in each grazing season. During each monthly test period comparable groups of 2 or more cows grazed each replicate of the 4 grasses. One test cow in each plot was allowed grazing alone without a supplement; the rest were given a grain supplement. The test cows were used to estimate the digestibility of the forage. Persistency of milk production was measured by calculating the ratio, as a percentage, between the production during the fourth week of the test period and the production during the week preceding the test period. The yield of total digestible nutrients (TDN) was estimated for each plot by making an allowance for yield of fat-corrected milk, body maintenance and changes in weight of the cows.

Throughout the 3 years the average persistency of milk production was 91·6, 90·8, 87·6 and 72·2 per cent., respectively, for the bluegrass, bromegrass, orchard grass and fescue. Average yearly yields of TDN per acre were 2284 for bromegrass, 2168 for bluegrass, 1749 for orchard grass and 1733 lb. for fescue. While the cows were on bluegrass and bromegrass their liveweights increased, but there was a slight loss on orchard grass and a highly significant loss on fescue.

2. The nutritional value of the grasses was estimated by the faecal chromogen and chromic oxide techniques. The dry matter content of bluegrass was significantly higher than that of the others. The average protein content of the bromegrass, orchard grass, fescue and bluegrass, respectively, was 25·6, 22·7, 21·4 and 19·2 per cent. When grazing the fescue pasture the cows tended to have a lower daily intake of dry matter. It was concluded that this was the main reason why cows on the fescue pasture showed poorer persistency in lactation, but there was a suggestion that there might be other reasons.—J. N. Aitken.

5200

GIULIANI, R. Necessità di far pascolare le vacche da latte e di far alpeggiare i giovani bovini. [**The need to turn dairy cows out to pasture and young cattle to alpine pasture.**] *Riv. Zootec.*, 1956, **29**, 129–135.

Turning cattle out to pasture adds the benefits of sunshine, fresh air and exercise to those of the nutrients available in good grass and the saving in labour and feedingstuffs. Grazing should be regulated according to the pasture. At the outset limited grazing should be allowed to avoid bloat. Excessive grazing, and grazing when the ground is too wet, should be avoided to save the pasture. In some localities there are difficulties in grazing, *e.g.*, in vineyards, but even there 2 months' grazing after the crop has been harvested is possible.

Young stock reared on alpine pastures are sturdier and better developed than their counterparts reared indoors. Where available such pastures should be used, and are suitable for calves over 6

months old. Bulls can also be maintained on them. The pastures must be accessible and provide good grazing, with hay for emergencies, an adequate water supply, and shelters should the weather be inclement. Calves to be sent to the alpine pastures should be prepared beforehand by moving them to open sheds and accustoming them to eating off the ground. To maintain alpine pastures in good condition they must be fertilised with artificial as well as natural manures, and overgrazing must be avoided by not overstocking and by moving the herds.—T. D. Bell.

5201

Vik, E. Samanlikning mellom berre dagbeiting med døgerbeiting for mjølkekyr. [**Comparison between grazing during the day only and day and night grazing for dairy cows.**] *Forskning og Forsøk Landbruket*, 1956, **7**, 109–128. [Beiteforsøksgarden Apelsvoll.] English summary.

Experiments were made, one in spring and one in autumn 1944 and one in 1946 that covered most of the summer; those took account only of milk yield and changes in weight of the cows. From 1950 experiments were continued and measurements were made of grass eaten and of grazing habits: in 1952 digestibility tests were made with wethers. Groups of 5 cows were matched for age, with a wide range of ages, and for stage of lactation; one grazed day and night, the other from 7.15 a.m. to 3.30 p.m. They were moved to fresh pasture every second day. Cows with restricted time to graze gave on the average nearly 1 kg. 4 per cent. milk less than those that grazed day and night, but when they were later allowed out all night the fall of milk yield with progress of lactation was arrested and their yield equalled or might exceed slightly that of the original day-and-night grazers.

Estimates of grass eaten were made with Cr_2O_3 as indicator. On the average, day-and-night cows ate 85 kg. with 16·8 kg. dry matter and day grazers 68 kg. with 13·8 kg. dry matter. When requirements were assessed by Hansson's method, both lots had an excess, and in one year day-grazers ate more than those that ate day and night. This is explained by the greater assiduity of the day cows, which grazed for 75 per cent. of the time on grass; day-and-night cows grazed for only 40 per cent. of the time. On the first day on a fresh strip of grass, day cows grazed for 75 per cent. and on the second day for 98 per cent. of the time devoted to grazing by the unrestricted group.

I. Leitch.

5202

Seath, D. M., Lassiter, C. A., Davis, C. L., Rust, J. W. and Cole, M. **The supplemental value of alfalfa hay when fed to cows on pasture.** *J. Dairy Sci.*, 1956, **39**, 274–279. [Kentucky Agric. Exp. Stat., Lexington.]

A trial with 16 cows, 8 Holsteins and 8 Jerseys, was made in order to determine the effect of supplementing a bluegrass pasture by giving one of each pair all the alfalfa hay it would eat during each of two 2-hr. periods daily. A grain mixture was given to all cows according to production. Digestibility trials and measures of dry matter intake were made on all cows every 2 weeks by a combination of the faecal chromogen and chromic oxide techniques. There was no significant effect on milk production due to the supplement except that for a short period the cows receiving the hay produced more 4 per cent. fat-corrected milk. The animals getting hay gained significantly more in liveweight. The total dry matter intakes of the cows receiving hay increased, but there was a decrease in the amount of dry matter obtained from pasture.—J. N. Aitken.

5203

Cox, C. P., Foot, A. S., Hosking, Z. D., Line, C. and Rowland, S. J. **The direct evaluation of pasture in terms of the milk production of individually grazed cows.** *J. Brit. Grassland Soc.*, 1956, **11**, 107–118. [Nat. Inst. Res. Dairying, Univ. Reading.]

Sixteen milking cows were strip grazed in individual cow-plots on a ryegrass and clover ley for 3 weeks. Their herbage consumption during 24-hr. periods was estimated on 9 occasions from the difference between the weight of grass offered for grazing and the ungrazed residue. The precision of this method is examined and suggestions are made for improving the technique. The estimated dry matter intakes and fresh herbage intakes over the 3-week period were both found to bear a significant linear relationship to mean milk yield. It is concluded that pastures can be evaluated directly in terms of milk production by using the techniques described. The number of animals required to detect differences of various magnitudes between 2 pastures in terms of milk yield have been calculated. A multiple regression equation was calculated relating dry matter intake to yield of 4 per cent. fat-corrected milk, liveweight and liveweight increase. From this equation the maintenance requirement of a grazing dairy cow weighing 1000 lb. was estimated to be 11·7 lb. dry matter daily. The requirement for 1 lb. of 4 per cent. fat-corrected milk was 0·29 lb. dry matter and for 1 lb. of liveweight increase 2·11 lb.—J. L. Corbett.

5204

Reid, D. and Holmes, W. **Winter feeding of dairy cows. 3. The influence on milk yield of high and low protein concentrates, each fed**

at two levels in addition to dried grass and grass silage. *J. Dairy Res.*, 1956, **23,** 159–168. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

For previous parts see Abst. 3849, Vol. 26.

3. Two groups of 4 cows were allocated each to one of 4 feed supplements according to a balanced Latin square design, the supplements being 4 lb. high-protein concentrate, 4 lb. low-protein concentrate, 2 lb. high-protein concentrate, and 2 lb. low-protein concentrate per gal. All cows were given dried grass and silage to appetite. The length of time on each supplement was 4 weeks.

Cows given 2 lb. concentrates per gal. milk daily consumed 2 lb. less total dry matter, but 4·3 lb. more dry matter as grass products produced 1·2 lb. less milk (mean yield for all cows, 33 lb. daily) and gave an increased margin of milk value over feed costs of 12 pence, as compared with cows given concentrates at 4 lb. per gal. The protein content of the concentrate did not noticeably affect dry matter consumption, milk yield or profit margin. It is considered that the saving in feed costs by giving concentrates at the 2 lb. per gal. level more than compensated for the slightly reduced milk yield.—T. R. Preston.

5205

WITT, M. Über den Einfluss verschiedener Beifuttermittel auf den Fettgehalt der Milch bei Weidegang. [**Effect of different supplements on the fat content of milk during the grazing season.**] *Arch. Tierernährung*, 1956, **6,** 61–91. [Max Planck Inst. Tierzucht, Mariensee, Trenthorst.]

A full account, with experimental details and tables and graphs of the results, is given of several experiments, some at Hanover and some at Lübeck, mostly with Black Pied Holstein cows, in which unsuccessful attempts were made to prevent the fat content of the milk falling when the cows went out to pasture, by giving supplements rich in carbohydrate or protein, *e.g.*, dried beet slices, GK-beet [not further described], or a mixture of groundnut meal and soya bean meal. The main findings have already appeared (Absts. 3044, Vol. 22; 4313, Vol. 25; 3846, Vol. 26). Some other small-scale experiments are included. The results were as before. Even a daily supplement of 2 kg. expeller process coconut meal, containing 15 per cent. crude fat, failed to prevent a fall; and it was found also when high-yieldihg cows were stall fed according to yield and let out on grass for 5 hr. daily.

There was no change in the consistency of the faeces of cows given a high-protein supplement, either in stall or at pasture. Hence it was concluded that scouring on young grass is not due to its high protein content, but may be due to its lack of fibre and high moisture content.—W. M. Deans.

5206

LOGAN, V. S. **Grazing management of dairy cattle.** *Agric. Inst. Rev., Canada*, 1956, **2,** 33–35. [Div. Animal Husb., Exp. Farms Serv., Canada Dept. Agric., Ottawa, Ont.]

5207

COLOVOS, N. F., KEENER, H. A., DAVIS, H. A., MORROW, K. S. and GIBSON, K. S. **The effect of texture on the nutritive value of concentrates for dairy cattle.** *New Hampshire Agric. Exp. Stat. Bull.* No. 419, May 1955, pp. 11.

Dairy heifers and mature cows were used in a series of double reversal trials. A concentrate mixture of maize, crimped [crushed] oats, wheat bran, soya bean oilmeal, brewer's grains, linseed oilmeal and minerals was supplied in a fine, coarse, or very coarse meal, or pelleted. The results showed that the finely ground was superior in nutritive value in terms of digestible protein and total digestible nutrients. In tests with single ingredients ground maize was superior to flaked maize and crimped oats were generally better than ground oats, except for the digestibility coefficients for protein and ether extract. Feed consumption, milk and butterfat production and liveweight gains of cows on the fine and coarse concentrate mixtures were studied in another experiment. There was no significant difference which could be attributed to the texture of the feed except that cows on the finely ground mixture made higher liveweight gains than those on the coarse mixture.—J. N. Aitken.

5208

BARBER, D. C., CARTER, E. S. and GILES, A. K. **Do bulk foods produce milk?** *Agriculture, J. Minist. Agric. Engl.*, 1956, **63,** 61–64. [Nat. Agric. Advisory Serv., South-Western Province.]

On the assumption that 4 lb. concentrates will produce one gal. milk, data assembled from 30 Gloucestershire farms showed that the proportion of total milk produced from bulky foods such as grass, silage, hay and roots was 65 per cent. in May, 54 per cent. in July and zero in November and March. The average level of concentrate feeding over the year was 2·9 lb. per gal. milk produced, and the average daily production from each cow 2½ gal. These figures are compared with those of 20 years ago when, with semi-derelict grasslands, concentrate feeding was nevertheless at the same level of 3 lb. per gal. milk produced. It is suggested that present-day large-scale investment in production of home-grown feed is not necessarily being repaid in more economic milk production.—T. R. Preston.

5209

BLACKETT, G. and RAVELL, J. **Fodder beet or swedes for milk?** *Scot. Agric.*, 1956, **35**, 219–221. [N. Scotland Coll. Agric.]

In a trial to compare swedes with 2 varieties of fodder beet, 4 groups of Ayrshires, each of 4 cows, were used. All groups were given the same ration of hay 7 lb., grass silage 42 lb., draff [wet distiller's grains] 7 lb. and either 56 lb. Danestone swedes, dry matter 11·13 per cent., or 30 lb. Red Otofte or Pajbjerg Rex fodder beet, dry matter 20·80 and 21·08 per cent., respectively. Concentrates were given at 4 lb. per gal. over the first 1½ gal. Group 1 had the swedes for 20 days, followed by a 3-day period for changing over, then Red Otofte fodder beet for 20 days. Group 2 had the fodder beet first and the swedes second. Groups 3 and 4 were similarly treated except that Pajbjerg Rex beets were used instead of Red Otofte.

Milk yields were better, and liveweights were better maintained on swedes, but there was no significant difference in total butterfat production, although the percentage of butterfat tended to be higher with the fodder beets.

Investigations on dry matter yield per acre of the crops and reliability of crops are in progress.

T. D. Bell.

5210

BREIREM, K. **Home-grown feeds in the feeding of cattle.** *Royal Agric. Coll. Norway, Div. Animal Nutrition*, 1955, Repr. No. 139, pp. 41.

The literature on feeding standards is reviewed, and it is concluded that the use of starch equivalents or Scandinavian feed units is justified. The standards based on the latter are most convenient for dairy cows, and it is shown that deviation from them is of no advantage. Milk yields up to 2 gal. daily can be achieved without concentrates when good quality hay and silage and roots are used. Above this yield increasing amounts of concentrates are necessary.

For beef production concentrates are not needed except when products of special quality are required for the luxury market, and then only for the young growing stock.

The importance of considering the energy concentration of home-grown forages, since the dry matter intake of cattle is limited, the protein requirements and possible mineral deficiencies, when balancing rations, and the role of fat and quality of protein from different sources, are discussed.—T. D. Bell.

5211

STAROVEROV, N. A. Kukuruza v zimnem kormlenii krupnogo rogatogo skota. [**Maize in winter feeding of cattle.**] *Zhivotnovodstvo*, 1955, No. 11, 11–15.

Maize given to cattle in winter should be supplemented with hay, root vegetables, concentrates and mineral supplements. Introduction of 40 kg. maize silage into the ration per cow daily improved the quality of butter and of Dutch cheese.

H. Scherbatoff.

5212

VOINOV, M. P. Silos—zimnyaya trava. [**Silage—winter grass.**] *Zhivotnovodstvo*, 1955, No. 11, 93–95. [Mariinskoi MTS.]

Grass silage should be given to cows in the same quantities as they eat during grazing, with the addition of mineral supplements.

H. Scherbatoff.

5213

RYLOV, I. E. Skarmlivanie kukuruznogo silosa molochnomu skotu. [**Maize silage for dairy cattle.**] *Zhivotnovodstvo*, 1955, No. 12, 101–102. [Krasnoyarsk. Sel'skokhoz. Inst.]

In an experiment with 2 groups of cows, of which one was given maize silage, the milk yield was increased by 31·9 per cent.—H. Scherbatoff.

5214

BAINTNER, K., BARABÁS, E. and MONOSTORI, I. Karbamidetetési kísérlet tetjelő tehenekkel. [**Feeding dairy cows on urea.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1**, No. 4, 21–26. [Inst. Animal Nutrit., Univ. Agric. Sci., Budapest.] Russian, German and English summaries.

In an experiment with dairy cows, it was possible to replace 0·9 kg. extracted sunflower meal with 0·9 kg. of a mixture containing, per cent., urea 18, ammonium sulphate 2 and molasses 80. There was no ill effect in a trial of 68 days. The cows were giving 9 or 10 litres of milk daily. (From English summary).—D. Duncan.

5215

DAVIS, C. L., LASSITER, C. A., SEATH, D. M. and RUST, J. W. **An evaluation of urea and dicyandiamide for milking cows.** *J. Animal Sci.*, 1956, **15**, 515–522. [Dairy Sect., Univ. Kentucky, Lexington.]

There was no significant effect on milk production, growth or feed consumption when urea or dicyandiamide was included in the concentrate ration of lactating cows. The rations of all cows contained less than the recommended amount of protein.—J. N. Aitken.

5216

DZHUNKOVSKII, I. E. Znachenie sochnykh kormov v povyshenii produktivnosti stada. [**Importance of succulent fodders in increasing productivity of the dairy herd.**] *Zhivotnovodstvo*, 1955, No. 8, 44–49. [Eksp. Ferma, Inst. Zhivotnovodstva, Kirgiz.]

5217

BAINTNER, K. and BÍRÒ, A. Különböző fehérjekoncentrációju takarmányok hatása a tehenek ivóvíz fogyasztására. [**The effect of feeds with different protein contents on the intake of drinking water by cows.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1,** No. 6, 33–44. [Inst. Animal Nutrit., Univ. Agric. Sci., Budapest.] Russian, German and English summaries.

The water intake of cows was influenced by environmental temperature and humidity and by the protein content of the ration. The greater the protein intake, the higher the water intake and the greater the increase with rising environmental temperature. This is ascribed to the small production of metabolic water from protein. (From English summary.)—D. Duncan.

5218

BROUWER, E. Variaties in de voedende bestanddelen der melk door factoren zoals lactatiestadium, voeding en erfelijkheid. [**Variation in the nutritive components of milk due to influences such as stage of lactation, diet and heredity.**] *Voeding*, 1956, **17,** 163–168. [Lab. Physiol. Dieren, Landbouwhogesch. Wageningen.]

More attention has been given to fat than to other components of milk. Apart from severe underfeeding, which may greatly reduce the solids-not-fat of milk, the biggest differences are referable to breed. Fat, fat-free dry matter, protein and riboflavin have been found, in most studies, to increase in the following order : Friesian, Ayrshire, Shorthorn, Guernsey and Jersey. Selection may modify this trend in that selection for yield without attention to fat and protein may reduce the average percentage of these constituents. On the other hand, the average may be raised by selection for more than one constituent.

I. Leitch.

5219

MAYHEAD, J. W. and BARNICOAT, C. R. **Variations in iodine value of milk fats.** *J. Dairy Res.*, 1956, **23,** 238–247. [Dept. Biochem., Massey Agric. Coll. (Univ. New Zealand), Palmerston North.]

The cows had liberal all-the-year round grazing, some meal in addition, and were milked at 5 a.m. and 4 p.m.

Iodine value of milk fat from butter churned from combined morning and evening milk was estimated by the method of Wijs 11 times during a 16-month period beginning 2 months after (winter) calving, for 5 Friesians and 5 Jerseys at the same stage of lactation. On the average the iodine value was lower by 2·2 units for Jersey milk fat than for Friesian. Iodine value was lowest in summer (December) and highest in winter, average difference 5·4 units for Jerseys and 7·6 for Friesians.

A group of 6 Jersey cows showed persistent individual variations of almost 5 units. On the average the iodine value was 1·8 units lower in the morning than in the evening. There were also irregular day-to-day fluctuations.

In feeding experiments, cows in the later stage of lactation were given peanut oil, iodine value 96·2, calculated composition oleic acid 44·5, linoleic acid 31 and saturated acids 19·5 per cent., mixed with the meal or as a drench, in amounts of the order of the amounts of triglyceride normally ingested in herbage.

In a 16-day experiment 3 Jerseys were controls and 3 were given 8 oz. peanut oil daily in the morning for 7 days beginning on the third day. The iodine value of the milk fat soon rose significantly ; the average maximum difference, 5 to 7 days later, was 4·4 units. Milk yield was unaffected.

In the middle of a 15-day period, 2 or 4 Friesians were deprived for 36 hr. of grass but not of water and were given a maintenance ration of hay and concentrates. Partial inanition raised the iodine value by 5·7 units on the average. In another Friesian similarly deprived but getting 16 oz. peanut oil daily, half at each milking, the rise during partial inanition was only 2·3 units. This last result was unexpected, and does not agree with the idea that the rise in iodine value of milk fat from cows on a low plane of nutrition is due to increased utilisation of body fat reserves. On certain assumptions it was calculated that about a third of the long-chain unsaturated acids of the diet were converted into milk fat, and that from 30 to 60 per cent. of the unsaturated acids in the milk fat came from the peanut oil.

From results of this laboratory and those of Sears and colleagues (Absts. 1941, 3535, Vol. 13) on the composition of New Zealand ryegrass-clover pasture, it was concluded that the amounts eaten would supply at least 12 oz. daily of C_{18} unsaturated fatty acids and that this could influence both composition and yield of milk fat.—W. M. Deans.

5220

LARSON, B. L., RÒLLERI, G. D. and KENDALL, K. A. **Protein production in the bovine. Comparison of daily protein, fat, and milk production during the entire lactation period.** *J. Dairy Sci.*, 1956, **39,** 204–213. [Lab. Biochem., Dept. Dairy Sci., Univ. Illinois, Urbana.]

In a preliminary study with 2 heifers and 2 cows it was found that maximum total protein production in milk occurred within a few days of parturition and then declined during lactation. The percentage of protein decreased as milk yield

increased but this tendency was reversed as total milk yield declined. No close relation between the protein and the fat content of the milk was shown.—J. N. Aitken.

5221

BAINTNER, K., TÓTH, P. and KOVÁCS, L. A nyers szójabab etetésének hatása a tehenek tejtermelésére és a tej összetételére. [**The effect of feeding cows on raw soya beans on the yield and composition of the milk.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1**, No. 5, 21–32. [Inst. Animal Nutrit., Univ. Agric. Sci., Budapest.] Russian, German and English summaries.

An experiment with 8 dairy cows lasted 71 days and was divided into 3 main periods and 2 periods of adaptation. The ration in the 3 main periods included 2·5 and 5·5 kg. raw soya beans and none. With from 5 to 5·5 kg. soya beans daily, no ill effect was found, but larger amounts were found to cause diarrhoea. The milk yield was increased slightly and the fat content by 10 to 15 per cent. with 2·5 kg. soya beans, and there was no further increase with the larger quantity. The butterfat was softer, but there was no adverse effect on flavour. (From English summary.)—D. Duncan.

5222

BRUNE, H. and SIECK, K. H. Ist die Calciumversorgung der Milchkühe durch den Oxalsäuregehalt der Futtermittel in Zuckerrübenbau-Betrieben gefährdet? [**Is the calcium supply of milk cows endangered by the oxalic acid of feeds on sugar-beet farms?**] *Ztschr. Tierernährung Futtermittelk.*, 1956, **11**, 113–126. [Inst. Tierphysiol., Univ. Göttingen.] English summary.

For previous work see Abst. 1167, Vol. 26.

Feeds were analysed for a year on 5 farms which used a lot of sugar-beet products. Each herd consisted of 19 to 22 Friesian cows, mainly fed indoors. Estimates of sufficiency of Ca and P were based on daily maintenance requirements of 30 and 20 g., with 2·5 and 2 g. per kg. milk and 3·2 and 2 g. daily for production of a calf. Available Ca in the ration was calculated by subtracting Ca, equivalent to the oxalic acid present, from the total Ca.

Results are given separately for each herd. It was concluded that although the Ca supply might be relatively poor during the short period of the year when fresh beet leaves were given, this was compensated during the rest of the year. Oxalic acid was not thought to produce Ca deficiency with the usual rations. The P supply was on the average from 6 to 12·7 g. too low. More use of P-rich milling by-products is recommended.

D. Duncan.

5223

RICHTER, K. and OSLAGE, H. J. Untersuchungen über die Mineralstoffversorgung von Milchkühen unter verschiedenen Fütterungsbedingungen. [**Providing milk cows with minerals under different conditions of feeding.**] *Züchtungskunde*, 1956, **28**, 148–168. [Inst. Tierernährung, Brunswick, Völkenrode.]

The feeding practice was studied for several years in 7 dairy herds in north-west Germany. The farms lay on soils of different types and had different systems. Ca, Mg, P, K, Na, Cl, Fe, Cu, Mn and Co were estimated in feedingstuffs. The estimated intakes are given in tables and are also expressed as percentages of the calculated requirements.

On all the farms the Ca supply at pasture was enough for up to 20 kg. milk daily, and in winter hay, roots and silage supplied enough for 15 kg. milk, but when beet leaves were given fresh or as silage their oxalic acid content made a Ca supplement desirable. The P supply was often insufficient both at pasture and indoors, except when the intake of concentrates was fairly high. In 2 herds the Na supply in pasture was low There was always enough Mg, K, Cl, Fe, Cu and Mn. Co was sometimes deficient in pasture on peat soils and more so when winter feeding was mainly on hay and roots, but beet leaves fresh or ensiled were a good source of Co.—D. Duncan.

5224

BINNERTS, W. T. Het jodiumgehalte van melk. [**The iodine content of milk.**] *Thesis, Univ. Amsterdam*, 1956, pp. 153. English summary.

Before 1914 the occurrence of goitre in the Netherlands was considered to be negligible. Medical examination of recruits revealed that this was not so, and tests and surveys led many local authorities to add iodine to drinking water. This was stopped by the second world war, and many reports and studies have been lost. Since the war it has been established that very few regions are completely goitre-free and gradually more and more local authorities have made compulsory addition of I to salt used in baking bread. Water is no longer iodised, but it seems desirable to find additional means of supplying I. Milk might be one, and addition to milk would especially benefit expectant and nursing mothers and young children. Since the war enlarged thyroid glands have been seen in cows. While concentrate cattle feeds were still rationed, addition of I was made compulsory; now it is merely recommended. In some regions salt licks containing I are in use. Surveys of the I content of milk in several different countries yield widely different results, but seem to point to low I content of milk in goitre regions.

Experiments with groups of 6 and 12 cows showed that of 100 mg. I added to the food about 10 per cent. appeared in the milk. Iodine was estimated by a modification of the method of Sandell and Kolthoff, with cerium as catalyst, adapted for serial work (see Abst. 2771, Vol. 24). The thesis contains a detailed description of the method in English. A negligible amount of I occurs in the fatty components of milk; practically all the I is found in the milk serum and the proteins. In the same herd 31 cows of approximately the same age and stage of lactation showed I contents ranging from 0·5 to 6·6 μg. per 100 ml. Iodine content increased as milk yield decreased. Colostrum from 2 cows showed values of 2·7 and 5·9 μg. Two small herds of 8 and 6 cows on adjoining farms were tested in winter and in summer; one herd was given pump water, poor in I, about 3 μg. per litre, and the other tap water containing about 30 μg. Results were inconclusive but there was a suggestion of higher values in winter, and in the herd receiving water rich in I.

Milk from 200 creameries all over the country was tested. Maps show the location of the creameries and indicate whether the soil of the area is rich or poor in I. Values found in winter were up to 13 μg. per 100 ml. and 2·3 μg. higher than those in summer. It is argued that values of 1·3 μg. per 100 ml. or less, in August, are too low from the point of view of public health; in winter they should not fall below 3·0 μg. per 100 ml. In most regions, therefore, addition of 5 mg. daily to the feeds is desirable, which means that the I content of the concentrates should be 1 mg. per kg., about 5 times the present value. It should not be given as iodide, as that is rapidly lost.—M. Eddison.

5225

VOLCANI, R., RODERIG, C. and OLOMUTSKI, E. **The effect of ethylene dibromide fumigated grain on cattle.** *Refuah Vet.*, 1955, **12,** 70–75 in Hebrew; 104–103 in English. [Agric. Res. Stat., Rehovot.]

Three cows and a calf 6 months old were given 50 p.p.m. ethylene dibromide in their concentrate ration. After 4 months the calf died, and post-mortem findings are described, but, on the evidence, death could not be attributed to bromine poisoning. No serious effect of ethylene dibromide on the reproduction of the cows was observed, though the period from parturition to first oestrus was longer than in untreated controls. The calf of one of the cows died after 10 days' suckling. The other 2 did not suckle, and developed normally. The milk yield and butterfat percentage of experimental cows were not affected by the treatment, but the Br content of their blood was higher than that of controls, and their milk contained Br, which was not present in that of untreated animals. The calves which died had received about 1 mg. Br per kg. bodyweight, which has been reported as toxic to poultry, and this, and the toxic forms of Br, are discussed.—T. D. Bell.

5226

SUNDARESAN, D. **Effect of milking by machine on rate of milking, yield and fat per cent. of milk of dairy cows.** *Indian J. Dairy Sci.*, 1956, **9,** 1–8. [Allahabad Agric. Inst.]

Two groups of 6 Red Sindhi cows were milked by hand and by machine in alternate weeks during a period of 2 months. There was no difference in milking time between hand- and machine-milking when the individual milking times for each cow were considered separately. The main advantage of the machine lay in the fact that it could milk 2 cows simultaneously. Total milk production and butterfat content of the milk were unaffected by the method of milking.—J. N. Aitken.

5227

NEHLER, G. M. Untersuchungen über den Herdenumtrieb und die Nutzungsdauer in der Rinderhaltung unter Berücksichtigung der Milch- und Fleischleistung und die züchterischen Konsequenzen. [**Herd turnover and productive life in cattle with reference to yields of milk and meat and the implications for breeding.**] *Ztschr. Tierzücht. Züchtungsbiol.*, 1956, **67,** 105–146. [Inst. Tierzucht, Christian Albrechts Univ., Kiel.]

In all types of cattle the best rate of turnover of herds depends on the optimum period of milk production. When yields are set against rearing costs the maximum crude income is attained between the sixth and the eighth lactations, and with increasing yield the peak shifts towards the eighth lactation. The higher the income from milk relative to costs of meat and of maintenance, the clearer is this tendency.

Crude income rises with increase in milk and fat yield per cow and lactation and with increased length of productive life. Differential milk prices have no influence on the economically optimum productive life. The influences of meat yield and price are slight. The longer the turnover time in a herd the more economical the utilisation of feed, which also improves with milk yield.

Losses depend greatly on the resistance of cattle to environmental conditions and to the strain of high production.—D. Duncan.

5228

VENGE, O. **Genetic differences in feed utilization in dairy cattle.** *Ztschr. Tierzücht. Zuchtüngsbiol.*, 1956, **67,** 147–158. [Inst. Animal

Breeding, Royal Agric. Coll., Upsala.] German summary.

A statistical study is presented of the data in the report of Johansson (Abst. 2921, Vol. 25). It is shown that so much environmental variation was present that genetic differences made up only a small proportion of the total variation in utilisation of feed units per kg. butterfat produced. Nevertheless, genetic differences in this ability could be demonstrated between groups of daughters of different bulls, and the heritability of the ability to utilise production feed units per kg. butterfat was 0·2. Elimination of some of the complicating environmental differences is discussed.

D. Duncan.

5229

NAGY, S. and GÁSPÁR, J. A persisztáló termelés tanulmányozásá. [**Persistence of lactation.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1,** No. 5, 35–50. [Inst. Animal Breeding, Univ. Agric. Sci., Budapest.] Russian, German and English summaries.

See also Absts. 4175, 4223, 4342, 4343, 4357.

REPRODUCTION

5230

ARTHUR, G. H. **Some observations on infertility in cattle.** *Brit. Vet. J.*, 1956, **112,** 144–154. [Royal Vet. Coll., Streatley, Berks.]

See also Abst. 4509.

SHEEP

5231

LAMBOURNE, L. J. **A comparison between rotational grazing and set stocking for fat-lamb production.** *N.Z. J. Sci. Technol.* [*A*], 1956, **37,** 555–568. [Ruakura Animal Res. Stat., Dept. Agric., Hamilton.]

In the first of 3 trials with Romney ewes 150 were kept on one pasture all the time (set-stocked) and 150 rotationally grazed from lambing to weaning, both at the rate of 6 ewes per acre. In the second trial 75 of the ewes were set-stocked and 75 rotationally grazed at the rate of 8 per acre and in the third trial 150, similarly divided, at the rate of 4 per acre. There was no significant difference between liveweight gain or fleece weight of ewes on the 2 different stocking systems. On the rotational system, lamb weight gains were superior with 8 ewes per acre but inferior with 4 ewes or 6 ewes (normal stocking) per acre. More feed was available on the rotational system, but unless this was used by increased stocking or by conservation of the extra herbage poorer lamb growth resulted owing to a decline in the feed quality.—J. C. Gill.

5232

NEALE, P. E. **Alfalfa cube mixtures for fattening lambs.** *New Mexico Agric. Exp. Stat. Bull.* No. 398, June 1955, pp. 10.

In a comparison of 3 cubed mixtures for fattening light and heavy lambs, heavy lambs fed on cubes containing coarse alfalfa hay 70, sorghum grain 20 and molasses 10 per cent. made higher liveweight gains and were more efficient than lambs fed on the same constituents in the proportions 60 : 30 : 10 and 50 : 40 : 10. Light lambs fed on the 70 : 20 : 10 ration were almost equal to those on the 60 : 30 : 10 cubes and superior to those on the 50 : 40 : 10 cubes. Best results from these self-fed cubed mixtures were obtained when crude fibre was 15 to 20, N-free extract 48 to 50 and total digestible nutrients below 60 per cent. Highest efficiency was reached at a roughage : concentrate ratio of 73 : 27.—J. C. Gill.

5233

LIGHT, M. R., DINUSSON, W. E., RICHARD, R. M. and BOLIN, D. W. **Urea and stilbestrol for fattening lambs.** *J. Animal Sci.*, 1956, **15,** 570–574. [N. Dakota Agric. Exp. Stat., Fargo.]

In a 10-week trial with 72 feeder lambs those given soya bean oilmeal as a protein supplement made significantly greater gains than those given urea. Stilboestrol, 0·5, 1·0 and 2·0 mg. daily, gave significantly greater gains on both types of ration. Stilboestrol treatment did not affect carcase grade or yield and caused no noticeable ill effect in the lambs.—J. C. Gill.

5234

ALBERT, W. W., GARRIGUS, U. S., FORBES, R. M. and NORTON, H. W. **The sulfur requirement of growing-fattening lambs in terms of methionine, sodium sulfate, and elemental sulfur.** *J. Animal Sci.*, 1956, **15,** 559–569. [Dept. Animal Sci., Illinois Agric. Exp. Stat., Urbana.]

In a 56-day trial 15 groups, each of 3 growing and fattening lambs, were individually fed on a purified ration in which urea made up 92 per cent. of the N content. To each group ration was added methionine, sodium sulphate or elemental sulphur at 1 of 5 levels. From the liveweight gains the percentage requirement of S was : as methionine 0·64 $\pm$ 0·048, sodium sulphate 1·27 $\pm$ 0·44 and elemental sulphur 0·47 $\pm$ 0·028, supplying S 0·138, 0·29 and 0·47 per cent. of the ration, respectively. The results seem to show that sodium sulphate may be used more efficiently than elemental sulphur.—J. C. Gill.

5235

ANDREWS, F. N., STOB, M., PERRY, T. W. and BEESON, W. M. **The effect of oral and subcutaneous estrogen and androgen administration on growth and carcass quality of lambs.** *J. Animal Sci.*, 1956, **15,** 575–588. [Dept. Animal Husb., Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Sixteen groups of 12 feeder lambs were used in a 73-day trial in which liveweight gain was significantly increased by subcutaneous implantation of 10 mg. oestradiol plus 250 mg. progesterone or by 12 mg. diethylstilboestrol, and significantly increased by 4 mg. dienoestrol given daily by mouth. Feed efficiency was also greatly increased ($P < 0{\cdot}01$); 2 mg. dienoestrol did not improve gain significantly but improved feed efficiency ($P < 0{\cdot}05$). Two mg. dienoestrol plus 25 mg. methyl testosterone given by mouth also improved feed efficiency. Diethylstilboestrol, dienoestrol and oestradiol all caused mammary development. Difference between liveweight and cold carcase weight was greatest in lambs implanted with oestradiol and progesterone pellets, followed by lambs given 4 mg. dienoestrol daily and then by those implanted with 12 mg. diethylstilboestrol. Carcase grades of some of the treated lambs were lower than those of controls. There was little difference in the oestrogenic activity of the meat of the treated lambs and that of the controls.

J. C. Gill.

5236

MAYBEE, H. J. **Lamb and mutton grading in Canada.** *Canada Dept. Agric., Ottawa, Publ.* No. 963, December 1955, pp. 14.

The method of classification of lamb and mutton, determination of age, class and sex of carcases, and grading standards and procedures are described. Lamb carcases had smaller and softer bones, lighter coloured flesh and softer and whiter fat than ewe carcases, and up to 14 months of age had a rough break joint where the fore-feet were separated from the carcase, compared with a smooth spool-like joint in mature sheep. Details of calculation of dressing percentages and prices are presented and photographs are included to illustrate different carcase grades.—J. C. Gill.

5237

MIKHNOVSKII, D. K. Vyrashchivanie i otkorm molodnyaka ovetz myasosherstnykh porod. [**Rearing and feeding young sheep of the mutton-wool strain.**] *Zhivotnovodstvo*, 1955, No. 10, 70–76.

5238

RETSON, G. C. **Management factors influencing returns from the sheep flock.** *Agric. Inst. Rev., Canada*, 1956, **2,** 45–47. [Div. Econ., Canada Dept. Agric., Truro, N.S.]

5239

HOLZE, R. Bewährte Leistungsprüfungen und Verfahren praktischer Züchtungsarbeit in Schafherden. [**Tests of production and procedures of practical breeding in sheep flocks.**] *Züchtungskunde*, 1956, **28,** 104–118.

5240

ROBERTS, E. M., MURRAY, P. F. and BARNICOAT, C. R. **Note on the autumn decline in liveweights of grazing ewes.** *N.Z. J. Sci. Technol.* [*A*], 1956, **37,** 606–609. [Dept. Biochem., Massey Agric. Coll., Palmerston North.]

Breed differences, stage of reproductive cycle, plane of nutrition and previous nutritional status were not related to autumn liveweight losses of ewes on ample pasture. It is suggested that losses are related to variations in the quality of the pasture.—J. C. Gill.

5241

KRÜGER, L. Die deutsche Schafzucht und ihre Leistungen auf der Ausstellung in München 1955. [**Sheep rearing in Germany and its performance at the exhibition in Munich, 1955.**] *Arb. Deutsch. landwirtsch. Gesellsch.*, 1956, **31,** 50–67. [Giessen.]

The intensification of crop production has reduced the crop area available for sheep but has increased yield per unit area. Competition against arable farming and cattle has promoted selection in sheep to produce more valuable flocks yielding better fleeces and meat and more lambs. Fertility is high; on the average 95 per cent. of ewes bred become pregnant where feed allows, and twins, and in "Marsch" sheep triplets, are common. The numbers of lambs and the numbers of lambings of old and young sheep of different breeds are tabulated. Data on weights and measurements and wool yields are tabulated also.

The best German sheep are fertile, productive, good converters of feed and adaptable. The main problem is the feed supply. In South Germany, where the sheep area is specially reduced, "capacity to hunger" has become important.—F. C. Aitken.

5242

NESENI, R., ALTENKIRCH, W. and OTTO, E. Über die Beeinflussung der Geschlechtstätigkeit bei Schafen durch Zufütterung von Kobalt, Thomasmehl und Kupferschlacke. [**Effect on reproduction in sheep of supplements of cobalt, basic slag and copper slag.**] *Arch. Tierernährung*, 1956, **6,** 104–109. [Inst. Tierzuchtforsch., Deutsch. Akad. Landwirtsch., Berlin.]

For the cobalt study a flock of ewes was divided into 2 groups of 111, including 19 and 17 yearlings. One group received during March and early April 1 mg. Co as 0·2 per cent. aqueous solution of Co nitrate per ewe daily. There was no effect of the Co on oestrus or percentage of ewes in lamb or on the birthweight of the lambs, but the number of twins in the Co group was greater, with low statistical significance.

In another flock of mutton Merinos the ewes were divided into 4 groups ; 61 ewes received 10 g. basic slag daily, 58 had 10 g. copper slag, 60 had 5 g. of each and 64 had no supplement. The percentage composition of the copper slag included Cu 0·47, Ni 0·014, Va 0·013, W 0·001, Fe oxide 5·76, SO_3 1·62, Zn 0·78, Ti 0·015, Cr 0·001, silicic acid 48·2, CaO 13·51, sulphite S 0·05, Mn 0·35, Co 0·002, Mo 0·001, Al_2O_3 22, MgO 5·92, P_2O_5 0·38 and alkalis. The basic slag included, per cent., CaO 50·8, Mn_2O_3 4·13, MgO 4·82, P_2O_5 18·35, Al_2O_3 1·03, S 0·2, Fe oxide 6·75 and silicic acid 12·86. The supplements were given during March and April.

The percentage of ewes which had lambs was not affected by the supplements. The total number of lambs was greatest in the group given no supplement, but was significantly less only in the group given copper slag alone. The number of twin births in this group was 15 per cent., compared with about 40 per cent. in the other groups. There was no effect on birthweight of lambs.

D. Duncan.

5243

LOCKART, L. W. **The reaction of primary and secondary wool fibres to changes in nutrition.** *Austral. J. Agric. Res.*, 1956, **7**, 147–151. [Agric. Exp. Stat., Trangie, N.S.W.]

A skin section was taken from each of 32 rams at a period of plentiful feed and another at a period of poor feed and major and minor diameters of primary and secondary fibres were measured. In a second trial 3 adult ewes on a high nutritional plane were transferred to a low nutritional plane and similar measurements were taken at intervals of 2 weeks. The response of primary and secondary wool fibres to changes in nutrition was found to be in proportion to their cross-sectional area. Primary fibres did not appear to compete more effectively with secondary fibres at a low level of wool production than at a high one.—J. C. Gill.

5244

RYDER, M. L. **Observations on the fleeces of experimental sheep receiving daily doses of sodium fluoride.** *J. Agric. Sci.*, 1956, **47**, 187–190. [Wool Indust. Res. Assoc., Leeds.]

The wool was shorter, finer, less crimped, less lustrous and less greasy in 4 sheep given sodium fluoride than in 2 control sheep. The possible stages in the development of capsules associated with follicles, probably caused by the fluoride, are described. Data on the normal changes in the percentage of fibre shedding through the year are presented. Sodium fluoride did not appear to affect it.—J. C. Gill.

5245

SLEN, S. B. and WHITING, F. **Wool growth in mature range ewes as affected by stage and type of pregnancy and type of rearing.** *Canad. J. Agric. Sci.*, 1956, **36**, 8–13. [Div. Animal Husb., Exp. Farms Serv., Canada Dept. Agric., Lethbridge, Alta.]

In trials with 87 Corriedale ewes on a 10 to 13 per cent. protein diet and 317 on a 7 per cent. protein diet until 6 weeks from lambing and 10 per cent. thereafter, bi-monthly sampling showed that wool production, fibre length and density of fibre per unit area were significantly higher from those with single lambs than from those with twins during both pregnancy and lactation. Wool growth was significantly reduced by early and advanced pregnancy and by lactation. Reduction of fibre density occurred earlier in ewes on the lower protein ration. Fibre thickness was greater in ewes with single lambs than in ewes with twins during late pregnancy on the lower protein ration. Over the 8 months of the trial ewes with single lambs produced 19 per cent. more wool than those with twins on the low plane of nutrition, and 11 per cent. more on the high plane.—J. C. Gill.

5246

RYDER, M. L. **Observations of nutritional and seasonal changes in the fleeces of some Masham sheep.** *J. Agric. Sci.*, 1956, **47**, 129–144. [Wool Indust. Res. Assoc., Leeds.]

In a summer trial 2 sheep fed so as to lose a quarter of their weight did not shed their wool fibres, but did so during the following winter when fed on a good diet, owing probably to a seasonal stimulus. The numbers of blood vessels in the skin and the amount of glycogen in the outer root sheaths of the follicles were not affected by the poor feeding. Data on wool weight, fibre length and fibre diameter for the 2 experimental and 2 control animals are presented.—J. C. Gill.

5247

MORLEY, F. H. W. **Selection for economic characters in Australian Merino sheep. 7. Interactions between genotype and plane of nutrition.** *Austral. J. Agric. Res.*, 1956, **7**, 140–146. [Wool Res. Lab., Agric. Exp. Stat., Trangie, N.S.W.]

7. In a trial in which groups of half-sibs were divided at weaning into 2, kept on a high and low plane of nutrition, heritability, as indicated by

the within-sire correlation, was found not to vary with plane of nutrition. No interaction between genotype and plane of nutrition was found for any fleece character or for bodyweight at 6 months, but interactions were large and highly significant for weight at 12 and 15 months.—J. C. Gill.

5248
LEE, H. J. **The influence of copper deficiency on the fleeces of British breeds of sheep.** *J. Agric. Sci.*, 1956, **47**, 218–224. [Div. Biochem. Gen. Nutrit., C.S.I.R.O., Univ. Adelaide, S. Australia.]

In a 3-year study of 4 Border Leicester, 4 Romney Marsh, 4 Lincoln and 4 Dorset Horn ewes on copper-deficient pasture it was found that crimp was lost and straight "steely" fibres were produced, but that crimp returned when sufficient Cu was given. Fleece abnormalities were similar to those of Merinos on Cu-deficient pasture but were absent when regular supplements of Cu were given.—J. C. Gill.

5249
PEROLD, I. S. and BOSCH, G. S. **Copper influence on the quality of wool.** *Farming in S. Africa*, 1956, **32**, 51 ; 53–54 ; 75 ; 77–78. [Stellenbosch-Elsenburg Coll. Agric.]

5250
LOCKART, L. W. **Variation in wool production per unit area of skin.** *Austral. J. Agric. Res.*, 1956, **7**, 158–161. [Agric. Exp. Stat., Trangie, N.S.W.]

A study of published data suggests that there is a considerable variation in production of wool per unit area of skin even under optimum conditions.—J. C. Gill.

5251
COOP, I. E. **The significance of face cover in Corriedale and Romney-Corriedale cross sheep.** *N.Z. J. Sci. Technol.* [*A*], 1956, **37**, 542–554. [Lincoln Coll.]

Records of 3000 ewes and 590 hoggets were studied. The sheep were classified into open-, intermediate- or cover-faced. The open-faced ewes were heavier, had a lower incidence of barrenness and weaned more and heavier lambs than the cover-faced, but their fleeces were somewhat lighter and of poorer quality. More cover-faced ewes could be carried per acre. The open-faced hoggets were heavier than the cover-faced, but the fleece differences were slight. Selection for open face is advocated.—T. D. Bell.

See also Absts. 4175, 5177, 5185.

PIGS

5252
GILL, J. C. and THOMSON, W. **Effect of environmental temperature on suckling pigs and a study of the milk yield of the sow.** *J. Agric. Sci.*, 1956, **47**, 324–331. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

During 3 winters 8 sows and their litters were studied. Half of each litter were housed in a pen containing a small unheated cage, the other half in a pen containing a cage similar in size but lagged and heated. Both types of cage were bedded with straw for all litters except one, for which wooden floors were provided. The young pigs slept in the cages, used the pens as runs, and were returned to the sows for suckling at intervals of 1½ hr. for the first 40 days, and thereafter at intervals of 2 hr. until weaning at 56 days of age. The air temperatures in the unheated cages varied about means of about 44° F., those in the heated cages were about 17° F. higher.

The difference in environmental conditions before weaning did not significantly affect the amounts of milk sucked from the sow or the liveweights of the pigs at weaning. In comparison with pigs kept in the heated cages, pigs kept in the colder cages ate more creep feed, and their coats were hairy and dull. They also converted both milk and creep feed less efficiently.

One litter, half previously in a warm environment and half in a cold, was kept in cold conditions after weaning and 7 of the 8 pigs died of a liver disease. A second litter was kept to 12 weeks of age in the same cold environment as it had up to weaning and all animals survived. Five other litters were weaned and the pigs were kept in a uniform environment from then until they reached bacon weight. Of the group kept in the warmer environment until weaning 3 died of the liver disease and 2 of pericarditis. Of the group kept in the colder environment until weaning 5 died of pneumonia and 2 others died without the cause being ascertained. The pre-weaning treatments had no effect on feed conversion efficiency or rate of liveweight gain after weaning, nor did they affect carcase quality.

The lactation curves of the sows reached their peaks at about 3 weeks after farrowing and maintained that level with some fluctuations until they fell off rapidly before weaning. The total milk yield per sow from the 3rd to the 56th day of

lactation ranged from 445 to 764 lb., average 605 lb. It was estimated that 412 Cal. net energy are required by a sow to produce 1 lb. milk.

I. A. M. Lucas.

5253

RUNTZIS, A. Ya. Vliyanie ponizhennoi temperatury na vyrashchivanie svinei. [**Influence of low temperature on the rearing of pigs.**] *Zhivotnovodstvo*, 1956, No. 2, 76–77. [Ist. Zootekh., Akad. Nauk Latviisk. SSR.]

Low temperatures, about — 0·7° [C?], combined with good feeding and management had a good effect on young pigs. They developed more rapidly, had a better appetite and were more resistant to disease than control animals reared at higher temperatures.—H. Scherbatoff.

5254

HANSON, L. E. and FERRIN, E. F. **Effect of antibacterial agents on the growth of suckling pigs.** *J. Animal Sci.*, 1956, **15,** 376–391. [Univ. Minnesota, St. Paul.]

Seven trials are reported in which sucking pigs were given supplements of oxytetracycline, bacitracin, penicillin, chlortetracycline or arsanilic acid in their creep feed. Oxytetracycline, used in one trial only, at 5 mg. per lb. feed, improved gains and prevented scours. Bacitracin partly prevented scours but did not increase rate of liveweight increase. In this trial, as in all the others, chlortetracycline improved rate of gain and prevented scours when they occurred in untreated groups. Penicillin given at levels of 5, 10 and 20 mg. per lb. feed gave weight gains better than those of controls, but was ineffective at a level of 2·5 mg. per lb. Arsanilic acid also improved growth rates.

In one trial subcutaneous implantation of bacitracin at 3 days of age did not affect growth of the piglets receiving no antibiotic in the creep feed.

T. D. Bell.

5255

GILL, J. C. and THOMSON, W. **Observations on the behaviour of suckling pigs.** *Brit. J. Animal Behaviour*, 1956, **4,** 46–51. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Eight litters were studied, in which the piglets sucked almost as soon as they were born. The suckling period was divided into 3 phases, preliminary massage lasting on the average 60·5 sec., milk let-down, 14·2 sec., and final massage 149·3 sec. There was apparently a correlation between the total milk yield of the sow and the total time spent in massage during each nursing, and when a sow habitually lay on one side or the other, the milk obtained from the teats on the under side, which were not so well massaged by the piglets, was less than that obtained from the upper side. When the sow stood massage was less vigorous and milk yield was less. More milk was obtained from the anterior than from the posterior teats. Rate of growth of the piglets to 19 days of age was highly correlated with the amount of milk they consumed. The lactation curve of the sows rose sharply for the first 3 weeks, then the level was maintained until the last week, when it declined rapidly.—T. D. Bell.

5256

TCHIDERER, K. Betriebswirtschaftliche Untersuchungen über die Fütterungstechnik bei Schweinen. [**Practical studies of feeding technique with pigs.**] *Arch. Tierernährung*, 1956, **6,** 44–49. [Schweine-Versuchsanst., Landwirtschaftskammer für Niederösterreich, Vienna.]

The varying results of attempts in different countries to avoid feeding pigs on Sundays are summarised. Since a preliminary trial early in 1953 with 2 groups each of 10 pigs showed no ill effect of a Sunday fast on average daily weight gain or feed efficiency, a comparison was made between 100 German Edelschwein fattened in the usual way in the summer of 1952 and 100 similar pigs fattened without Sunday feeding in the summer of 1953. The pigs were penned individually and fed to appetite at 6.30 a.m. and 3.30 p.m. Monday to Saturday, without a double portion on Saturday or Monday; water was supplied on Saturday evening and the pigs were left alone on Sunday; complete quiet on the fast day is regarded as important. The percentage composition of the ration was maize 44, barley 44, ground lucerne meal 7, yeast 3, mineral mixture 2 (chalk 62·5, steamed bonemeal 20, iodised salt 15, ferrous sulphate 1·6, manganese sulphate 0·6, copper sulphate 0·3 per cent.), given as a thick slop with sour skimmed milk, 1 to 3 litres per pig daily; the pigs also had 5000 I.U. vitamin D_3 each weekly.

The pigs not fed on Sundays took longer to reach slaughter weight, and slaughter losses were slightly greater. Feed efficiency was unaffected. They had longer bodies and thinner back and belly fat. The fat : flesh ratio was less and the proportion of desirable cuts greater. These differences were significant.—W. M. Deans.

5257

LASSITER, J. W., TERRILL, S. W., BECKER, D. E. and NORTON, H. W. **Protein levels for pigs as studied by nitrogen balance.** *J. Animal Sci.*, 1956, **15,** 392–399. [Illinois Agric. Exp. Stat., Urbana.]

N balance trials with 4 sets of 4 pigs of about 50 lb. liveweight and 4 sets of 4 pigs of about 150 lb. liveweight are reported. The pigs were given a ration of maize and a protein supplement, fortified

with minerals, vitamins and antibiotic, in 2 equal feeds daily : 1 lb. feed was given to the small and 4·5 lb. to the large pigs. After a 10-day preliminary period urine and faeces were collected during consecutive periods, one of 3 days and 2 of 2 days. Protein levels for the 4 sets of pigs of each size were 10, 14, 18 and 22 per cent.

In the smaller pigs N retention increased to the 18 per cent. protein level. With the larger pigs there was some evidence that protein level affected N retention, but the differences due to protein level were not significant. The results are discussed in relation to those of growth trials with the same feed for pigs from weaning to 100 lb. liveweight, and other conditions affecting protein utilisation are mentioned.

With a sufficiently long preliminary period of 10 days there was no added advantage in extending the collection period from 3 to 5 or 7 days.

T. D. Bell.

5258

HVIDSTEN, H. and HUSBY, M. Forsøk med ulike proteinformidler til slaktegriser. [**Experiments with different protein supplements for bacon pigs.**] *Meld. Norges Landbrukshøgsk.*, 1955–56, **35**, 23–70. [Norges Landbrukshøgsk.] English summary.

There were 24 experiments with in all 240 pigs and, as supplements to a normal cereal diet, ordinary herring meal, whalemeal, soya bean meal, a mixture of oilcakes, fish solubles, whole fish meal, herring meal made from fresh herring and herring meal from herring preserved with nitrite. The digestibility of some of the feeds was estimated with wethers. Eighteen of the experiments date back to 1932–1934 but have not been published before. They compared herring meal of good quality with oilseed meals and cakes. The remaining 6 experiments were made in 1949–1951 to compare the new meals with one another and with soya bean meal. The results are presented in graphs and tables ; some of the tables have headings in English.

In the 18 older experiments together, the mean daily rate of gain with herring meal was 541 g., with oilseed meals and cakes 509 g. In the more recent tests there was no clear differences between the several animal proteins ; on the average, growth with animal protein was 18 per cent. faster than with soya bean. Whalemeal gave the bacon a characteristic, not unpleasant, taste. Back fat was thicker with soya bean meal.

On the basis of tests with wethers, whole herring meal with 90·8 per cent. dry matter had per kg. 634 g. digestible crude protein, 1·39 Scandinavian feed unit or 1·07 feed unit for fattening ; whole meal of whale flesh had, in the same order, 634, 1·32 and 0·98.—I. Leitch.

5259

BARBER, R. S., BRAUDE, R. and MITCHELL, K. G. **Formalin-treated skim milk for pigs.** *Agriculture, J. Minist. Agric. Engl.*, 1956, **63**, 111–114. [Nat. Inst. Res. Dairying, Reading.]

Formalin was added to skimmed milk in 3 tanks in a concentration of 0·1, 0·2 or 0·5 per cent. Some milk was withdrawn daily from each tank, leaving 4 gal. in each at the end of 1 week. More skimmed milk and appropriate amounts of formalin were then added and the process was repeated. With 0·1 per cent. formalin the milk clotted after 4 weeks, at the other 2 concentrations it clotted after $6\frac{1}{2}$ weeks.

In other tests the milk remaining in the tanks was run off each week and the tanks were rinsed with cold water before being re-filled with milk and formalin. The numbers of weeks before the milk clotted varied widely and there was no consistent difference between samples containing 0·1 or 0·2 per cent. formalin.

In a feeding experiment weanling pigs each consumed 1 gal. daily of fresh skimmed milk, but others would take only $\frac{1}{2}$ gal. daily of skimmed milk containing 0·5 per cent. formalin until they each weighed about 90 lb. liveweight. Apart from a dislike of the formalin-treated milk the pigs remained thrifty. During the subsequent 8 weeks pigs in both lots consumed their full allowance of milk and grew equally rapidly, indicating that skimmed milk preserved with as much as 0·5 per cent. formalin could be given to pigs in the later stages of fattening. The milk did not cause off-flavours in the bacon.

On 2 commercial farms the addition of formalin at the rate of 0·1 to 0·2 per cent. of the skimmed milk prevented clotting for 8 or 9 days. There was some vomiting in the younger pigs given formalin-treated milk twice daily, but when the milk was given 4 times daily on one farm the vomiting ceased.—I. A. M. Lucas.

5260

REES, D. H. and WESTMACOTT, M. H. **The feeding of fodder beet to pigs.** *J. Agric. Sci.*, 1956, **47**, 232–237. [Rothamsted Exp. Stat., Harpenden, Herts.]

The results of 9 sets of experiments, 3 in Denmark, 5 in England and one in Northern Ireland, on the use of fodder beet of high dry matter content, 18·5 to 22·5 per cent., for fattening pigs are summarised. In all experiments except 2 of the Danish series, meal was restricted and fodder beet given to appetite.

When fodder beet was given the daily intake of energy by the pigs was reduced, and growth rates were lower. There was a suggestion in some of the experiments that when the lower protein intake due to the replacement of concentrate by fodder beet

was compensated by using meal with a higher percentage of protein, growth rates were improved. When fodder beet with restricted meal or meal only was given there was no difference in the amount of starch equivalent required per lb. liveweight increase. Observed replacement values of fodder beet for meal, when reduced growth rates were not considered, agreed well with the values calculated from the dry matter content of the beet and the starch equivalent value of the meal taken from Woodman's tables. Observed values were from 4·8 to 6·3 and calculated from 4·8 to 5·2 lb. beet per lb. meal. In the Danish experiments carcase quality was slightly less good when beet was given, but in the other experiments reported the opposite was found.—T. D. Bell.

5261

RICHTER, K., CRANZ, K. L. and OSLAGE, H. J. Vergleichende Untersuchungen über den Einfluss einer unterschiedlichen Fütterung von Schweinen mit Getreide, Kartoffeln, und Zuckerrüben auf Mastentwicklung und Schlachtqualität. [**Comparative studies of the effect of some alternative rations for pigs, with grain, potatoes and sugar beet, on fattening and slaughter quality.**] *Züchtungskunde*, 1956, **28**, 93–104. [Inst. Tierernährung, Brunswick, Völkenrode.] English summary.

There were 6 groups of 8 pigs and 3 groups of 9, all initially comparable. There were 3 types of diet, one based on barley, one on potatoes and one on 2 parts sugar beet and 1 part potatoes; both the bulky diets included 1 kg. concentrates daily. With each diet pigs were killed at 3 weights, about 135 to 150 kg., 120 to 135 kg. and 110 to 120 kg.

The differences with diet in rate and efficiency of gain, feed conversion and carcase quality were not significant. The carcase measurements are tabulated. In the heaviest pigs the meat : fat ratio was significantly better on the sugar beet and potato diet and in the smallest pigs it was better on the barley diet, but the quality of the ham was similar and so was that of the back fat. There was a longer large intestine in pigs fed on the bulky diets.—D. Duncan.

5262

DANILENKO, I. A. and BELOGUB, D. K. Silosovanie i ispol'zovanie kukuruzy dlya kormleniya svinei. [**Ensilage and use of maize for pig feeding.**] *Zhivotnovodstvo*, 1955, No. 8, 7–10. [Ukrain. Nauch.-Issled. Inst. Zhivot.]

Results are given of experiments with maize silage which show that the quality of meat and lard is best from pigs fed on maize cobs ensiled at the milky-wax or the milky stage.

H. Scherbatoff.

5263

BEREZHNAYA, P. P. Opyt otkorma svinei kukuruzoi i sochnymi kormami. [**Feeding pigs with maize and succulent fodders.**] *Zhivotnovodstvo*, 1955, No. 8, 33–39.

5264

GORB, T. V. and KLITZENKO, S. T. Opyt prigotovleniya i ispol'zovaniya kukuruznogo silosa dlya svinei. [**Preparation and use of maize silage for pigs.**] *Zhivotnovodstvo*, 1955, No. 9, 102–104.

Silage made from maize cobs at either the milky-waxy or the waxy stage, mixed with succulent fodder, legume hay or grass was readily eaten by pigs and supplied them with almost all the necessary nutrients. The silage was mixed with concentrates and root vegetables before being given to the pigs.—H. Scherbatoff.

5265

KOVALENKO, N. A. Ispol'zovanie kukuruzy pri otkorme svinei. [**Maize for pig feeding.**] *Zhivotnovodstvo*, 1955, No. 10, 17–20.

Grain can be almost entirely replaced in the rations of fattening pigs by silage made of maize cobs. When unripe maize cobs are given to pigs it is necessary to add chalk and salt. To encourage pigs to eat maize silage they should be started on small amounts, 0·5 to 0·8 kg. daily, and reach the full amount [not stated] in 5 to 6 days.

H. Scherbatoff.

5266

WALLACE, H. D., CUNHA, T. J. and COMBS, G. E. **Low-gossypol cottonseed meal as a source of protein for swine.** *Univ. Florida Agric. Exp. Stat. Bull.* No. 566, June 1955, pp. 26.

Trials made over 4 years with growing and fattening pigs and pregnant and lactating sows are reported. In the first trial 3 commercial cottonseed meals containing over 0·063 per cent. free gossypol as the source of protein were unsatisfactory for growth and fattening. A fourth meal with only 0·024 per cent. was better, though gains were not optimum, and aminoacid, vitamin A or vitamin B complex supplements were ineffective. The value of an animal-protein factor supplement was demonstrated.

In the other trials with growing and fattening pigs supplements of 0·4 per cent. lysine with or without 0·075 per cent. methionine did not improve performance on a ration in which the source of protein was low-gossypol cottonseed meal, when compared with a ration in which soya bean oilmeal supplied the protein. A supplement of 0·8 per cent. lysine was effective. Other supplements tried were distiller's solubles concentrate, crude cottonseed oil, waste beef fat, a surface-active

compound, condensed fish solubles, Cu and Zn, all of which were without effect. A high level of Aurofac was of some advantage, and the results with Fe sulphate were good in 4 out of 6 trials. In the pigs not performing satisfactorily there was no clear evidence of gossypol poisoning, but since Fe was of some value in counteracting the effect of the cottonseed meal it was thought that the unthriftiness may have been due to the gossypol. In all groups getting the cottonseed meal there was great variation between individuals, which was not found in the groups getting soya bean meal instead.

For pregnant and lactating gilts and sows cottonseed meal and soya bean meal as sources of protein were of equal value when farrowing, nursing and development of litters were considered.

T. D. Bell.

5267

HANSON, L. E., PRITCHARD, W. R., REHFELD, C. E., PERMAN, V., SAUTTER, J. H. and SCHULTZE, M. O. **Studies on trichloroethylene-extracted feeds. 9. Experiments with swine fed trichloroethylene-extracted soybean oil meal.** *J. Animal Sci.*, 1956, **15,** 368–375. [Dept. Animal Husb., Sch. Vet. Med., Univ. Minnesota, St. Paul.]

For parts 1 and 2 see Abst. 1162, Vol. 23.

Soya bean oilmeals extracted with hexane or trichloroethylene, the latter known to be toxic to cattle, were compared at levels of 10 to 20 per cent. of the ration in terms of the growth of weanling gilts, their subsequent reproduction, and the growth of their offspring. No significant difference was found on any of these counts attributable to the method of extraction of the soya beans.

T. D. Bell.

5268

BAINTNER, K. and JELENITS, K. Különféle élesztők értéke a sertések hizlalásában. [**Value of different yeasts for fattening pigs.**] *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1,** No. 4, 27–64. [Inst. Animal Nutrit., Univ. Agric. Sci., Budapest.] Russian, German and English summaries.

In experiments with pigs the values of brewer's yeast dried at 110° C. and of samples of baker's yeast dried at 60° to 70° C. were compared. Both kinds of yeast improved the performance of pigs on all-vegetable rations, and in some experiments the results with baker's yeast were even better when Aurofac and a preparation containing vitamin B_{12} (Vitagen) were given also. In one experiment this combination gave better results than a supplement of animal protein. Up to 7 per cent. yeast was given without ill effect. (From English summary.)—D. Duncan.

5269

GLAPŚ, J. and RUSZCZYC, Z. Badania nad zastosowaniem drożdży pastewnych i kukurydzy w tuczu trzody chlewnej. [**Studies on the use of fodder yeast and maize in the fattening of pigs.**] *Rocz. Nauk rol.* [*B*], 1955, **70,** 139–152. [Inst. Zootech., Cracow.] Russian and English summaries.

Provided the feed mixture for pigs contained maize, fodder yeast could be used to replace all the fishmeal. When potatoes were used for fattening pigs, and no maize was given, greater gains were produced by fishmeal than when maize was included in the ration, but on potatoes alone fodder yeast did not give as good gains as fishmeal, and the fattening period was prolonged. Concentrates and maize only for fattening were not as good as a feeding system including potatoes. Apparently slight changes in the diet affected differently the development of certain organs and tissues. Rate of gain was not influenced by sex. (From English summary.)—T. D. Bell.

5270

RUSZCZYC, Z. and GLAPŚ, J. Zastosowanie gęstwy drożdżowej (suszonych drożdży piwnych) w tuczu trzody chlewnej. [**The use of yeast slop (fresh brewery yeast) for fattening pigs.**] *Rocz. Nauk rol.* [*B*], 1955, **70,** 153–167. [Inst. Zootech., Cracow.] Russian and English summaries.

From a feeding trial with 32 male and 32 female pigs fattened from 40 to 110 kg. liveweight the following conclusions were drawn. Fresh brewery yeast, 600 to 900 g. daily, could be given, replacing some of the concentrate mixture and saving 47 kg. concentrate per pig. When the concentrate had only vegetable protein, utilisation of the feed was improved by the brewery yeast and the fattening period was reduced, but this was not so when animal protein was included in the concentrate. Pigs getting animal protein gained faster and more efficiently than those getting vegetable protein only. Fresh brewery yeast given up to the time of slaughter caused watery flesh. It was thought this could be avoided by stopping the yeast a few weeks before slaughter. If this were done brewery yeast would be a useful feed for fattening pigs, but since it cannot be stored its use would be limited to the immediate neighbourhood of the breweries. (From English summary.)

T. D. Bell.

5271

RUSZCZYC, Z. and GLAPŚ, J. Zastosowanie drożdży posulfitowych w tuczu trzody chlewnej. [**The use of post-sulphite yeast in the fattening of pigs.**] *Rocz. Nauk rol.* [*B*], 1955, **70,** 169–180. [Inst. Zootech., Cracow.] Russian and English summaries.

A trial is reported in which there were 3 groups of 6 Large White pigs, 3 male and 3 female in each group. Group 1 was given a concentrate mixture containing fishmeal, group 2 post-sulphite yeast and group 3 fodder yeast instead of fishmeal. In weight gain there was no significant difference between groups 2 and 3. When given with potatoes, barley and rye bran, fishmeal was better than either of the yeasts for both rate of gain and efficiency of feed utilisation. Fishmeal also gave carcases of better grade with firmer fat. (From English summary.)—T. D. Bell.

5272

BIELIŃSKI, K. Badania nad określeniem wartości pokarmowej pektynowanych plew lnianych w tuczu trzody chlewnej. [**Studies on the nutritive value of pectinised flax chaff for fattening pigs.**] *Rocz. Nauk rol.* [*B*], 1955, **70,** 121–137. [Inst. Zootech., Z.D. Kołuda Wielka.] Russian and English summaries.

A pectin extract obtained as a by-product in the process for extracting fibre from flax was mixed with flax chaff in the proportion of 1 : 3 and pressed into cakes. The pectinised chaff had the following composition : dry matter 90·3, digestible protein 3·2, total digestible nutrients 42·8 per cent.

It was used to replace 15 per cent., increased to 25 per cent. near the end of the feeding period, of the potato flakes and barley for fattening pigs from 41 to 90 kg. liveweight. Average daily liveweight increase was 593 g. Similar animals on the normal ration without flax chaff gained 611 g. daily. In efficiency of feed utilisation the animals getting flax chaff were inferior to the others, requiring 5·50 feed units (F.U.) and 546 g. digestible protein per kg. liveweight increase, compared with 5·08 F.U. and 458 g.

Carcase grading of the pigs getting chaff was similar to that of the other pigs, except that there was more fat in the loin ; but livers were heavier, 2149 g. compared with 1716 g., and the tissue of the digestive tract was darker. During the experiment the pectinised flax chaff caused some scouring. It was concluded that the proportion of barley and potato flakes replaced by the chaff was too high. (From English summary.)

T. D. Bell.

5273

DALMATOV, V. A. Primenenie kormovogo belka iz zhmykha kleshcheviny v korm podsvinkam. [**Use of protein from castor seed cake in feed for store pigs.**] *Zhivotnovodstvo*, 1955, No. 9, 85–87. [Vses. Inst. Zhivot.]

Higher average daily liveweight increases were obtained in pigs when part of the digestible protein in the ration was replaced with protein from castor seed. The protein formed 54·6 per cent. of the digestible protein of the ration in one experiment. As a rule about 30 to 50 per cent. digestible protein was replaced by protein from castor seed.

H. Scherbatoff.

5274

KRAVCHENKO, I. E. Opyt Sovkhoza " Odesskii " po ispol'zovaniyu pishchevykh otkhodov pri otkorme svinei. [**A study at the " Odessa " Sovkhoz on the use of swill for feeding pigs.**] *Zhivotnovodstvo*, 1955, No. 10, 110–112.

5275

PLUMLEE, M. P., THRASHER, D. M., BEESON, W. M., ANDREWS, F. N. and PARKER, H. E. **The effects of a manganese deficiency upon the growth, development, and reproduction of swine.** *J. Animal Sci.*, 1956, **15,** 352–367. [Dept. Animal Husb., Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Four experiments are reported. In the first, 9 weanling Duroc boars, liveweight 35 lb., were hand-fed on a purified ration containing 1·5, 20·5, or 34·0 p.p.m. Mn. During the trial, lasting 14 weeks, there was no significant difference in liveweight increase between the groups. The Mn content of the livers, on a dry weight basis, was 2·2, 10·4 and 12·3 p.p.m. for the low, medium and high groups, respectively.

The 2 groups each of 6 pigs in the second trial were similarly managed, but the rations contained 1·4 or 40·0 p.p.m. Mn. The pigs were fed from 43 to 246 lb. liveweight. Rate of weight gain in both groups was similar. For the low and high Mn groups, respectively, the Mn contents of liver, heart, thyroid and testes were, in p.p.m. : 4·6, 12·1 ; 0·65, 1·53 ; 0·37, 0·91 ; 0·99, 2·69. The Mn content of blood was 5·95 and 6·96 μg. per 100 ml. On 1·4 p.p.m. Mn there was a tendency towards " sickle-hocks".

The levels of Mn tested in the third trial were 1·0 and 38·0 p.p.m. in rations containing maize and 3·4 and 40·0 p.p.m. in rations where the maize was replaced by cerelose. They were given to 4 groups of 4 Duroc gilts up to about 250 lb. liveweight. Between groups no difference in weight gain, efficiency, number of piglets farrowed, or viability or birthweights of the litters could be attributed to the levels of Mn given. Total Mn in soft tissues of both gilts and offspring was about 50 per cent. less in pigs on lower levels of Mn. There was no difference between groups in organ weights, blood phosphatase, or phosphorus or manganese content of the hock bones. Boars from the gilts getting low Mn and those getting high Mn, all reared on rations with 3·3 p.p.m. Mn, performed equally well and showed normal spermatogenesis.

Finally 20 female suckling pigs, 9·4 lb. liveweight, were given semi-purified rations containing

0·5 or 40·0 p.p.m. Mn throughout growth, gestation and lactation. After farrowing, colostrum was analysed, and the piglets were suckled by the sows, with access to their rations, and weaned at 6 weeks. Growth rate and feed efficiency were satisfactory at both levels. Signs of Mn deficiency, manifested by discomfort and weakness of the legs at 60 lb. liveweight, shortened and thickened front legs, becoming bowed by 90 lb. liveweight, appeared in the low-Mn gilts, and they were shorter in the body and too fat. X-ray photographs of the legs showed that growth of the radius was prevented by closure of the distal epiphyseal plate. Liver, spleen, pituitary, thyroid and reproductive organs were histologically normal.

The depleted gilts, during the breeding season, showed irregular oestrus and sometimes would not accept the boar, although examination showed normal ovulation. Of those mated, 5 in all, only 2 farrowed.

The litters from the high-Mn gilts were presented normally and were vigorous and healthy. Those of the depleted gilts were weak, with poor balance, inco-ordination, and inability to suck. All of one litter of 7 died within a week, and the other, of 4 piglets, died even when transferred to a diet containing 40 p.p.m. Mn. The soft tissues of the low-Mn gilts had less Mn than those of the high Mn, and the colostrum contained 0·27 and 0·38 p.p.m., respectively, for gilts on low and high levels of Mn.—T. D. Bell.

5276

PYSHENKIN, A. D. 101 tz. svininy na 100 ga. pashni. [**101 centners of pork per 100 hectares of arable land.**] *Zhivotnovodstvo*, 1956, No. 4, 16–21. [Chernilovsk. Nauch.-Issled. Stat. Zhivot.]

5277

YAAMA, K. YA. Bekonnyi otkorm svinei v Estonii. [**Feeding bacon pigs in Estonia.**] *Zhivotnovodstvo*, 1955, No. 12, 34–44. [Inst. Zhivot., Akad. Nauk Eston. SSR.]

A survey.

5278

DOYLE, L. P., TURMAN, E. J. and ANDREWS, F. N. **Some pathological effects of anterior pituitary growth hormone preparations on swine.** *Amer. J. Vet. Res.*, 1956, **17**, 174–178. [Dept. Vet. Sci., Purdue Univ., Lafayette, Ind.]

In 3 trials with castrated pigs of initial liveweight 100 to 115 lb., fattened to 220 lb., 11 pigs were given by intramuscular injection different amounts of anterior pituitary growth hormone preparations, and in each trial untreated pigs were kept as controls.

In the first trial there were 2 pigs treated, one with 10 mg. and the other with 5 mg. hormone per 15 kg. bodyweight daily. No ill effect resulted, rate of gain was excellent, efficiency was better than in untreated pigs and the edible carcase had more protein and less fat.

In the second trial 2 pigs got 4·5 mg. daily per 15 kg. bodyweight, of a different preparation of the hormone, 2 got 2·25 mg., and 3 were untreated. Growth was good in all pigs until the 30th day when 1 pig getting the higher dose went off feed; it died with convulsions 9 days later. The other pig on the same dose died similarly, between the 40th and 45th days. The pigs getting the smaller dose gained faster and more efficiently than controls, and their edible carcases had more protein and less fat.

One pig in the third trial received the same dose of the same preparation as the 2 which died in the previous experiment. Two pigs got a third preparation at 6 mg. per 15 kg. bodyweight daily, and 2 at 3 mg. The first and the last pigs were more efficient and had less fat and more protein in the edible carcase, but growth rate of the pig getting 4·5 mg. hormone was below that of controls. Feed was refused by the pigs getting 6 mg. hormone on the 7th and 11th days. One died on the 17th day. Injections were discontinued in the other, and it recovered in 10 days, but when they were started again death ensued within 3 weeks.

Macroscopic and histological findings at post-mortem examination of the pigs which died included damage to the heart, lungs, liver and kidney, and oedema. The findings in each pig are described in detail.—T. D. Bell.

5279

FORSHAW, R. P. **Management and the "A" grade hog.** *Agric. Inst. Rev., Canada*, 1956, **2**, 40–44. [Dept. Animal Husb., Ontario Agric. Coll., Guelph.]

5280

USHKALOV, E. N. Kastratziya svinok dlya otkorma. [**Castration of pigs for fattening.**] *Zhivotnovodstvo*, 1955, No. 11, 100–101.

Pigs should be castrated at 6 months, which gives a larger output of pork for a smaller amount of concentrates. Castrating fattening pigs at 4 months delays their growth and development.

H. Scherbatoff.

5281

KUDRYAVTZEV, P. N. Myasnoi otkorm svinei. [**Feeding pigs for meat.**] *Zhivotnovodstvo*, **1955**, No. 12, 28–34. [Vses. Nauch.-Issled. Inst. Zhivot.]

Arguments are given in favour of feeding pigs for meat instead of for lard.—H. Scherbatoff.

5282

RAIMONDI, R. Alcuni indirizzi tradizionali della suinicoltura italiana al controllo della sperimentazione. [**Some traditional methods of pig breeding in Italy examined experimentally.**] *Riv. Zootec.*, 1956, **29,** 80–89. [Ist. Zootec. Piemonte, Turin.]

The traditional method of pig breeding in north-eastern Italy since the end of last century has been to cross native sows with Large or Middle White boars, giving good pigs for fattening. The crosses were well suited to the conditions of fattening, usually in the woods and meadows, with little use of concentrates. Native sows also were maintained almost entirely in this manner. The market demand was for a fat pig, which the crosses provided. In the changing conditions of the present day a more intense agriculture is bringing the semi-wild regions into cultivation and more stall- or yard-fattening of pigs must be practised.

A trial with 4 groups of pigs was made. The groups, of 6 pigs each, represented Large White purebred, Large White × Cinta Senese, S. Lazzaro (a Large White locally inbred since 1875) × Romagnola, and Large White × Garlasco. All pigs were fed on the same concentrate mixture, skimmed milk and water, as a thick slop, twice daily. The same amounts on a liveweight basis were given to each pig. The pigs were weaned at about 74 days old, and the trial continued for 200 days, when liveweights were about 130 to 156 kg.

Up to 110 days, 85 to 95 kg. liveweight, there was little difference between the breeds in liveweight increase or economy of gain. In the last 90 days the Large Whites gained faster than the crosses, and rates of daily gain over the whole period were 0·670, 0·592, 0·589 and 0·546 kg. for the groups in the order first named. Since almost equal amounts of feed were eaten economy of gain was also in the same order, 3·72, 4·21, 4·22 and 4·56 feed units per lb. liveweight increase. Large Whites gave the leanest and Large White × Garlasco the fattest carcases.

It is suggested that since there is now little demand for fat carcases policy should be directed to breeding Large Whites, maintaining the native breeds only where semi-wild conditions demand it, and carefully selecting the native pigs retained.

T. D. Bell.

5283

LUCAS, I. A. M. and CALDER, A. F. C. **The response of different types of pigs to varying levels of feeding from weaning to bacon weight, with particular reference to carcass quality.** *J. Agric. Sci.*, 1956, **47,** 287–323. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

A review of the literature shows that restriction of feed intake by growing and fattening pigs does not in itself improve efficiency of feed conversion. When feed is severely restricted carcase quality is improved, but the time required to reach slaughter weight is too long for practical purposes, and small restrictions give only slight improvement which may be influenced by the genetic make-up of the pig more than by the plane of feeding.

In the experiments reported these findings were investigated. The breeds compared in each experiment were representative of lean and fatter types, and 3 planes of feeding were used. In the first experiment litters out of Large White sows by Wessex Saddleback and Swedish Landrace boars represented the fatter and lean types, respectively, and in the second the litters were by a Swedish Landrace boar out of a Large White sow for the lean type, and by a Large White boar out of an Essex Saddleback sow for the fatter. In each experiment group 1 had a high plane of nutrition from weaning to 100 lb. liveweight and from 100 lb. to 200 lb. Group 2 was fed on the high plane to 100 lb. and was restricted from 100 to 200 lb., and group 3 was on a low plane in both periods. In the second experiment the restriction imposed on group 2 was more severe than in the first, but group 3 was allowed more than in the first.

In both experiments time taken to reach bacon weight was much longer for group 3, and almost 2 weeks longer for group 2 than for group 1. There was no difference between breeds in the first experiment; in the second the lean type in groups 1 and 2 grew faster, but in group 3 the position was reversed.

Efficiency of feed conversion did not differ between breeds in experiment 1, and between groups, group 3 was inferior to groups 1 and 2. The lean type in the second experiment was more efficient in groups 1 and 2, but the fatter type in group 3. When the effect of breed was eliminated groups 1 and 2 were equal but group 3 was inferior.

The differences in carcase quality between types were slight, in favour of the leaner types. The improvement due to restricted feeding in group 2 was of the same magnitude. In group 3 a greater improvement was obtained, but the carcases tended to be soft, though it was not possible to record the iodine numbers to confirm this.

Only in experiment 2 was there a difference between sexes in growth rate, and then only from 100 to 200 lb. liveweight did females grow faster than males in groups 1 and 2, but males faster than females in group 3. Also in this experiment females were more efficient than males in groups 1 and 2 and males than females in group 3. Length of carcase was greater in females in all groups and experiments, and they also had less shoulder fat and a larger area of eye muscle. On the other hand, restricted feeding from 100 to 200 lb. liveweight gave greater improvement in females in

these respects, although it was the males which had greater need of improvement.

It is concluded that choice of type of pig is more important than close regulation of plane of nutrition in improving carcases produced for bacon, and other conditions, including housing, are of great importance (Absts. 5873, Vol. 25 and 2538, Vol. 26).—T. D. Bell.

5284

MAYBEE, H. J. **Hog grading in Canada.** *Canada Dept. Agric. Ottawa, Publ.* No. 961, December 1955, pp. 31.

5285

HORN, A. and FEKETE, L. A sertéshús minőségének javítása vágás előtti takarmányozással. **[Improvement of the quality of pork by special feeding before slaughter.]** *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1955, **1,** No. 8, 3–11. [Inst. Animal Breeding, Univ. Agric. Sci., Budapest.] Russian, German and English summaries.

Most of the lactic acid of carcases is formed from glycogen, after death, and a study was made of the possibility of increasing carcase glycogen and thus the lactic acid content. Of 2 groups each of 5 pork pigs 11 months old and weighing about 145 kg., one group was fasted as usual for a day at the slaughterhouse and the animals of the other group were given a feed containing 750 g. sugar.

The *p*H of the meat of pigs given sugar was consistently lower than that of the starved pigs, both when the meat was kept at 36° C. for 36 hr. and when it was kept at from 9° to 13° C. for more than 3 weeks. The colour of the meat also was improved in the pigs given sugar. (From English summary.)—D. Duncan.

5286

PERRY, J. S. **Observations on reproduction in a pedigree herd of Large White Pigs.** *J. Agric. Sci.*, 1956, **47,** 332–343. [Agric. Res. Counc. Inst. Animal Physiol., Babraham, Cambridge.]

The records from the Agricultural Research Council Field Station, Compton, refer to 247 pregnancies in 85 pigs. Mean duration of pregnancy was 114·17 $\pm$ 0·144 days and there was no effect of litter number (age of sow); nor was duration of pregnancy related to number of pigs born alive, except for pregnancies of more than 116 days, in which there was a significant deficit of live pigs. In 157 records of number stillborn there was no relation to length of gestation.

Sows were usually not bred until 8 months old or more. Average total litter size at birth rose to the fifth, sixth and seventh litters and fell thereafter. When only live-born pigs were considered, the peak came at litter 5; stillbirths were most frequent in litters 6 and 7. The proportion of pigs born dead decreased from 3·1 per cent. in litters of 3 to 8 (average 7), to zero in litters of 11, and rose to 10·2 in litters of 16 to 24 (average 18).

There was no difference in sex ratio between small and large litters, or early and late litters. Total weight of litter rose with size of litter, average weight declined from 3·12 lb. for 7 pigs to 2·55 lb. for 9·5 pigs and 2·29 for 18 pigs.

Records for number born alive in 163 litters [in text 110] with a total of 2026 pigs gave an average of 12·4 per litter; records of 322 litters weaned [in text 252] gave an average of only 8·1, suggesting a mortality of nearly 35 per cent., but wrongly, because pigs killed as "superfluous" were not separately recorded.

Sterility, or slow breeding, was less important as a reason for disposal of sows than mastitis and "failure to rear a litter of economical size"; of 136 sows 10 are shown as sterile and 13 as discarded for mastitis and poor performance.

I. Leitch.

5287

WEIPERS, M. and INGLIS, J. S. S. **Studies on the relationship of the nutrition and management of the sow to the health of litters.** *Vet. Rec.*, 1956, **68,** 315–316. [Vet. Sch., Univ. Glasgow.]

Sows and gilts were given a balanced ration of meal, 6 lb. per head daily, increased to 8 lb. a fortnight before farrowing. After farrowing the meal allowance was dictated by the size of the litter. There were 3 groups of 6 each, served by the same boar. Group 1 were kept on pasture during pregnancy and moved into arks with a grass run from farrowing until weaning. Group 2 were kept indoors on concrete for the whole time, and group 3 were on pasture until farrowing, then moved to concrete-floored farrowing pens where they remained until weaning. For groups 1, 2 and 3, respectively, average numbers of pigs farrowed per litter were 12·0, 8·4 and 11·7, and average numbers weaned were 9·5, 4·4 and 9·2. Death rates of piglets were 20·1, 47·6 and 21·4 per cent. Pigs in groups 1 and 3 were healthier and more uniform at birth. The possible reasons for the beneficial effect of pasture during pregnancy are discussed, and it is hoped to investigate this further.—T. D. Bell.

5288

HORST, P. Untersuchungen über Länge und Volumen des Schweinedarmes und die Möglichkeit ihrer Beeinflussung durch die Fütterung. **[Length and volume of the pig intestine and the possibility of altering it by diet.]** *Ztschr. Tierernährung Futtermittelk.*, 1956, **11,** 88–108. [Inst. Tierzücht., Fak. Landbau, Tech. Univ., Berlin-Charlottenburg.] English summary.

Pigs weighing 30 kg. were divided into 2 groups ; 18 pigs received a ration high in ballast and 16 controls a ration low in ballast. The first group had initially 56 per cent. wheat bran. 28 per cent. weatings and 16 per cent. protein concentrate ; the proportions were changed at 50 kg. liveweight to 62, 30 and 8 and at 70 kg. to 64, 32 and 4. The second group had initially 84 parts barley meal and 16 parts protein concentrate ; at 50 kg. 9 of them had 92 parts barley meal and 8 parts protein feed, and 96 and 4 parts from 70 kg., but the other 7 had 78·5 parts barley meal, 6·8 parts protein feed and 14·7 parts " Steffenschnitzel " (sugar beet slices), changing at 70 kg. to 79·2, 3·3 and 17·5 parts. All the pigs were killed at 110 kg. without fasting. The length of the digestive tract, its weight both full and empty, and its volume when filled with air at 33·2 mm. water pressure were estimated.

In the pigs with higher ballast intake the stomach, small intestine and total digestive tract were significantly heavier than those of controls, but the difference in the colon and caecum was not significant. The length and volume of the digestive tract varied widely in both groups, but there was no significant difference with diet. The contents of stomach and small intestine weighed about the same in both groups, but the large intestine and the whole tract contained significantly more in the high-ballast group.

In 8 pigs fed individually for the last 4 weeks of the experiment there was no relation between total volume of the tract and total feed intake. It was concluded that the capacity of the digestive tract does not influence feed intake.—D. Duncan.

5289

KLIESCH, J. and BANKWITZ-SILBER, E. Röntgenologische Untersuchungen über den Zusammenhang zwischen Körperlänge, Wirbelzahl und Wirbelgrösse an Ferkeln im Alter von 7–10 Tagen. [**X-ray studies of the relations between body length and number and size of vertebrae in pigs at the age of 7 to 10 days.**] *Züchtungskunde*, 1956, **28,** 208–211. [Inst. Tierzucht., Tech. Univ., Berlin.]

The pigs examined were all from the Institute's herd and X-ray photographs were made when they were 7 to 10 days old. The number of presacral vertebrae was in 102 pigs 27, in 158 pigs 28 and in 7 pigs 29. In these 3 groups the number of animals with 14, 15 and 16 pairs of ribs, respectively, was 90, 12, 0 ; 56, 101, 1 ; and 0, 2, 5. In most of the breeds studied there were equal numbers of pigs with 27 and 28 vertebrae, but English Saddleback × Improved Landschwein included a larger number with 28 vertebrae. All the pigs with 29 vertebrae were in a single litter of the Schwäbisch-Hällisch breed.

The correlation coefficient between number of vertebrae and body length was $r = + 0{\cdot}338$, a low value. The correlation between the average length of the vertebrae and body length was higher, $r = + 0{\cdot}893$. The regression coefficient between body length and vertebral length also showed that body length in pigs depends more on the length than on the number of vertebrae.

D. Duncan.

5290

MIKHNYUK, S. P. Preparat zhidkoi krovi dlya zhivotnykh. [**A preparation of whole blood for feeding to animals.**] *Veterinariya*, 1956, **33,** No. 2, 63–66. [Baranov. Meatpreserving Combine, Brest Regim.]

The preparation consisted of defibrinated blood from healthy slaughtered cattle 96 per cent., ethanol 3 per cent., ascorbic acid 0·01 per cent., chemically pure glycerine 1 per cent. and crystal violet, 1 part to 25 to 30 thousand parts of the preparation. The glycerine was used as a source of metabolic energy. When backward, underdeveloped pigs were given 75 ml. each of this preparation, 3 times a day for 15 days, Hb values rose and their general condition improved.

H. Scherbatoff.

5291

MUTTI, R. J. **Adequacy of protein in swine rations in Illinois, as related to areas within the state, phases of production, size of enterprise, share of income from swine sales, soil association, tenure, and the market for protein supplements.** *Univ. Illinois Agric. Exp. Stat. Bull.* No. 599, February 1956, pp. 31.

A farm survey was made to ascertain the levels of protein given to pigs in Illinois and also to find out whether insufficient protein was associated with size of enterprise, percentage of income from sale of pigs, soil type or farm tenure.

In the areas studied, about half the farmers gave rations adequate in protein, nearly one-third rations with up to 3 per cent. too little, and one-sixth even less adequate rations. The adequacy of protein feeding for different classes of pig and in different seasons varied between different areas within the state, but a 27 per cent. increase in the amount of 35 per cent. protein supplement used would be required to make up the average deficiency for all areas.

Generally, greater protein deficiencies were encountered in the small herds and when sales of pigs represented less than 20 per cent. of the gross farm income. The effects of type of farm tenure and of soil type varied widely between the different areas in the state.—I. A. M. Lucas.

See also **Absts. 4248, 4335, 4336, 4374, 4409, 4620, 4843, 4861, 4888, 5146.**

GOATS, RABBITS AND OTHER MAMMALS

5292

TORTORELLI, N. Esperienze di lattazione artificiale in giovani capre. [**Artificial induction of lactation in young goats.**] *Riv. Zootec.*, 1956, **29,** 149–154. [Ovile Naz., Foggia.]

Artificial lactation was induced within 2 to 15 days in 12 of 13 goats of different breeds, about a year old, by a single subcutaneous injection in the neck of 1·5 mg. foralactol, a synthetic oestrogen, followed by daily massage of the udders. A second injection after 15 days was successful with the goat which did not respond at first. Daily milk yields ranged from 15 to 900 g., and total yields in 160 to 170 days from 13·2 to 103·6 kg. Best yields were from the goats which responded most readily to treatment. The milk obtained was normal according to chemical analysis, and was successfully used for processing into cheese and "ricotta". No ill effect was seen in the goats, which developed well, and were served, towards the end of lactation, by the same male. Twelve of the goats conceived immediately. Records will be kept through the subsequent gestation and lactation, to see what relation there is between production in induced and natural lactations.

The literature is reviewed and the advantages of induced early lactation are discussed. The study is considered of special importance since the goat population in Italy is increasing, but rearing practices leave much to be desired. The tendency is to mate the goats too young, at 7 to 8 months old, so that a long unproductive period is avoided, but this prejudices the animal's development and shortens her productive life. By inducing articificial lactation this situation can be avoided.—T. D. Bell.

5293

THACKER, E. J. **The dietary fat level in the nutrition of the rabbit.** *J. Nutrition*, 1956, **58,** 243–249. [U.S. Plant Soil Nutrit. Lab., Agric. Res. Serv., Ithaca, N.Y.]

Groups of young Dutch belted rabbits were fed to appetite for 15 weeks on diets containing different amounts of fat, consisting of crude casein 25, Ruffex 10, maize oil 2, mineral mixture 5·1 and hydrogenated vegetable oil ("Primex") 3, 8, 13, 18 or 23 per cent., with dextrin to 100 and a vitamin supplement in proportion to the energy value of each diet. Thus the diets contained 5, 10, 15, 20 or 25 per cent. fat; an additional group were similarly fed on commercial pellets containing 3·77 per cent. ether-extractable matter. The animals were housed individually; feed consumption was measured daily and they were weighed weekly.

The rabbits which were fed on the diets containing 10, 15, 20 and 25 per cent. fat showed similar bodyweight gains; the animals given the commercial pellets also showed weight gains which were not statistically different from those found on the semi-synthetic rations, though nearly twice as much of the pellet diet by weight was required to produce each g. gain as was required with the 25 per cent. fat diet. The animals fed on the diet containing 5 per cent. fat gained about 200 g. less than those in the other groups.—G. A. Garton.

5294

ANDO, N., KOJIMA, M., HETSUKA, K. and SERA, H. **Studies on the meat and by-products (46-48). Rabbit part: 12. Effect of castration on body weight gain and dissecting yield of fattened rabbit. 13. Effect of castration on the chemical composition of meat of fattened rabbit. 14. Effect of castration on the distribution of nitrogen in meat of fattened rabbit.** *Bull. Fac. Agric. Univ. Miyazaki*, 1956, **1,** 237–242; 242–244; 244–246. [Lab. Chem. Technol. Animal Products, Fac. Agric., Univ. Miyazaki.]

12. Male rabbits were castrated at 9, 17 or 29 weeks of age, or left intact, and slaughtered at 36 weeks old. They were fed alike throughout, during the last 42 days on a fattening ration. Castration at any age did not affect total weight increase or dressing percentage. There was more superficial and kidney fat in the castrated animals, but other carcase characteristics were unaltered.

13. Lean meat trimmed of fat from the castrated rabbits had a higher content of ether extract than that of the intact rabbits. The energy value of the meat and the proportion of water-soluble protein were also increased by castration.

14. In the meat of castrated animals, water-insoluble N was less and water-soluble N, except in the amino form, was more.—T. D. Bell.

5295

MEREGALLI, A. L'alimentazione invernale dei conigli. [**Winter feeding of rabbits.**] *Riv. Zootec.*, 1956, **29,** 91–92.

5296

GREIG, J. R. **The sheep dog. Management and feeding.** H.M.S.O., Edinburgh, 1956, pp. 16. Price 1s. 3d. net.

The sheep dog may travel as much as 100 miles a day during the lambing season, and it is always active. It is essential that it be adequately fed both quantitatively and qualitatively. A survey

in Wales, England and Scotland (Abst. 3722, Vol. 23) showed that sheep dogs are not usually in a good state of health. The diets commonly given are monotonous and unbalanced, deficient in Ca, nicotinic acid and sometimes riboflavin and vitamin D. The general principles of nutrition are discussed and correct diets for pregnant and nursing bitches, growing pups and working dogs are described. Variety is important, and the use is advocated of fish liver oils, animal protein and milk and fats to avoid the usual deficiencies of a monotonous diet of oat- or maizemeal.—T. D. Bell.

5297

HOLZWORTH, J. **Anemia in the cat.** *J. Amer. Vet. Med. Assoc.*, 1956, **128,** 471–488. [Angell Mem. Animal Hosp., Boston, Mass.]

Anaemia due to acute blood loss is rare ; haemolytic anaemia due to an infection was common, with a low rate of production of red cells. Nutritional deficiencies are not obviously present but further investigation of the nutrition of the cat might show it to be important.—T. D. Bell.

5298

VORONOV, A. G. O metodakh polevogo izucheniya kormogo ratziona melkikh gryzunov. [**On methods of field study of the food of small rodents.**] *Byull. Mosk. Obshch. Prirod. Otdel Biol.*, 1955, **60,** No. 5, 21–30.

A survey was made of the main methods of investigation used by different workers to study the amount and quantity of food eaten by small rodents. Included were : the quantitative composition of the foods, daily amounts eaten, chemical composition, effect of rodents on plants, and soils, the daily feeding rhythm, habits of the rodents, changes in the food in relation to external factors and the physiological condition of the animal, and effect of the quality and quantity of food on reproduction.

In some of these investigations the animals were studied under both laboratory and field conditions. It is suggested that reliable results can be obtained only by investigations which include all these methods, as they are mutually complementary.—H. Scherbatoff.

See also Absts. 4364, 4462, 4679, 4888.

POULTRY

GROWTH AND FATTENING

5299

ACKERSON, C. W. and MUSSEHL, F. E. **Growth of chicks as influenced by degree of confinement and level of feed intake.** *Poultry Sci.*, 1956, **35,** 483–485. [Dept. Biochem. Nutrit., Univ. Nebraska, Lincoln.]

Variations in growth rate caused by different rates of feed intake were studied by allowing groups of day-old chickens to eat to appetite up to 900 g. in all ; consumption in other 3 groups was restricted to 90, 80 and 70 per cent. of the amount consumed daily by the first group until each group had also consumed 900 g. One series were fed in individual cages and another in battery brooders. Chickens on the 70 per cent. restricted diet took 6 days longer to consume 900 g. feed. The enforced restriction produced no difference in rate of gain, but the standard error of the mean weight of the chickens in the individual cages was only about 4 g. while in battery-fed chickens it was 12 g., indicating that smaller significant differences can be detected by individual feeding.—J. S. Thomson.

5300

MARGOLF, P. H. and WASHKO, J. B. **Seven years of managed turkey grazing : 75 to 150 birds per acre.** *Pennsylvania Agric. Exp. Stat. Bull.* No. 608, October 1955, pp. 9.

A cocksfoot and ladino white clover pasture established in 1944 was used in trials each year from 1945 to 1951. Turkeys were kept on the pasture from spring to autumn of each year at 2 rates of stocking : half of the pasture had 50 birds per acre and half 100 birds per acre in 1945, and in the other years the rates were increased to 75 and 150 birds per acre. Shelters and feeders on the pastures were moved daily to ensure even cropping and distribution of droppings.

During the trials the ladino clover declined rapidly, and by 1948 only cocksfoot remained under both rates of stocking.

Mortality was not high, and there was no evidence that infection had built up either through the years or during the season. Bad weather and inadequate protection in the first year, when mortality was highest, caused an outbreak of blackhead, but infection did not persist.

The birds were put on the pasture at from 6 to 15 weeks old and removed at about 32 weeks old. At the younger ages they were unable to take full advantage of the abundant early growth of grass, and at the older ages they attained sexual maturity, which was deleterious to market quality, before removal from the pasture.

From the light grazing the weight of live turkey produced per acre was from 531 to 1106 lb., and from the heavy from 911 to 2198 lb. The greatest reason for variation at either rate of grazing was

the actual number of birds in each separate year. It was apparent that the pasture could maintain the heavier rate of stocking. Consumption of feed per lb. gain, as mash and grain, was similar for both.—T. D. Bell.

5301

McCartney, M. G. **The effect of day-length on rate of growth, feed conversion, feathering and market quality of turkeys.** *Poultry Sci.*, 1956, **35,** 468–475. [Dept. Poultry Husb., Pennsylvania State Univ., University Park.]

In each of 2 experiments one group of turkeys had an experimental day-length of 13 hr., and another natural daylight, all at normal environmental temperature. In each experiment the birds were reared together from hatching until the experiments began. In experiment 1 the birds were White Hollands, and the natural daylight was 12 hr. at the beginning, falling to 9 hr. between 13 and 28 weeks of age. In experiment 2, with Beltsville Small Whites, the natural day-length increased from 12 to 15 hr. between 12 and 24 weeks of age.

In each experiment the birds getting the longer daylight, experimental day in the first, and natural day in the second, were significantly heavier at the end of the trial, and efficiency was better. It is suggested that a day-length of at least 13 hr. and probably 15 hr. is required for maximum growth of turkeys, and birds maturing in autumn and winter would benefit from artificial light.

Feathering and market quality were not consistently affected by the conditions imposed.

T. D. Bell.

5302

Mały, F., Małowa, M. and Filusowa, F. Zużycie pasz przy wychowie kurcząt rasy Sussex do 6 miesiąca życia. [**Feed consumption of Sussex breed chicks up to the age of 6 months.**] *Rocz. Nauk rol.* [*B*], 1955, **70,** 181–196. [Inst. Zootech., Cracow.] Russian and English summaries.

The trial was made under unfavourable weather conditions, but the chickens developed satisfactorily as regards weight increases and attainment of maturity and reached average weights for pullets and cocks of 2038·6 g. and 2687·2 at 26 weeks and 55 per cent. of the pullets laid their first egg at between 181 and 230 days.

Feed consumed per head by pullets and cocks, respectively, during the breeding period was; grain 5·05, 5·87; concentrates 12·02, 17·07; green fodder 0·83, 0·75; skimmed milk 1·16, 0·90 kg., giving 2290 and 2950 g. digestible protein and 16·7 and 20·8 feed units. These quantities represented more green feed and skimmed milk than usual. The necessity for the high feed intake was attributed to the unfavourable conditions; in spite of the cost the trial was considered economically sound. (From English summary.)—T. D. Bell.

5303

Sunde, M. L. **A relationship between protein level and energy level in chick rations.** *Poultry Sci.*, 1956, **35,** 350–354. [Dept. Poultry Husb., Univ. Wisconsin, Madison.]

Rations containing 20 or 28 per cent. crude protein were supplemented with 0, 5 or 10 per cent. white grease to vary the energy levels in trials with chickens from day-old to 4 weeks and from 4 to 10 weeks. At the lower protein level, increases in energy did not consistently affect growth to 4 weeks or to 10 weeks. At the higher protein level growth was improved by 5 per cent., and more by 10 per cent. added fat. The improvement was more marked at 10 than at 4 weeks. Without added fat the growth rate on 28 per cent. protein was less than that on 20 per cent. protein.

Efficiency of feed conversion was improved by raising levels of fat with each level of protein. Without added fat efficiency was better on the low- than on the high-protein level, but high protein and high energy combined were better than low protein without fat. When the results were plotted graphically it appeared that a change in protein level caused a change in the optimum ratio of energy to protein.—T. D. Bell.

5304

Fisher, H. and Weiss, H. S. **Feed consumption in relation to dietary bulk and energy level: the effect of surgical removal of the crop.** *Poultry Sci.*, 1956, **35,** 418–423. [Poultry Dept., Rutgers Univ., New Brunswick, N.J.]

A basal ration supplemented with cerelose, or fibre and maize oil, to give total rations of equal energy value and protein percentage gave similar weight increases and efficiency of feed utilisation in a trial with 7-day-old chickens lasting 19 days. The same level of fibre but with cerelose instead of maize oil, and reduced energy, gave similar growth, but more feed was required. Similar results were obtained in a trial with rations supplemented with cerelose, maize oil, fibre, maizemeal or ground oats. It was concluded that feed intake was controlled partly by bulk, and not solely by energy intake.

Surgical removal of the crop from 3-week-old chickens is described. It was a simple operation and the birds soon recovered and have been raised to maturity without ill effect.

Trials with birds from which the crops had been removed, using rations similar to those in the first trial, showed that the operation did not affect feed consumption.—T. D. Bell.

5305

BALDISSERA NORDIO, C. Influenza delle alte dosi di farina di medica sull'accrescimento del pulcino. [**Effect of high proportions of alfalfa meal on the growth of chickens.**] *Riv. Zootec.*, 1956, **29,** 125–127.

A review.

5306

WEST, J. W. **Degossypolized cottonseed meal as a substitute for soybean oil meal in a turkey growing mash.** *Poultry Sci.*, 1956, **35,** 304–307. [Mississippi Agric. Exp. Stat., State College.]

Solvent-extracted cottonseed oilmeal free of gossypol was used for turkeys to replace completely or partly the soya bean oilmeal in a growing and finishing mash containing about 20 per cent. protein. Eighty birds in each of 6 groups were given mash and grain to appetite from 8 to 28 weeks of age. There was no significant difference between any of the groups in growth rate, efficiency, uniformity or mortality. A non-significant, but constant, difference in favour of combinations of the meals, compared with either meal separately, suggested that they had some complementary action.

T. D. Bell.

5307

KIRCHGESSNER, M. Die Verwendung von Leinexpeller in der Kükenaufzucht. [**Use of expeller process linseed meal in rearing chicks.**] *Arch. Tierernährung*, 1956, **6,** 55–60. [Inst. Tierernährungslehre, Landw. Hochsch., Hohenheim.]

Six groups of from 27 to over 50 day-old White Leghorn cockerels were fed to appetite for 10 days on a ration of barley 15, wheat 15, oats 15, maize 10, weatings 10, expeller process linseed meal 13, groundnut extraction meal 8, lucerne meal 5, wheat germ 5, sesame extraction meal 2, Protektor Konzentrat 2 per cent., believed to be adequate in amino acids except for lysine and methionine; or the same with lysine or methionine or both raised to requirement, plus 1 per cent. Aprofa, equivalent to 0·7 mg. vitamin B_{12} per cent.; or the same with the lysine and methionine supplements but no vitamin B_{12}. A control group had a practical ration. The results were analysed statistically. Growth and feed utilisation on all the experimental rations were extremely poor.

Another experiment, in which 7 groups of cockerels aged 30 days were given mixtures of the practical ration with 10 per cent. of maize, sesame meal, lucerne meal, wheat germ, weatings or groundnut meal, or 15 per cent. of linseed meal, confirmed the depressing effect of the last, though feed utilisation was less affected than in the younger chicks.

In a third experiment groups of 8-week-old chickens had the practical ration with 3, 5, 8, 10, 15 or 20 per cent. linseed meal. Again weight gain and feed utilisation were impaired, significantly so with over 10 per cent. linseed meal, and utilisation of total nutrients and digestible protein was impaired with only 5 per cent.—W. M. Deans.

5308

ROSENBERG, M. M. and PALAFOX, A. L. **Response of growing and mature pullets to continuous feeding of cane final molasses.** *Poultry Sci.*, 1956, **35,** 292–303. [Dept. Poultry Sci., Univ. Hawaii, Honolulu.]

New Hampshire chickens 6 weeks old, which had been reared to that age on rations containing different levels of molasses from 0·0 to 34·5 per cent. in a previous trial (see Abst. 5923, Vol. 25), were kept on grower rations containing the same percentages of molasses to 24 weeks of age, and then on layer rations, still with the same percentages of molasses, to 72 weeks. Each level of molasses was investigated in triplicate.

Growth to 24 weeks of age was satisfactory on levels of molasses up to 16·5 per cent. in one trial and 11·5 per cent. in the other 2. At the highest level, 34·5 per cent., there was a significant fall in growth rate. More feed was required to produce 1 lb. weight increase with each successive rise in molasses, but cost was reduced. Onset of maturity and rate of lay were not adversely affected by the experimental rations.

From 24 to 72 weeks of age egg production, egg size, incidence of blood spots, shell formation, mortality or feed required to produce a dozen eggs were not prejudiced by the level of molasses in the ration. Cost of feed per dozen eggs was inversely related to the level of molasses. Liveweight increase was progressively decreased by molasses at 7·5 per cent. and over, and concentrations of 16·5 per cent. and over increased the percentage of soiled eggs. The possibility that some of the observed differences were due to the high mineral content, up to 7·07 per cent., of the rations, or to slight differences in the energy supplied, is discussed.—T. D. Bell.

5309

BALLOUN, S. L., DONOVAN, G. A. and PHILLIPS, R. E. **Trichorethylene-extracted and expeller-type meat scraps and tallow in the diets of young chickens.** *Poultry Sci.*, 1956, **35,** 163–167. [Dept. Poultry Husb., Iowa State Coll., Ames.]

In 5 experiments it was shown that either expeller-type or trichloroethylene-extracted meat scraps at levels of 5 or 10 per cent. in the ration improved chick growth up to 4 or 8 weeks compared with a standard soya bean oilmeal type of

ration. Trichloroethylene-extracted meat scraps at a level of 20 per cent. could be given up to 12 weeks of age without impairing growth or efficiency of feed utilisation. There was no difference between the 2 types of meat scraps. Tallow as 2 or 4 per cent. of the ration also improved growth, but the effect was not so great when meat scraps were included in the ration. Tallow also improved efficiency.—T. D. Bell.

5310

YACOWITZ, H., CARTER, R. D., WYNE, J. and MCCARTNEY, M. G. **Effects of varying protein and fat levels in a finishing ration for turkey broilers.** *Poultry Sci.*, 1956, **35,** 227–229. [Dept. Poultry Sci., Ohio Agric. Exp. Stat., Wooster.]

Turkeys were fed from 8 to 16 weeks of age on rations containing 20, 23 or 26 per cent. protein, with or without 3 or 6 per cent. stabilised animal fat. At 16 weeks of age there were significant increases in weight, due to the added fat, on each protein level in males, but not in females. There was no significant difference between protein levels, and carcase quality was not affected. Feed efficiency also was improved by fat, but not by raising the protein level.—T. D. Bell.

5311

DAVIDSON, A. L. **Fat in poultry nutrition. 1. The chick from hatching to five weeks of age.** *J. Sci. Food Agric.*, 1956, **7,** 240–244. [Biol. Testing Stat., British Cod Liver Oils (Hull and Grimsby), Ltd., Hull.]

1. The first experiment reported showed that maximum growth and efficiency of chicks to 5 weeks of age was obtained on a ration in which the ratio of total digestible nutrients (TDN) to crude protein was between 3·5 and 4·0 to 1. In 2 further experiments this was confirmed, and it was demonstrated that, provided the ratio of TDN to crude protein was kept at the optimum level, improved performance was obtained by including higher levels of fat in the ration. All the experiments were on groups of 25 Rhode Island Red × Light Sussex cockerels, with a basal mixture of ground wheat, barley and oats; white fishmeal supplied the protein, and the fat was a blend of cod liver oil and vegetable oil.—T. D. Bell.

5312

SUNDE, M. L. **The effect of fats and fatty acids in chick rations.** *Poultry Sci.*, 1956, **35,** 362–368. [Dept. Poultry Husb., Univ. Wisconsin, Madison.]

In experiments with day-old chicks, growth to 4 weeks was not affected by supplements of white, brown or yellow grease, tallow, commercially stabilised fat or hydrogenated fat. Efficiency of feed utilisation was improved by all except the hydrogenated fat. Oleic, linolenic, linoleic and butyric acids improved feed utilisation but not rate of gain. Butyric acid depressed rate of gain. Stearic acid was without effect, and the addition of dispersing agents did not improve utilisation of the stearic acid. Tall oil, a by-product from the wood-pulp industry, crude tall oil and rosin acid extract of tall oil all depressed growth rate and efficiency in the order given.

Supplements of 5 per cent. white grease improved equally the efficiency of utilisation of high- and low-energy basal diets. When rations with and without fat supplements were offered to chickens either day-old or 31 days old, in a cafeteria system, the birds chose about twice as much of the supplemented ration.—T. D. Bell.

5313

CURTIN, L. V. and RAPER, J. T. **Feeding value of hydrolyzed vegetable fats in broiler rations.** *Poultry Sci.*, 1956, **35,** 273–278. [Buckeye Cotton Oil Company, Cincinnati, Ohio.]

Hydrolysed cottonseed fat, distilled cottonseed fatty acids, distilled animal fatty acids and animal fats were added to a basal ration containing 20 per cent. protein given to chickens from day-old to 8 weeks. They were added at rates up to 6 per cent. of the ration. The additions produced weight gains comparable to those of untreated birds, and improved feed utilisation. The highest rate, 6 per cent., was not better than 4 per cent. The hydrolysed vegetable fats containing 87 per cent. or more free fatty acids gave the most satisfactory improvement.—T. D. Bell.

5314

SUPPLEE, W. C., COMBS, G. F. and ROMOSER, G. L. **Failure to obtain growth responses with thioctic acid in chicks from different sources.** *Arch. Biochem. Biophys.*, 1956, **61,** 140–143. [Poultry Dept., Univ. Maryland, College Park.]

Groups of chickens of different breeds and with different diet histories were fed on either purified diets or on a practical starter diet to which 0·5 or 1·5 mg. thioctic (lipoic) acid had been added. Over a period of from 21 to 23 days there was no effect, as compared with controls, on either rate of gain or efficiency of feed conversion. The result was not in agreement with that of DeBusk and Williams (Abst. 5384, Vol. 25).—J. S. Thomson.

5315

MOELLER, M. W. and SCOTT, H. M. **Effect of equalized feed intake on the response of chicks to fish meal.** *Poultry Sci.*, 1956, **35,** 491–492. [Illinois Agric. Exp. Stat., Urbana.]

Day-old chickens were fed for 7 days on a pre-test ration. From 7 to 21 days groups of paired chickens were then fed individually on a test ration or the same ration with 10 per cent. fishmeal replacing an equivalent amount of cerelose. In one series the ration was fed to appetite, in the other feed intake was equalised. In both series fishmeal increased the rate of growth significantly, by 17·5 per cent. when feeding was to appetite and by 9·4 per cent. when feeding was equalised, indicating that fishmeal improved the quality of the test ration independently of its effect on feed consumption.—J. S. Thomson.

5316

ARSCOTT, G. H. **Complexity of a chick growth response to egg yolk, animal fat and fish solubles additions to the diet.** *Poultry Sci.*, 1956, **35,** 338–342. [Dept. Poultry Husb., Oregon State Coll., Corvallis.]

From day-old to 4 weeks of age chicks were given a semi-purified basal ration believed to be complete in all nutrients, and experimental groups were given supplements of 4 or 8 per cent. fish solubles, 4 or 8 per cent. stabilised animal fat or 4, 8 or 12 per cent. dried egg yolk, or combinations of the 4 per cent. levels of the solubles and fat, with or without 8 per cent. dried egg yolk, or either 4 per cent. solubles or 4 per cent. fat with 8 per cent. egg yolk.

The growth response to 4 and 8 per cent. fish solubles or animal fat was similar, and was not improved when the two were combined. Four per cent. dried egg yolk also produced a similar growth response, but with this supplement the response was greater as the level rose. The response to 8 per cent. dried egg yolk with 4 per cent. animal fat was significantly better than the response to animal fat alone. The complexity of the problem of the growth factors investigated is discussed.—T. D. Bell.

5317

HOPPER, J. H., SCOTT, H. M. and JOHNSON, B. C. **The growth promoting ability of fluid egg yolk.** *Poultry Sci.*, 1956, **35,** 195–197. [Illinois Agric. Exp. Stat., Urbana.]

When given as 5 or 10 per cent. of either practical or purified rations for growing chickens from day-old for 28 days, egg yolk improved weight gains during the last 14 days. The egg yolk, 5 per cent., was given also in combination with liver powder, fish solubles or whey, and these supplements were given alone to some groups of birds. The results indicated that egg yolk lacked the " whey factor " and it is suggested that its growth-promoting effect is due to its containing the " fish factor ".—T. D. Bell.

5318

LILLIE, R. J., SIZEMORE, J. R. and DENTON, C. A. **Feather meal in chick nutrition.** *Poultry Sci.*, 1956, **35,** 316–318. [U.S. Dept. Agric., Agric. Res. Serv., Animal Poultry Husb. Res. Branch, Beltsville, Md.]

In a trial with day-old New Hampshire chicks reared to 10 weeks of age, feather meal could replace part of the fishmeal, maintaining the same level of animal protein in the ration, without affecting growth or efficiency. A second experiment confirmed these results, but it was also found that the feather meal could replace all the fishmeal satisfactorily, and the combination of the 2 gave better growth than either separately.

In a third experiment a significant growth response was obtained by fish solubles at the 6 per cent. level or by feather meal at levels of 2·5 or 4 per cent. when added to a ration considered complete in all required nutrients. It is concluded that feather meal is a source of unidentified growth factor (see next Abst.)—T. D. Bell.

5319

MENGE, H., LILLIE, R. J., SIZEMORE, J. R. and DENTON, C. A. **An unidentified mineral required by the chick.** *Poultry Sci.*, 1956, **35,** 244–245. [Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

Feather meal ash and feather meal, each as 4 per cent. of the ration of day-old chicks, stimulated growth equally up to 4 weeks, compared with a basal ration considered to be complete. It is suggested that the unidentified growth-stimulating factor in feather meal is inorganic in nature.

T. D. Bell.

5320

WISMAN, E. L., HOLMES, C. E. and ENGEL, R. W. **Chick growth response to condensed fish solubles and varying levels of terramycin.** *Poultry Sci.*, 1956, **35,** 457–462. [Virginia Agric. Exp. Stat., Blacksburg.]

Two experiments were made with day-old White Leghorn cockerels. In the first the basal ration contained no animal protein but was considered adequate in essential nutrients. Condensed fish solubles was added to the rations of half the birds, replacing 5 per cent. soya bean oilmeal. Terramycin hydrochloride was added to all rations at levels of 0, 10, 50, 100 and 200 mg. per lb. feed. The experiment was made in old quarters; in one series the droppings were removed and in another they accumulated. Growth data to 4 weeks showed that the presence or absence of droppings had no significant effect. Fish solubles in the ration had a marked stimulating effect. Terramycin at any level had no effect on growth with the basal ration, but with fish solubles there

was a significant effect at the highest levels of terramycin.

The second experiment was similar to the above except that the chickens were housed in either old or new quarters. Growth responses to fish solubles and terramycin were similar to those found in the first experiment. There was no significant effect of housing conditions.

J. S. Thomson.

5321

HAVERMANN, H. and HARTFIEL, W. Bestätigt der Röntgen-Test den Einfluss von Antibiotica (Terramycin) auf die Ca- und P-Aufnahme bei Küken? [**Does X-ray examination confirm the effect of antibiotics (terramycin) on the assimilation of Ca and P by chicks?**] *Arch. Geflügelk.*, 1956, **20,** 90–96. [Inst. Tierzucht, Univ. Bonn.] English summary.

The 240 chicks received for the first week after hatching a rachitogenic diet to make them use up their reserves of vitamin D_3 and then a similar diet with higher Ca and P contents, 0·53 and 0·45 per cent. in the first period and 1·44 and 0·99 in the next. The diet contained, per cent., maize-meal 60, soya meal 21·5, skimmed milk powder 10, lucerne meal 7, vitamin B concentrate 0·5, minerals and trace elements 0·5 and charcoal 0·5. After the first week the chickens were divided into 10 groups and given different combinations of terramycin and vitamin D_3. After 22 days of this treatment the right intertarsal region was X-rayed.

The calcification value derived by the method of Olsson (see Abst. 4104, Vol. 9) was improved by terramycin and rose both with increasing terramycin intakes of from 10 to 30 mg. per kg. feed and with increasing vitamin D_3 intakes of from 60 to 240 I.U. per kg. feed. Weight gains also were favourably influenced by terramycin.

D. Duncan.

5322

HEUSER, G. F. **Feeding high levels of antibiotics to chickens.** *Poultry Sci.*, 1956, **35,** 81–84. [Dept. Poultry Husb., Cornell Univ. Agric. Exp. Stat., Ithaca, N.Y.]

White Rock pullet chicks were given a basal ration and some birds received supplements of 10, 50 or 100 g. aureomycin or 100 g. terramycin per ton of feed for 12 weeks. The lowest level of aureomycin increased market weight at 12 weeks, and improved efficiency of feed conversion only slightly. Mortality was reduced. The higher levels of the antibiotics significantly increased market weight and feed conversion efficiency, and reduced mortality. From the 6th to the 8th week of the trial there was an outbreak of respiratory infection, and the effect of the high levels of antibiotics seemed to be enhanced thereby.

T. D. Bell.

5323

HAUSER, M. M., ANDERSON, G. W., PEPPER, W. F. and SLINGER, S. J. **Further evidence on the relation of coliforms to the growth response of chicks to antibiotics.** *Poultry Sci.*, 1956, **35,** 27–36. [Dept. Bacteriol., Ontario Agric. Coll., Guelph.]

Day-old chickens were kept for 17 days in a cleaned and disinfected environment. Some of the birds were given supplements of 10, 25, 100 or 200 p.p.m. chloromycetin. Bacterial counts of the intestinal contents of selected birds from each group were taken at 2 to 6, 6 to 13 and 13 to 17 days and weight gains and efficiency of feed utilisation were recorded for the remaining birds. Growth response to the antibiotic was slight, occurred mainly between 13 and 17 days, and was accompanied by an increase in intestinal coliform bacilli. Efficiency increased as the level of antibiotic rose, and corresponded to a progressive decrease in intestinal lactobacilli.

In a second experiment birds were kept for 35 days in an environment which had only been washed with cold water and not disinfected. Bacterial counts were made up to the 27th day, and feed efficiency and growth rates recorded. The supplements given were penicillin, aureomycin, terramycin, chloromycetin or sulphisoxazole, all 25 p.p.m., or 3-nitro-4-hydroxyphenylarsonic acid, 50 p.p.m. All supplements except sulphisoxazole stimulated growth, and the greatest stimulus was during the first week. The increased growth rate was accompanied by increase of intestinal coliform bacilli and reduction of enterococci. The lactobacillus counts showed no clear trend, and efficiency was not consistently improved. The relation between intestinal coliform bacilli and growth stimulation by antibiotics is discussed.

T. D. Bell.

5324

MCDONALD, M. W. **Feeding of detergents may have value in cockerel raising. Results of some early experiments.** *Agric. Gaz. N.S.W.*, 1956, **67,** 39–41. [N.S.W. Dept. Agric. Poultry Exp. Stat., Seven Hills.]

Two experiments are reported in which the effect of supplements of 6·6 p.p.m. procaine penicillin and 0·5 per cent. Na tetrapropylene benzene sulphonate, a detergent, on growth and efficiency of feed utilisation of chickens from day-old to 12 weeks in the first, and to 9 weeks in the second, experiment was investigated.

In the first experiment weight was 9 per cent. higher with penicillin and 6 per cent. higher with the detergent than that of controls getting no supplement. In combination the antibiotic and the detergent improved growth by 21 per cent. For each lb. liveweight increase controls required

4·10 lb. feed, compared with 3·80, 4·16 and 3·71 lb., respectively, for the groups getting antibiotic, detergent or both.

In the second experiment no supplement stimulated growth or improved efficiency. The antibiotic alone or in combination improved mortality rate in the first but not in the second experiment. These results agree with others published. The mode of action of detergents in promoting growth of chickens is discussed.

T. D. Bell.

5325

ISSAWI, H. F., KHISHIN, S. S. and HAFEZ, S. **Response of growth and dressing out percentage in imported breeds of cockerels to stilbestrol implantation in the subtropics.** *Poultry Sci.*, 1956, **35,** 85–92. [Dept. Animal Prod., Fac. Agric., Ein Shams Univ., Cairo.]

Blue Holland, Rhode Island Red, White Leghorn, Light Sussex and native cockerels were implanted with 15 mg. stilboestrol at 20 or 25 weeks of age. The birds were killed 13 weeks after implantation and dressing percentages were calculated.

Stilboestrol gave greater liveweight increases, compared with untreated birds, in Blue Hollands and Rhode Island Reds, and implantation at 20 weeks of age was more effective in this respect than it was at 25 weeks of age. In all breeds except the native the percentage yield of edible meat was increased by stilboestrol, which was more effective when implanted at the greater age.

T. D. Bell.

5326

KRATZER, F. H., DAVIS, P. N. and MARSHALL, B. J. **The protein and lysine requirements of turkeys at various ages.** *Poultry Sci.*, 1956, **35,** 197–202. [Dept. Poultry Husb., Univ. California, Davis.]

The crude protein and lysine requirements of turkeys were investigated in 12 experiments covering 4-week periods of growth from 4 to 24 weeks of age. Requirements of both decreased with age. At 4 weeks the necessary crude protein level was 23·5 per cent., and it fell regularly to 15 per cent. at 16 weeks, and more slowly to 13·5 per cent. at 20 weeks. The lysine requirements at the same ages were 0·92, 0·5 and 0·50 per cent. of the ration, or 3·90, 3·86 and 3·70 per cent. of the protein. Deficiency of lysine caused faulty feather pigmentation up to 12 weeks old, but not after that.—T. D. Bell.

5327

EDWARDS, H. M. (Jr.), NORRIS, L. C. and HEUSER, G. F. **Studies on the lysine requirement of chicks.** *Poultry Sci.*, 1956, **35,** 385–390. [Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

When a semi-synthetic diet was supplemented with lysine, to give lysine levels of from 0·7 to 1·2 per cent., maximum growth response from day-old to 4 weeks of age was obtained at the 0·9 per cent. level, but growth compared to that of controls getting a commercial starter was poor. In a ration in which protein was supplied by sesame meal the maximum response was with a lysine level of 1·1 per cent. The rations contained 20·5 per cent. crude protein. In 2 other trials maximum growth response to 6 weeks of age was obtained with a lysine level of 1·1 per cent., when growth was equal to that of controls getting a commercial starter mash. Maximum feed efficiency in all cases was obtained with 0·1 percentage unit more lysine than was maximum growth response. The reason for the requirements being higher than values suggested in the literature is discussed.—T. D. Bell.

5328

NEAL, W. M. **Cannibalism, pick-outs and methionine.** *Poultry Sci.*, 1956, **35,** 10–13.

Feather-picking and cannibalism (pick-outs) were reduced for several weeks in 2 flocks of growing Rhode Island Red chickens about 5 weeks old by giving a supplement of 1 oz. DL-methionine per cent. feed for 48 hr. In one flock the methionine supplement was continued, and pick-outs were almost completely eliminated. After 16 weeks of age feather-picking ceased in both flocks.

The flock not continued on methionine was given a ration of breeder mash 45 and oats 55 per cent., containing 0·20 per cent. methionine. The birds were in full production at 7 months of age, and there was no feather-picking from 16 weeks to 7 months. Picking started soon after 7 months. When 4 oz. methionine was given to 575 birds at each feeding picking stopped, and smaller amounts of methionine reduced the incidence. As soon as the supplement was withdrawn the picking began again.

The other flock did not receive any methionine supplement as mature birds. Picking in this flock was slight, which seemed to indicate that the birds had built up a reserve of the amino acid.

Production levels of over 80 per cent. were attained in both flocks although they were receiving only 0·20 per cent. total methionine, a level below that generally recommended.—T. D. Bell.

5329

EVANS, R. J., BANDEMER, S. L. and BAUER, D. H. **Methionine and cystine requirements of chicks determined by calculation.** *Poultry Sci.*, 1956, **35,** 174–178. [Dept. Agric. Chem., Michigan State Univ. Agric. Appl. Sci., East Lansing.]

Available methionine and cystine in common poultry feedingstuffs were estimated by digestion

in vitro with trypsin and erepsin followed by microbiological estimation with *Leuconostoc mesenteroides*. The values found were then used to calculate the available methionine and cystine of diets reported in the literature. It was found that the requirement of growing chickens for available methionine plus cystine was between 0·22 and 0·46 per cent. of the diet, with 0·15 to 0·42 per cent. as methionine, values which agree well with the results of workers using carcase analysis and amino acid balance methods. The availability of methionine and cystine should be kept in mind when evaluating rations or estimating the requirements of chickens.

T. D. Bell.

5330

FISHER, H., DOWLING, J. (Jr.) and MADDY, K. H. **Low protein diets for turkeys raised under practical conditions.** *Poultry Sci.*, 1956, **35**, 239–241. [Rutgers Univ., New Brunswick, N.J.]

Up to 6 weeks of age turkeys were given rations containing 20 or 28 per cent. protein, from 6 to 12 weeks they had 16 or 20 per cent. and from 12 to 26 weeks 16 per cent. On each protein level some birds were given supplements of a methionine hydroxy analogue (calcium DL-2-hydroxy-4-methylthiobutyrate) and lysine hydrochloride in varying proportions.

In the first period growth was stimulated by the amino acids with 20 per cent. protein, but not with 28 per cent., and the advantage was maintained to the end of the trial. The growth of these birds was comparable to that of the turkeys getting 28 per cent. protein in the first 6 weeks. Amino acid supplements to the low-protein ration in the second period also produced results comparable to those obtained with the high-protein ration, which were unaffected by the supplement. When improved growth had been obtained up to 6 weeks of age there was no further stimulation. For low-protein rations of the types tested the estimated supplements required for satisfactory growth were : methionine hydroxy analogue from 0·05 to 0·5 and L-lysine from 0·1 to 0·4 per cent. of the ration.

T. D. Bell.

5331

ZNANIECKA, G., WODZINOWSKI, J. and KORZENIEWSKA, H. Porównanie wydajności wzrostowej, rzeźnej i mięsnej kur 4 ras popieranych i ich krzyżówek. 2. Wydajność nieśna zielononóżek, sussexów i ich obukierunkowych mieszańców. [**Comparison of the growth, meat yield and egg production on four breeds of chickens and their crosses. 2. Egg production of Polish Greenleg hens, Sussex and their reciprocal crosses.**] *Rocz. Nauk rol.* [*B*], 1955, **70**, 49–67. [Inst. Zootech., ZZD Pawłowice.] Russian and English summaries.

When Polish Greenleg and Sussex breeds were crossed either way they took less time to mature than the pure breeds, but not always significantly less than Polish Greenlegs, which are an early maturing breed. Winter laying was increased, as was total egg production on a hen-day basis. The efficiency of feed utilisation for egg production was improved, and there was no effect on the size of the eggs, broodiness or mortality of the hens. The liveweight of the crosses was greater than that of the Polish Greenlegs, the lighter breed. For commercial purposes crossing of Polish Greenleg and Sussex breeds is recommended. (From English summary.)—T. D. Bell.

5332

SIZEMORE, J. R. and LILLIE, R. J. **Lack of effect of a synthetic poultry feed flavor on chick growth and feed efficiency.** *Poultry Sci.*, 1956, **35**, 360–361. [Poultry Sect., Animal Poultry Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

Growth rate and feed efficiency of chickens to 4 weeks were not improved by the addition to a practical starter of a synthetic feed flavouring containing extracts of anise, rose, cinnamon, lemon and orris. It is suggested that the flavouring might improve a less palatable ration.

J. S. Thomson.

5333

ORR, H. L., HUNT, E. C. and SNYDER, E. S. **A comparison of dressing percentages and yield of edible cooked meat in five strains of turkeys as broilers and as mature stock.** *Poultry Sci.*, 1956, **35**, 333–338. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

The yields of Broad Breasted Bronze, Empire White, Beltsville Small White and 2 strains of Medium White turkeys at broiler weight, from 13 to 17 weeks of age, and maturity, 23 to 24 weeks of age, were compared. The rearing and treatment of all the birds was the same. Liveweight, dressed weight, ready-to-cook weight excluding neck and giblets, yield of edible meat and bone were recorded for the comparisons, and sex differences were also noted.

Males were heavier than females in both age groups, and had a higher percentage of bone. Females had higher percentages of dressed weight, ready-to-cook weight and edible meat than males, but the actual yields were less.

Broad Breasted Bronze broilers and mature birds had higher dressed weights as percentage of liveweights than Small and Medium Whites, and, in the mature birds, also than Empire Whites. Empire and Medium White mature birds were better than Small White. Ready-to-cook weight of broilers as percentage of dressed weight was

better in Small White broilers than in Empire and Broad Breasted Bronze. Between strains there was no significant difference in yield of edible cooked meat or percentage of bone, except for Small White, which had less bone than other strains. In mature birds Broad Breasted Bronze gave more edible cooked meat as a percentage of liveweight, but there was no difference in percentage of bone between strains. A higher percentage of edible cooked meat also was found in the mature birds than in the broilers, and the percentage of bone was less.—T. D. Bell.

5334

FROMM, D. and MARGOLF, P. H. **The effect of diethylstilbestrol on dressing and cooking losses of New Hampshire broiler-fryers.** *Poultry Sci.*, 1956, **35**, 254–256. [Dept. Poultry Husb., Pennsylvania State Univ., University Park.]

Diethylstilboestrol, 12 mg., implanted subcutaneously in 10 cockerels 5 weeks before slaughter at 13 weeks of age gave carcases with significantly higher dressing percentages than those of similar untreated birds. Total cooking losses in the treated birds were greater than in the untreated because treated birds lost more juice than untreated birds, and when this was allowed for the difference in favour of the untreated birds was not significant.—T. D. Bell.

5335

LEWIS, R. W., SANFORD, P. E., ERICSON, A. T. and CLEGG, R. E. **Effect of diet on the ether-extract content of chicken muscles.** *Poultry Sci.*, 1956, **35**, 132–137. [Dept. Poultry Husb., Kansas Agric. Exp. Stat., Manhattan.]

From day-old to 10 weeks of age chickens were fed on a purified diet low in fat, and experimental groups had this diet modified by the inclusion of maize, oats, barley, wheat, soya bean oilmeal or groundnut meal, or faeces. At 10 weeks of age ether extract in light and dark meat was estimated and the covering of subcutaneous, abdominal and neck fat was examined. Another group of birds got a standard high-efficiency ration from day-old to 8 weeks of age.

The type of diet significantly affected the percentage of ether extract of both types of meat. The low-fat purified diet gave greater deposition of fat in the muscles than did the diets modified with natural ingredients to contain more fat. Only the purified diet plus 10 per cent. faeces gave muscle with higher ether extract content than the purified diet without modification. The lowest ether extract content of muscle was produced by the maize modification, and the highest, next to the unmodified diet, by barley. In general there was more external fat when there was less muscle fat, except with groundnut meal.—T. D. Bell.

5336

LEWIS, R. W., SANFORD, P. E., ERICSON, A. T., HARRISON, D. L. and CLEGG, R. E. **Flavor and aroma of birds fed purified and standard diets.** *Poultry Sci.*, 1956, **35**, 251–253. [Dept. Poultry Husb., Kansas State Coll., Manhattan.]

With rations previously described (preceding Abst.), the effect of purified and natural diets on the quality of poultry meat was investigated. The birds were reared to 8 or 10 weeks old.

The diets modified with natural ingredients consistently and significantly improved the flavour and aroma of light and dark meat, broth and juice. The methods of assessment are described and it is considered that the diets used would be of value in further studies on the effect of diet on flavour of poultry.—T. D. Bell.

5337

SCHOETTLE, C. E., REBER, E. F., ALBERTS, J. O. and SCOTT, H. M. **A study of New Hampshire × Barred Columbian chicks from two days of age to ten weeks of age. 1. Growth; organ weights; liver fat and protein; femur and tibia fat and ash of chicks fed a ration free of antibiotics and coccidiostats.** *Poultry Sci.*, 1956, **35**, 95–98. [Dept. Vet. Physiol., Univ. Illinois, Urbana.]

From 2 days to 10 weeks of age the chicks were given a ration without antibiotic or coccidiostat. Five chicks were taken at 2 days and 1 week old and weekly thereafter, and gall bladder and bile, spleen, liver, femur and tibia were weighed. Percentages of protein and fat in the liver and of fat and ash in the bones were estimated.

The growth curve was linear, and average liveweight at 10 weeks was 1432 g. Weight of gall bladder plus bile, as a percentage of bodyweight, was not changed by age, and after a sharp increase in the first 3 weeks the same was true of spleen weight. Liver weight relative to bodyweight decreased steadily throughout the 10 weeks. The percentage of fat in the liver fell; that of protein rose sharply in the first week and then remained fairly constant. The percentage of fat and ash in the bones was not affected by the age of the birds.

T. D. Bell.

5338

ERASMUS, J. **Relation of age to body weight in poultry.** *Farming in S. Africa*, 1956, **31**, 214–215; 217. [Agric. Res. Inst., Univ. Pretoria.]

See also Absts. 4332, 4333, 4369, 4371, 4461, 4531, 4699, 4765, 4862.

EGG PRODUCTION

5339

GOWE, R. S. **Environment and poultry breeding problems. 2. A comparison of the egg production of 7 S.C. White Leghorn strains housed**

in laying batteries and floor pens. *Poultry Sci.*, 1956, **35**, 430–435. [Canada Dept. Agric., Ottawa.]

Chickens of 7 strains of White Leghorns were hatched and reared together to 160 days of age. From 160 to 500 days some of each strain were kept in batteries and some in floor pens with about 4 sq. ft. floor space per bird. All received the same laying mash to appetite. Mortality of the laying birds was significantly higher in pens than in batteries, and there were significant differences between strains in each location. Egg production estimated on the basis of number of hens originally in the hen-house and on the number surviving differed significantly within locations between strains, and between locations, and the interaction between location and strain was significant. Body-weight showed significant interaction between strain and location, and significant differences between strains and between locations. Egg weight was significantly different between strains only, and age at sexual maturity between strains and between locations. The importance of these findings for the commercial poultryman when selecting stock and choosing a system is discussed.

T. D. Bell.

5340

HUTCHINSON, J. C. D. **Control of seasonal variation in the egg production of hens.** *Nature*, 1956, **177**, 795–796. [Poultry Res. Centre (Agric. Res. Counc.), West Mains Rd., Edinburgh.]

Two groups of 21 Brown Leghorn pullets were given different lengths of artificial day. The control group had a constant day-length of 12 hr. throughout the experimental period of 42 weeks, and the experimental group had a day-length of 23½ hr. for the first 18 weeks, when they had been in lay for about 2 months, and then the period of light was gradually reduced during 8 weeks to 12 hr., where it was maintained. In the experimental group egg production was reduced and moulting increased by the reduction of day-length, compared with the controls, and recovery took about 2 months. In this trial environmental temperature was maintained at 64° F. Further investigations showed that reduction of temperature, to a minimum of 36° F., to simulate autumn and winter temperatures, in conjunction with shortening the day-length did not have any greater effect than the change in day-length alone. The same alterations of day-length with the experimental group in their second laying year completely stopped egg production.—T. D. Bell.

5341

DUBISKI, J. and CZYŻ, A. **Wpływ warunków oświetlenia na aktywność pokarmową kur. [The influence of light on the feeding activity of hens.]** *Rocz. Nauk rol.* [*B*], 1955, **70**, 31–47. Russian and English summaries.

Studies of 2 hens showed that, in winter, feeding began immediately it became light, and ceased some time before sunset. When artificial light was given, feeding began as soon as the light was put on. Extending the period of light in the afternoon had no effect, except to delay roosting.

With 2 groups of hens kept under the conditions of small farms, introduction of artificial light increased feed consumption by 4·3 to 18·6 per cent., depending on the way in which the light was prolonged. The most economical system was to give an extra 1½ hr. light at the end of the day. (From English summary.)—T. D. Bell.

5342

HILL, F. W., ANDERSON, D. L. and DANSKY, L. M. **Studies of the energy requirements of chickens. 3. The effect of dietary energy level on the rate and gross efficiency of egg production.**

HILL, F. W. **4. Evidence for a linear relationship between dietary productive energy level and the efficiency of egg production.** *Poultry Sci.*, 1956, **35**, 54–59; 59–63. [Cornell Univ. Agric. Exp. Stat., Ithaca, N.Y.]

For previous parts see Absts. 5507, Vol. 24; 719, Vol. 25.

3. In the first experiment groups of 129 pullets in their first laying season were fed on rations supplying 740, 840 or 930 Cal. per lb., with 17·5 per cent. protein, for 11 months from October to August. During autumn, spring and summer egg production was not affected by the energy level of the ration. During the winter the rate of production was highest on the high- and lowest on the low-energy ration. Over the whole period the production levels for low-, medium- and high-energy levels were, respectively, 64·9, 66·9 and 68·1 per cent. The daily feed per 100 birds was 31·0, 28·9 and 26·1 lb. and the feed required per dozen eggs was 5·74, 5·19 and 4·60 lb. Weight changes of the pullets showed similar patterns, but total gains were 398, 458 and 516 g.

In the second experiment the energy levels compared were 945, 985 and 1025 Cal. per lb., with 16·5 per cent. protein, using groups of birds similar to those in the first experiment over a similar period. The extra energy of the 2 highest rations was supplied by adding 2½ or 5 per cent. industrial tallow. Again no difference was found in autumn, spring or summer in egg production. In winter production was higher as energy level rose. Over the whole period egg production in the groups getting 945, 985 and 1025 Cal. per lb. feed was, respectively, 66·5, 69·5 and 70·9 per cent.; feed per 100 birds daily was 25·6, 25·2 and 24·6 lb., and feed per dozen eggs was 4·62,

4·35 and 4·16 lb. Gains in liveweight were 113, 173 and 171 g.

4. From the results of the experiments reported above the relative efficiencies of the rations were calculated using the observed feed consumption and the feed consumption predicted by the partition equation of Byerly (*Maryland Agric. Exp. Stat. Bull.* A1, 1941) which takes into account bodyweight, weight changes and level of production. The relative efficiency was calculated as

$$\frac{100 \times \text{Predicted feed consumption}}{\text{Observed feed consumption}}.$$

The relative feed consumptions on rations supplying 740, 840, 930, 945, 985 and 1025 Cal. per lb. were 82·7, 90·5, 101·0, 101·7, 105·5 and 110·0. These values showed a linear relationship. The equation for the 4 lowest energy levels was $E = 11{\cdot}3 + 0{\cdot}96\,x$, where E = relative efficiency and x = productive energy of the rations in Cal. per lb. The importance of considering production level when evaluating the energy content of feeds in relation to efficiency is discussed.—T. D. Bell.

5343

Graton, A. and Poirier, R. Essai de trois formules alimentaires pour la ponte. [**Trial with three feed formulae for egg production.**] *Rev. d'Oka*, 1956, **30**, 1–4. [Inst. Agric. d'Oka, Canada.]

Three groups of 120 pullets each were used to compare different systems of feeding for egg production. The laying period of 310 days began when the birds were 6 months old. Group 1 was given grain and mash, 20 per cent. protein in the latter, in equal quantities, so that the total feed had 16 per cent. protein. Group 2 got an all-mash, high-energy ration with 20 per cent. protein and group 3 an all-mash, high-energy ration with 17 per cent. protein.

Heavier but fewer eggs were laid by group 2, and their efficiency of feed utilisation for egg production was inferior, 7·66 lb. feed per dozen eggs compared with 6·37 and 6·38 lb. in groups 1 and 3, respectively. Group 3 produced more eggs than group 1 and the size of the eggs was greater, little less than that in group 2. The importance of the grading of the eggs and the economics of the system are discussed.—T. D. Bell.

5344

Coles, R. **Observations on the occasional depressing influence of fishmeal on the hatchability of hens' eggs.** *J. Agric. Sci.*, 1956, **47**, 354–362. [Minist. Agric. Fish. Food.]

Four groups of pullets were given rations with the same crude protein level, well fortified with vitamins A and D_3. Group 1 got vegetable protein and synthetic vitamin B_{12}, group 2 vegetable protein and condensed fish solubles, group 3 white fishmeal 10 per cent. and group 4 white fishmeal 5 per cent. The vitamin B_{12} content of rations 1 to 3 was estimated to be 0·015 μg. per g., and of ration 4, 0·003 μg. per g. Percentage hatching was lower than expected and lower than usual in the flock. For groups 1 to 4, respectively, the hatchabilities were 74·2, 69·4, 54·7 and 56·8 per cent. Most of the embryonic mortality was about the 19th day of incubation. There was no heavy mortality in the early days of incubation, as is usual, and the peak in this case was not thought to be due to deficiency of vitamin A or E. It had been thought vitamin E might be deficient because of destruction in the fishmeal rations, but evidence for this was not found. The depression in groups 3 and 4 may have been due to a toxic substance in the fishmeal, which may occur only in certain batches or from certain sources, and may be the cause of occasional reductions in hatchability in flocks which normally have high records. Mortality to 12 weeks of age of the chicks hatched was less in the groups with high hatchability rates. This is discussed in relation to the effect of the fishmeal on hatchability.

T. D. Bell.

5345

Moreng, R. E. and Bryant, R. L. **Reproduction in turkeys as influenced by 4-nitro-phenylarsonic acid.** *Poultry Sci.*, 1956, **35**, 406–409. [Poultry Dept., N. Dakota Agric. Exp. Stat., Fargo.]

Addition of 4-nitrophenylarsonic acid to the drinking water of breeding turkeys decreased egg production but had no effect on hatchability and fertility of eggs or on mortality of the poults. The weight of the poults at hatching time was depressed but at 8 weeks of age there was no difference in weight.—J. S. Thomson.

5346

Adams, J. L. **A comparison of different methods of progesterone administration to the fowl in affecting egg production and molt.** *Poultry Sci.*, 1956, **35**, 323–326. [Poultry Dept., Univ. Wisconsin, Madison.]

There were 6 groups of 10 year-old hens as follows: group 1, untreated control; group 2, 110 mg. progesterone per kg. feed; group 3, 220 mg. progesterone per kg. feed; group 4, a single intramuscular injection of 50 mg. progesterone; group 5, a 33·4 mg. pellet of progesterone implanted in the neck; group 6, weekly intramuscular injections of 25 mg. progesterone.

Progesterone, however given, depressed egg production compared with controls, during the 12 weeks when observations were made, but bodyweights were not affected. In all groups except 4 and 5 rate of wing moult was increased, and in

this respect group 6 suffered most. Progesterone by mouth, in groups 2 and 3, was slower to take effect than by injection. Implanted progesterone also was slower to act than injected, but the effect lasted longer.—T. D. Bell.

5347

HEYWANG, B. W. **The effect of supplemental methionine in a corn-soybean diet for laying chickens.** *Poultry Sci.*, 1956, **35,** 462–468. [U.S. Dept. Agric., Agric. Res. Serv., Animal Poultry Husb. Res. Branch, Glendale, Ariz.]

In the first experiment pullets were given a basal ration of ground yellow maize and soya bean meal containing about 0·28 per cent. methionine and 0·56 per cent. cystine to which was added for other groups 0·05 or 0·085 per cent. DL-methionine or 5 μg. vitamin B_{12} per lb. feed, or combinations of these. In the second experiment 2 basal rations were used similar to the above but containing slightly less soya bean meal; one contained 2·5 per cent. fishmeal. Both rations had 5 μg. vitamin B_{12} per lb. added.

In neither experiment, over 252 and 215 days, did the additional methionine have a significant effect on weight gain, egg production, feed consumption per dozen eggs, egg weight or shell thickness. In the first experiment the hatch of eggs was increased by the addition of vitamin B_{12} but there was no additional effect when methionine was given along with vitamin B_{12}.—J. S. Thomson.

5348

HEUSER, G. F. **Feeding chemically treated seed grains to hens.** *Poultry Sci.*, 1956, **35,** 160–162. [Dept. Poultry Husb., Cornell Univ. Agric. Exp. Stat., Ithaca, N.Y.]

In the first trial, groups of 12 to 17 hens were given an all-mash ration containing 33⅓ per cent. treated sweet corn and 33⅓ per cent. untreated maize, and a control group got 66⅔ per cent. untreated maize. The fungicides used were: group 1, Ceresan M (7·7 per cent. ethyl-mercury-*p*-toluene-sulphonanilide, Hg 3·2 per cent.) freshly applied; group 2, Semesan Jr. (12 per cent. hydroxymercuricresol) applied 3 years previously; group 3 Arasan (50 per cent. tetramethylthiuram disulphide) applied 3 years previously; group 4 none; group 5, none.

There was no significant difference between groups 1, 2, 4 and 5 in bodyweight, mortality or egg production. In group 3 egg production declined, within 2 or 3 days, to 10 per cent. from its original level of 60 to 70 per cent. Removal of the treated grain from the ration caused an equally rapid rise in egg production to the previous level.

In the second trial group 1 got wheat treated 2 years previously with Improved Ceresan (5 per cent. ethyl-mercury phosphate, Hg 3·8 per cent.) as the grain portion of a grain and mash ration, about half of the feed intake being grain, and group 2 got untreated wheat. Egg production declined to about 25 per cent. on treated wheat, but more slowly than in group 3 in the previous trial.—T. D. Bell.

5349

SWANSON, M. H., WAIBEL, P. E., HELBACKA, N. V. and JOHNSON, E. L. **Shell egg quality as affected by Arasan in the diet.** *Poultry Sci.*, 1956, **35,** 92–95. [Dept. Poultry Husb., Univ. Minnesota, St. Paul.]

Arasan-SFX, a fungicide used in seed treatment and containing tetramethylthiuram disulphide, was added for 16 days to the ration of laying hens at levels rising from 10 to 200 p.p.m. Levels up to 50 p.p.m. reduced shell thickness and the quality of the albumin. At the highest level no hard-shelled egg was produced after 36 hours' treatment. Seven days after treatment ceased egg quality returned to normal.—J. S. Thomson.

5350

HILL, J. F. and NORDSKOG, A. W. **Efficiency of performance testing in poultry.** *Poultry Sci.*, 1956, **35,** 256–265. [Dept. Poultry Husb., Iowa State Coll., Ames.]

This is a study of differences in egg production and in mortality between different varieties of chickens, to see how such differences may vary between testing locations or from one year to another at the same place. Two sets of data were analysed, each consisting of hen-day egg production and mortality of all birds in each hen-house for groups of hens over a period of 348 days from 22 weeks of age. The first set of data covered groups of 55 different inbred-hybrid varieties each tested at 13 different locations in the same year, and demonstrated significant differences in performance both between locations and between varieties. The second set of data was from tests of 10 varieties at 4 locations in 3 consecutive years. A complication existed in that the 10 varieties were selected from a larger number of varieties on the basis of the performances in the first and second years, but it is argued that this probably had little effect on the conclusions. Estimates of variance components were obtained from the analyses and it was found for both measures that there was a larger interaction between varieties and years than between varieties and locations. It is concluded that more efficient variety comparisons are obtainable by replicating over years than over locations. Tests at one location over 3 years are likely to give results of the same accuracy as tests at 2 locations for 2 years or at 13 locations for a single year.—I. McDonald.

See also Absts. 5308, 5331.

OTHER BIRDS

5351

SUNDE, M. L. and BIRD, H. R. **A critical need of phosphorus for the young pheasant.** *Poultry Sci.*, 1956, **35,** 424–430. [Dept. Poultry Husb., Univ. Wisconsin, Madison.]

Day-old Chinese Ring-neck pheasants were reared to 4 weeks of age on a basal diet containing 0·66 per cent. P, much of it as phytin P; other groups were given additions of 0·1, 0·2, 0·3, 0·4, 0·5 and 0·8 per cent. inorganic P. Growth on the basal diet was poor and weight differences were evident after only 1 week; mortality was high and leg weakness appeared in one week. Bone ash was only about 38 per cent. Growth and bone calcification were normal when 0·3 per cent. P was added to the ration. Larger amounts had no further appreciable effect on growth. On the assumption that 70 per cent. of the P in the basal ration was phytin P it is concluded that optimum performance was obtained when the level of inorganic P was 0·5 per cent. The early effect of P deficiency on growth and the early appearance of leg deformity should make the pheasant a good test animal in a study of the metabolism and availability of P.—J. S. Thomson.

5352

LAESSLE, A. M. and FRYE, O. E. (Jr.) **A food study of the Florida bobwhite *Colinus virginianus floridanus* (Coues).** *J. Wildlife Management*, 1956, **20,** 125–131. [Dept. Biol., Univ. Florida, Gainesville.]

The feeds most eaten by the bobwhite quail were sloughgrass (*Scleria muhlenbergii*) and wax-myrtle (*Myrica* spp.); preference was shown for the former. The sloughgrass nearly provided the "ideal" requirements of the birds for protein, Ca and P. In late autumn and winter, when wax-myrtle predominated in the diet, many birds were listless and unable to fly any considerable distance. A list of other feeds found in the crops of 375 birds, on which the study was based, is given.—T. D. Bell.

5353

ROSENE, W. (Jr.) **An appraisal of bicolor lespedeza in quail management.** *J. Wildlife Management*, 1956, **20,** 104–110. [U.S. Fish and Wildlife Serv., Gadsden, Ala.]

Trials in which bicolour lespedeza was planted in some areas and similar areas were left unplanted showed that the value of the legume was only as a feed for quail; it was of no use to supply nesting cover. Where other natural foods were scarce the population of quail rose on the planted areas, but not so when feed was adequate elsewhere. Some of the strips of lespedeza remained unused when unplanted areas provided ample feed. Only high quality plantings of lespedeza were of any value. In the main the planting o lespedeza did not increase quail population, though from the hunter's point of view it had the advantage of attracting birds during the winter, providing more concentrated sport. Crop analysis showed that bicolour lespedeza was a preferred feed of quail.—T. D. Bell.

5354

MRAZ, F. R., BOUCHER, R. V. and CALLENBACH, E. W. **The response of bobwhite quail to antibiotics.** *Poultry Sci.*, 1956, **35,** 76–80. [Pennsylvania Agric. Exp. Stat., University Park.]

Supplements to provide 10 g. per ton of feed of aureomycin, bacitracin, procaine penicillin, terramycin or streptomycin were given to groups of 60 quail chicks for 5 or 16 weeks. Growth at 3 weeks of age was stimulated significantly by the first 4 but not the last of the antibiotics. Thereafter the advantage in weight was lost, so that by 16 weeks of age birds not getting antibiotics were as heavy as any of the supplemented birds.

In a second experiment penicillin, bacitracin or terramycin was given at levels of 5, 10 or 20 g. per ton of feed to groups of 60 quail chicks for 6 weeks. Penicillin and bacitracin gave significantly better growth response at 3 weeks than terramycin, which was, in turn, significantly better than no antibiotic supplement. The advantages in weight were still present in this experiment at 6 weeks of age. There was no difference between the different levels of penicillin. With bacitracin the 2 higher levels were significantly superior to the lower, at both 3 and 6 weeks. With terramycin the highest level was significantly better than the medium, and the medium than the lowest at 3 weeks, but at 6 weeks the 2 lower levels were not different, but were significantly worse than the high level. In neither experiment did the antibiotics influence mortality, cannibalism or feather-picking.—T. D. Bell.

5355

SCHEMNITZ, S. D. **Wild turkey food habits in Florida.** *J. Wildlife Management*, 1956, **20,** 132–137. [Sch. Forestry, Univ. Florida.]

Analyses of the contents of 32 crops taken from wild turkeys in winter showed that 114 items of food altogether were eaten, but of these only 14

were present as more than 0·5 per cent. by weight of the total. The most important feed was live oak acorns, and other types of acorn in small quantities, followed by paspalum and panicum grass seeds. In each bird from 3 to 24 different types of feed were found, with an average of 8. Animal feeds, mainly grasshoppers and dragon-flies, represented 3 per cent. of intake.

In droppings taken throughout the whole year grass seeds and leaves were most abundant. Food in winter was mainly acorns, grass seeds and a few fruits ; in summer grass leaves and seeds preponderated. Animal feeds, grasshoppers and dragon-flies, were 3·6 per cent. of feed found. Maize was generally available in feeders. It was not eaten to any great extent, especially in autumn when abundant acorns were available, or in spring and summer when there was plenty of grass and grass seeds.—T. D. Bell.

5356

POKROVSKAYA, I. V. Materialy po pitaniyu gnezdovykh ptentzov lesnykh ptitz leningradskoi oblasti. [**Data on the feeding habits of nestlings of forest birds in the Leningrad region.**] *Zool. Zh.*, 1956, **35,** No. 1, 96–110. [Dept. Zool., Leningrad A.I. Gertzen Pedagogical Inst.]

Observations made on the following birds are given in detail : starling, jay, redwing, fieldfare, magpie, blackcap, lesser whitethroat, siskin, linnet.

The type of food in many cases depended on the weather, nesting time and site. The freshwater fauna of reservoirs was largely used by birds for feeding the nestlings. For several types of nestlings and adult birds, the change-over to feeding on insects which appear at a given time and in large numbers was characteristic. The birds were useful to destroy insect pests of trees and market garden crops.—H. Scherbatoff.

FOOD ECONOMICS AND STATISTICS

5357

SURE, B. **The critical world food situation.** *Amer. J. Clin. Nutrition*, 1956, **4,** 211–223. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

A review of the methods whereby the world's total production of food might be increased.

5358

BLACK, J. D. **Agriculture in the nation's economy.** *Amer. Econ. Rev.*, 1956, **46,** 1–43.

5359

BONADONNA, T. Significato sociale ed economico della produzione zootecnica. [**Social and economic importance of animal production.**] *Zootec. Vet.*, 1956, **11,** 92–102. [Univ. Camerino.]

The world food situation is reviewed. With the technical advances already made and still possible, the existing shortages in some areas are regarded as a social, political and moral problem of distribution and organisation and co-operation between nations.

The paradoxical existence of regions of plenty and regions of want is a fact. In Italy, since such a world situation exists, the problem of over-production and excess of imports of food over exports should be met by organisation and regulation of animal, and all agricultural, production, improvement of quality, reduction of production costs by application of up-to-date technique, and education of the people to demand a better standard of feeding. The average consumption per head of protein, particularly animal protein, is lower than is desirable, and this could be rectified by planning and distribution combined with a programme of education on nutrition.

T. D. Bell.

5360

HAUKALI, R. Konstruksjon og bruk av nomogrammer ved produksjonsøkonomiske analyser og kalkulasjoner. [**Construction and use of nomograms in analyses and calculations of the economics of production.**] *Meld. Norges Landbrukshøgsk.*, 1955–56, **35,** 1–21. [Norges Landbrukshøgsk.] English summary.

5361

MANNING, E. S. **Live stock management and the consumer.** *Agric. Inst. Rev., Canada*, 1956, **2,** 48–50 ; 58. [Meat Packers Counc. Canada, Toronto, Ont.]

5362

WILLIAMS, H. T. **Silage in the economy of the farm.** *Agriculture, J. Minist. Agric. Engl.*, 1956, **63,** 1–5. [Seale-Hayne Agric. Coll., Newton Abbot.]

Calculations are presented which suggest that, of the common homegrown feeds, kale cut for feeding gives the highest profit per acre for milk production. Grazed grass comes second and grass silage third. In terms of profit per hour of labour required in crop production, grazing is the most profitable, followed by grass silage and kale. It is concluded that where land is the limiting factor, grazing and kale should be increased at the

expense of silage. Where land is relatively more plentiful than labour the emphasis should be on grazing, silage and kale in that order. Silage, however, is important in any grassland system as a means of conserving surpluses. It is unwise to grow large areas of roots (including kale) if their high labour requirements prevent conservation of grass and cause waste.—J. L. Corbett.

5363

MACKNESS, R. A. **Seasonality of beef and veal supplies in the United Kingdom.** *Empire J. Exp. Agric.*, 1956, **24,** 20–25. [Sch. Agric., Univ. Cambridge.]

In this introduction to a series of papers in which the problems posed by seasonal production will be examined it is shown that between 1940 and 1953 supplies of home-produced beef and veal had become increasingly seasonal, being highest in October and lowest in June. Despite the higher prices prevailing in June, producers were prepared to accept the lower prices prevailing in October because of the firmly established belief that cattle finished on grass were less costly to produce. Supplies of imported meat also show a seasonal pattern, maximum quantities arriving in October, the month of highest home production. It is suggested that the adoption of improved methods of feeding cattle in winter would enable producers to level out supplies.—J. N. Aitken.

5364

Nahrungsmittelausfall durch Tiererkrankung. [**Loss of food through animal diseases.**] *Lebensmittel u. Ernährung*, 1956, **9,** No. 4, 12–13.

The loss from carcases partly or wholly condemned on account of tuberculosis in 1952 was estimated at nearly 12 million Schilling and there were also estimated losses of production from diseased animals not coming to slaughter, of milk 46,000 metric tons and meat 3900 metric tons, value 73 and 58 million Schilling, respectively. For liver fluke in cattle the corresponding estimates were 5 million Schilling, milk 22,000 metric tons and meat 3200 metric tons, value 35 and 48 million Schilling. Mastitis is believed to cause a loss of 23,000 metric tons of milk, value 36 million Schilling. Allowing for other losses from contagious abortion, warble fly and intestinal worms, the total annual loss to Austrian agriculture from chronic disorders is estimated at 300 million Schilling.—W. M. Deans.

5365

JEBE, E. H. and CLIFTON, E. S. **Estimating yields and grades of slaughter steers and heifers.** *J. Farm Econ.*, 1956, **38,** 584–596. [Iowa State Coll., Ames.]

It is important that the prices paid to producers of livestock should be a fair reflection of the values placed by the consumer on the meat, or meat products, which are obtained after slaughter and processing. Accuracy of pricing will encourage farmers to produce the proportion of the different weights and grades of animals that will meet to the fullest extent the consumer's demand. To show how accuracy might be improved an example is taken of the yields and grades estimated by one buyer for 219 steers and 74 heifers, analysed in relation to the actual yield and Federal carcase grade of each animal. The carcase gradings are put on a numerical basis by estimating to the nearest third of a grade and coding, so that the top third of the Prime grade scores 15 and the lower third of the Utility grade scores 1.

Linear regression analyses of actual yields and grades on estimated yields and grades lead to a number of conclusions regarding the errors of the particular buyer studied. Thus it is concluded that he tended to underestimate the yields of low-yielding steers and to overestimate those of high-yielding steers ; these errors tended to cancel each other and leave the average estimated yield close to the average actual yield. Conclusions of the same type are set out for heifers and for grade estimates. It is suggested that the regression equations obtained could be used for the adjustment of estimates, with a resulting reduction in the errors for individual animals.

A further analysis of the differences between actual and estimated yields and grades showed that there is a positive correlation between these for the buyer in question. Given a value equation, relating the value of the animal to its weight, yield and grade, the results of this analysis could be used to give the resulting errors in price paid to the producer. In a constructed example the standard deviation of these errors was found to be $15. In conclusion a number of suggestions are made for improving the pricing accuracy of livestock.

[Scatter diagram and conclusions drawn from regression analysis do not agree.]—I. McDonald.

5366

BLAGBURN, C. H. **Costs and profits in milk production.** *Agric. Rev.*, 1956, **1,** 29–34. [Univ. Reading.]

The factors influencing profits per gal. per cow and per acre are discussed with particular reference to a farm management survey made by the University of Reading. Farm-produced feeds, especially grass, are valuable for reducing costs per gal., giving economic increases in milk yields and increasing stock density. More efficient use of labour will reduce costs per gal. and permit increases in herd size.—J. L. Corbett.

5367
PACI, C. La crisi del latte sotto il profilo produttivistico. [**The milk crisis from the producer's viewpoint.**] *Riv. Zootec.*, 1956, **29,** 101–105.

The outward sign of the milk crisis in Italy is over-production relative to demand, and resulting low prices: fundamentally the trouble is that though production has increased since the war, the increase is mainly due to increased numbers of cattle, to a large extent imported. Milk yield per head is very low, about 400 gal. per cow per year, and compares unfavourably with that in other European countries. The cost of milk production per gal. is high, and only by improving yields can this unfavourable balance between price and cost be redressed.

Very few farms, only 2 per cent., record their milk yields. The introduction of this practice alone, with the consequent elimination from the herds of poor-yielding cows, better selection of replacements and reduction of waste of concentrates, would do a great deal towards overcoming the economic crisis as it stands. Further attention to animal health, the elimination of tuberculosis, estimated to be present in 55 per cent. of the cattle and causing from 10 to 25 per cent. reduction of production, and improvement of fertility by paying attention to nutritional deficiencies, are also necessary for the complete solution of the problem.—T. D. Bell.

5368
LOWE, Y. **The effect of fixed and variable costs on keeping high producing milk cows in Israel.** *J. Farm Econ.*, 1956, **38,** 93–101. [Minist. Agric., Israel.]

5369
GÉNIN, G. Le lait et l'industrie laitière dans le monde. [**Milk and the world milk industry.**] *Lait*, 1956, **36,** 160–171.

A review.

5370
MOLNAR, I. **Wheat and sheep production in the wheat belt.** *J. Austral. Inst. Agric. Sci.*, 1956, **22,** 51–56. [Soil Conservation Authority, Victoria.]

From surveys of farms in 3 areas of Victoria the relative returns from wheat and sheep, including lambs and wool, were assessed and compared. Recommendations are made for the areas in which wheat growing should first be restricted or prohibited should the necessity arise.—T. D. Bell.

5371
MAUNDER, A. H. **Economy in pig feeding.** *Farm Econ.*, 1955, **8,** 12–17. [Agric. Econ. Res. Inst., Univ. Oxford.]

The system of marginal analysis was applied to a number of pig feeding experiments taken from the literature. It was shown how marginal analysis could be applied in practice to ascertain the relation between profit, the number of pigs to be fattened and the weight to which they should be taken, when the price of feeds and market price of the pigs sold were considered. In short-term programmes overheads and labour were taken as constants and price of purchasing weaners was considered.—T. D. Bell.

5372
BOYSEN, H. Kan vi bli selvberget med brødkorn. [**Can we become independent in respect of bread cereals?**] *Tidsskr. norske Landbruk*, 1956, **63,** 79–88.

The accurate measurement of potentially arable land has many difficulties and it is costly to put new land under the plough. The planning of production for self-sufficiency in war time must imply certain surpluses in peace. Estimates are presented of how Norwegian agricultural land might be used to produce the bread cereals required.

I. Leitch.

DIET IN ETIOLOGY OF DISEASE

GENERAL

5373
BODA, J. M., CUPPS, P. T., COLVIN, H. (Jr.) and COLE, H. H. **The sequence of events preceding death of a cow in acute experimental bloat on fresh alfalfa tops.** *J. Amer. Vet. Med. Assoc.*, 1956, **128,** 532–535. [Dept. Animal Husb., Coll. Agric., Univ. California, Davis.]

Bloat occurred 40 min. after the cow started to graze lucerne at the flowering stage. Pressure in the rumen increased to 49 mm. Hg before rumen movement ceased. The highest pressure recorded was 74 mm. Hg 2 hr. after feeding started. Final collapse occurred when the pressure was 55 to 60 mm. Hg.

The cow ultimately became cyanotic and the rumen was tapped when breathing ceased but the pulse was still present, releasing free gas. Further opening of the rumen released a fountain of foaming digesta.—A. T. Phillipson.

5374
BARRENTINE, B. F., SHAWVER, C. B. and WILLIAMS, L. W. **Antibiotics for the prevention of bloat**

in cattle grazing ladino clover. *J. Animal Sci.*, 1956, **15,** 440–446. [Dept. Animal Husb., Mississippi Agric. Exp. Stat., State College.]

Steers were selected on the basis of their susceptibility to bloat and allowed to graze a pure stand of ladino clover. The oral administration of chlortetracycline, oxytetracycline, bacitracin, and streptomycin gave no protection against bloat. A single dose of 25 mg. procaine penicillin prevented bloat in yearling steers for up to 3 days. Older steers required 50 to 75 mg. Pure potassium penicillin in equivalent amounts was equally effective. Protection against bloat was not immediate but was effective several hours after the penicillin had been administered.—J. N. Aitken.

5375

FORD, C. M. **Nutritional factors and bovine infertility in the East Midlands.** *Brit. Vet. J.*, 1956, **112,** 177–188. [Vet. Invest. Lab., Sutton Bonington, Loughborough.]

An investigation of 150 herds with low fertility is reported. Of the herds, 35 per cent. showed signs of genital infection, and in 21 per cent. both genital infection and ovarian dysfunction were present. Where there was no infection ovarian dysfunction was generally considered to be of nutritional origin, and in a few of the herds there was obvious undernutrition. In most of the remainder imbalance or deficiency of Ca and P was found in the rations, and response could be obtained by correcting the mineral contents of the rations. The importance of trace elements, and the need to consider the mineral composition of common feedingstuffs such as kale, mangolds and hay, are discussed.—T. D. Bell.

5376

SCHÖNHERR, S. Die Unfruchtbarkeit der Ziegenböcke, ihre Verbreitung, frühzeitige Erkennung und Bekämpfung. [**Infertility of male goats, its extent, early recognition and control.**] *Ztschr. Tierzücht. Züchtungsbiol.*, 1956, **66,** 209–234; 381–416. [Tierklin., Freie Univ., Berlin.]

Infertility in male goats is a serious problem in Central Germany. Between 1950 and 1953, 1545 bucks were examined clinically, of which 280 were infertile and 281 had reduced fertility. A clinical description is presented. The infertility could not be related to feeding practices and most of the animals seemed to be in a good state of nutrition and general health. The cause of the trouble is not understood and requires more study.

D. Duncan.

5377

BAUER, H. Die Wehenschwäche der Mutterschweine infolge Mangelfütterung wie Konstitutionsschwäche, und ihre Beziehungen zu Totgeburten und Aufzuchtsverlusten der Ferkel. [**Failure of uterine contractions of sows as the result of defective diet and constitutional weakness, and its relation to stillbirths and losses in rearing young pigs.**] *Züchtungskunde*, 1956, **28,** 189–204. [Tierhyg. Inst., Univ. Freiburg i. Br.]

In sows labour lasting more than 10 hr. is considered abnormal. Failure of uterine contractions is a more common cause of delay than obstruction. Götze (*Berl. tierärztl. Wochenschr.*, 1934, p. 849) considered that unbalanced diets low in protein were especially liable to produce K deficiency and failure of uterine contractions. Old sows are particularly prone, and tetany, eclampsia and deficiency diseases like rickets are predisposing conditions, but there is some ground also for suspecting a constitutional predisposition to lack of uterine tone. The relative importance of nutrition and hormone production is not understood. Longer pregnancy is correlated with longer labour, and the number of dead and weak piglets increases with length of labour.

A questionnaire was answered by 65 veterinary surgeons in different areas, about the relation between nutritional defects and failure of uterine contractions. All sorts of deficiencies were blamed, both excess and lack of protein, excess carbohydrate, mineral deficiencies and lack of vitamin A.

D. Duncan.

5378

GARTON, G. A., DUNCAN, W. R. H., BLAXTER, K. L., MCGILL, R. F., SHARMAN, G. A. M. and HUTCHESON, M. K. **Muscular dystrophy of beef cattle and unsaturated fats.** *Nature*, 1956, **177,** 792–793. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The suggestion that the nature of the dietary fat, in addition to low tocopherol intake, might help to account for the occurrence of muscular dystrophy in sucking beef calves in the north of Scotland was not supported by fatty acid analyses of milk and blood serum of cows or calves. On the contrary, rations of straw and turnips, known to be deficient in tocopherol, produced milk fat which was less unsaturated than that produced by silage rations, which do not normally cause dystrophy in the offspring. A similar trend was observed for the unsaturated fatty acid content of the blood serum of the calves.

It is concluded that the tocopherol content of the milk fat [given in table 1 as mg. per g. instead of μg. per g.] is more important than the presence of unsaturated fats in accounting for the occurrence of dystrophy.—T. R. Preston.

5379

CLARKE, E. A. and FILMER, D. B. **Hogget rearing.** *N.Z. J. Agric.*, 1956, **92,** 115–120. [Dept. Agric. Ruakura Animal Res. Stat.]

An investigation into a wasting disease of hoggets which occurs only in the autumn is described. Loss of weight occurs also in older ewes. Trials showed that parasitism was not the cause of the unthriftiness, but did become a secondary problem which could be controlled by phenothiazine. The first sign of unthriftiness coincided with the fresh growth of pasture after the first rains of autumn and the incidence could be reduced by running the sheep on mature pasture and mature pure white clover.—J. C. Gill.

5380

CARNAGHAN, R. B. A. and MARKSON, L. M. **Studies on encephalomalacia in poultry. 1. The incidence in England and Wales.** *Brit. Vet. J.*, 1956, **112,** 140–144. [Minist. Agric., Fish. Food, Vet. Lab., New Haw, Weybridge. Surrey.]

The incidence of encephalomalacia in chickens submitted to the laboratory for examination in 1953 to 1955 was 1·5 and 1·6 per cent. in the two 12-month periods. The disease always occurred between 3 and 9 weeks of age. There was no seasonal trend, and the outbreaks of the disease could not be related to feeds or feeding practice. The incidence was higher in cockerels than pullets, in the ratio 7 : 2, and highest in the heavy breeds. No relation was found between encephalomalacia and other infections.—T. D. Bell.

See also Absts. 5275, 5402.

DEFICIENCY DISEASES

5381

RYŚ, R., GROBLEWSKA, S. and STYCZYŃSKI, H. Wstępne badania niedoboru miedzi na niektórych terenach Polski. [**Preliminary investigations on copper deficiencies occurring in certain areas in Poland.**] *Rocz. Nauk rol.* [*B*], 1955, **69,** 365–379. [Inst. Zootech., Cracow.] Russian and English summaries.

Deficiency of Cu is reported from the districts of Ostrotęka, Kolno and Pisz in Poland, predominantly on wet peat soils. Samples of pasture contained from 4·65 to 9·2 mg. Cu per kg. dry matter. Cattle were in poor condition, emaciated and often with rough coats and poor appetites. Serum Cu was from 0·37 to 1·26 mg. per litre and Hb from 6·9 to 11·5 g. per cent. The white blood picture showed high eosinophil counts. Some cows given Cu improved in general condition and in milk yield. There is need for further investigation.—D. Duncan.

5382

ALLCROFT, R. and LEWIS, G. **Relationship of copper, molybdenum and inorganic sulphate content of feeding stuffs to the occurrence of copper deficiency in sheep and cattle.** *Landbouwk. Tijdschr.*, 1956, **68,** 711–722 (with discussion 722–723). [Minist. Agric., Vet. Lab., Weybridge.] Dutch summary.

In an experiment with barren ewes on a diet of hay and mixed concentrates supplying daily 12·2 mg. Cu, 1·1 mg. Mo and 7·3 g. sulphate, supplementary Mo decreased storage of Cu in the liver. But in 6 ewes initially pregnant, more Cu was stored with Mo supplements than in 3 ewes given no extra Mo. The foetal livers contained less Cu in the group given Mo. In both experiments ewes given Mo had higher blood Cu than controls.

Ewes were stall-fed during pregnancy, and liver Cu was estimated before and at the end and in the newborn lambs. A supplement of sulphate had no effect on storage of Cu in the liver, whether the basal diet was cocksfoot straw, low in sulphate, or kale, with more Mo and more sulphate. When Cu intake was 10 mg. and Mo intake 50 mg. daily the ewes increased their liver Cu stores, and this was not prevented by addition of sulphate. On the other hand, sulphate greatly reduced liver Cu in the lambs. This was so whether the sulphate was in the form of kale or was added to the cocksfoot diet. Sulphate also reduced storage of Mo in the foetal liver.

Analyses of pasture showed no difference in Cu, Mo or sulphate between farms where there was swayback and those where it was unknown.

Low liver Cu values were produced in beef cattle in stalls and at pasture when Mo was given, but the stalled animals, unlike those at pasture, showed no clinical sign of Cu deficiency even after 18 months. Cattle with initially low liver Cu scoured when put on to pasture topdressed with Mo, but cattle with normal liver Cu did not. In stall-fed cattle large doses of Mo could cause scouring and loss of condition before the liver Cu had fallen below 40 p.p.m. on a dry basis. Thus "teart" scouring is not absolutely dependent on low Cu reserves.

Cows being treated with aluminium sulphate against fluorosis, on a farm where the Cu and sulphate contents of the grass were high, did not show an effect of the extra sulphate on liver Cu or on the liver Cu stores of their newborn calves.

D. Duncan.

5383

ENSOR, C. R. **A preliminary classification of the soils of Northland according to their copper-cobalt status.** *N.Z. Vet. J.*, 1956, **4,** 8–10. [Dept. Agric., Whangarei.]

The Pinaki soils, derived from windblown sand on the west coast, and the Maungarei soils, of volcanic origin, are probably inherently deficient in Cu. Marua soils, geologically the oldest in Northland, are probably inherently deficient in Co, though in places intrusions of volcanic rock or

limestone may correct the deficiency. Clinical deficiencies of Co and Cu appear in animals on podsolised yellow earths. Cu deficiency is often associated with acidity in volcanic rock and sometimes with dolerites and andesites, but not with basalts. Basalts, dolerites and andesites are more likely to be deficient in Co. All peats should be suspected of Cu deficiency. Marginal Cu contents in the liver of animals on some limestones may be related to the high Mo : Cu ratio in the soils.

It is suggested that all strongly podsolised soils in Northland should be topdressed at least annually with both Co and Cu. More than 5000 acres of land being developed in 1955 is classified as borderline to low in one or both elements, and animal health and production should be investigated with this in mind.—D. Duncan.

5384

INNES, J. R. M. **Swayback in lambs (a demyelinating encephalopathy) and its possible occurrence in the United States.** *Vet. Med.*, 1956, **51,** 201–206. [Inst. Animal Pathol., Univ. [Cambridge.]
A review.

5385

LUECKE, R. W., HOEFER, J. A., BRAMMELL, W. S. and THORP, F. (Jr.) **Mineral interrelationships in parakeratosis of swine.** *J. Animal Sci.*, 1956, **15,** 347–351. [Dept. Agric. Chem., Michigan State Univ., East Lansing.]

A group of 10 pigs, 6 weeks old, getting a ration high in Ca, 1·50 per cent., and P, 0·80 per cent., and containing 31 p.p.m. Zn all developed parakeratosis in an experiment lasting 8 weeks. Growth and efficiency of feed utilisation were poor. In a similar group of pigs a supplement of 20 p.p.m. Zn prevented the parakeratosis in all but one pig, and growth and efficiency were improved. When 20 p.p.m. Zn were given to the pigs in the first group appetite immediately improved, the skin trouble cleared up in 3 to 6 weeks, and during 6 weeks growth and efficiency were good.

A third group of similar pigs got a ration still high in Ca and P, but containing less than that of the first 2 groups. It contained 0·98 per cent. Ca, 0·70 per cent. P and 29 p.p.m. Zn. Growth and efficiency were almost as good as in pigs in the second group. Three pigs developed mild parakeratosis. A further supplement of 20 p.p.m. Zn produced excellent gains and efficiency and the parakeratosis was prevented.

The Zn content of common feedingstuffs was estimated, showing that meat-and-bone scraps and bonemeal contain more than feeds of vegetable origin. This is discussed in relation to present tendencies to reduce the amount of animal protein used.—T. D. Bell.

5386

GIULIANI, R. Deficienza di fosforo nei foraggi e sterilità nei bovini. [**Deficiency of phosphorus in feedingstuffs and sterility in cattle.**] *Riv. Zootec.*, 1956, **29,** 65–67.
A review.

5387

GERI, G. Il ferro e l'anemia dei maialetti. [**Iron and piglet anaemia.**] *Riv. Zootec.*, 1956, **29,** 118–119.

5388

ANDREWS, E. D. **Cobalt deficiency.** *N.Z. J. Agric.*, 1956, **92,** 239–244. [Dept. Agric. Animal Res. Stat., Wallaceville.]

5389

GREEN, R. J. **Micronutrient deficiencies in sheep and cattle and their distribution in Tasmania.** *J. Austral. Inst. Agric. Sci.*, 1956, **22,** 40–44. [Tasmanian Dept. Agric.]

See also Abstr. 4308, 4340, 4351, 4355, 4356, 4366, 4372, 4438, 5248.

DISEASES OF METABOLISM

5390

SEEKLES, L. and BOOGAERDT, J. Uitkomsten van een voortgezette voederproef met magnesiumoxyde-houdende koekjes als voorbehoedend middel tegen kopziekte. [**Results of a continued feeding experiment with cake containing magnesium oxide as preventive of grass tetany.**] *Tijdschr. Diergeneesk.*, 1956, **81,** 281–296. [Lab. Med. Vet. Chem., Rijksuniv., Utrecht.] English, French and German summaries.

In continuation of earlier experiments (Title 3797, Vol. 23) a test was made in the spring of 1954 on farms in Utrecht province liable to have grass tetany, in which 976 milking cows were given daily for 4 or 5 weeks 50 g. technical magnesium oxide (about 90 per cent. MgO) in 2 portions in cake. Grass tetany occurred in 0·41 per cent. In 1426 untreated cows, 1·21 per cent. had grass tetany. The difference is moderately significant ($P = 0·032$).

In the spring of 1955, the same preparation was given to 12,700 milk cows and reports were returned for 10,000 on 569 widely scattered farms, all liable to show grass tetany ; also, in the Gouda district, Mg cake was given on 99 farms and records were kept for 54 farms without treatment.

Of the 10,000 cows, 2024 refused the cake and of them 59, or 3·00 per cent., developed tetany ; of the 7976 that took the cake, only 1·10 per cent. had tetany. In the Gouda area, of 1573 cows given cake, 0·89 per cent. had tetany ; of the

untreated controls, 4·25 per cent. All the differences between treated and untreated groups were highly significant.

Practical difficulties, of which one is the unpalatability of the magnesium oxide, are discussed. The reduction of tetany and consequent increase of production makes the treatment extremely profitable economically. Instructions for farmers are given.—I. Leitch.

5391

MARSHAK, R. R. **Studies on parturient paresis in dairy cows with particular reference to udder insufflation.** *J. Amer. Vet. Med. Assoc.*, 1956, **128,** 423–431. [Springfield, Vt.]

The blood picture of cows before and after udder insufflation for parturient paresis was studied, and at the same time changes in the composition of colostrum. Serum Ca and P, which had fallen below physiological levels, increased after insufflation, and there was a corresponding fall in the colostrum values. There was a rise in serum alkaline phosphatase, but no corresponding fall in colostrum value. Serum and colostrum values for N.P.N., total protein, Mg and ketone bodies were not significantly affected by insufflation, and there was no qualitative change in the protein indicated in electrophoretic studies. The action of udder insufflation in curing parturient paresis, and its value, particularly in cows which have relapsed after treatment with Ca, are discussed, and wider use of the method is advocated.—T. D. Bell.

5392

ROBERTSON, A., MARR, A. and MOODIE, E. W. **Milk fever.** *Vet. Rec.*, 1956, **68,** 173–180 (with discussion 180–181 ; 182). [Royal (Dick) Sch. Vet. Studies, Univ. Edinburgh.]

Investigations are reported which show that milk fever is an exaggeration of a normal physiological condition : in normal cows at parturition there is a fall in serum Ca and plasma inorganic P and a rise in serum Mg. The changes become more pronounced in successive lactations. Pre-partum milking advanced the fall in Ca and P and the rise in Mg. Removal of the udder had little effect on plasma inorganic P changes, but to a large extent prevented the changes in Ca and Mg due to parturition and the onset of lactation.

The nature of milk fever and the treatments used are discussed. The type has changed and severity of the disease is less than 20 or 30 years ago.—T. D. Bell.

5393

REBER, E. F., BAIN, L. R., HATCH, R. D., SCHOETTLE, C. E. and SAMPSON, J. **The use of 11-ketoprogesterone in the treatment of hypoglycemia and ketonemia in the ruminant.** *Vet. Med.*, 1956, **51,** 290–292. [Dept. Vet. Physiol. Pharmacol., Coll. Vet. Med., Urbana, Ill.]

A cow with mild ketosis recovered within 24 hr. after a single treatment with 4 g. 11-ketoprogesterone, but a more severe case required 2 treatments of 2 g. with a 2-day interval, and recovered slowly within 72 hr. of the first treatment. Three cows did not respond to the hormone, but treatment with glucose was effective.

In 2 pregnant ewes hypoglycaemia and ketonaemia were induced by starvation. Response to 500 or 750 mg. 11-ketoprogesterone was variable in 1 ewe. The other doses of 1 and 2 g. reduced blood ketones slightly and improved blood sugar levels, but glucose treatment was much more effective. The cases are all described in detail.

T. D. Bell.

5394

BLOOD, D. C. **Field aspects of acetonaemia of dairy cows.** *Austral. Vet. J.*, 1956, **32,** 31–39 (with discussion 39 – 41). [Univ. Sydney.]

The 135 cases of acetonaemia observed were classified as digestive, nervous and milk fever types ; 75 per cent. were digestive type, 9·5 per cent. digestive with nervous signs, 13 per cent. nervous type and only 2·5 per cent. milk fever type. The signs of the digestive and nervous types are described : the milk fever type was regarded as acetonaemia associated with another disorder, to which it was probably secondary.

Accurate histories could not be obtained, but it seemed plain that poor nutrition could be inculpated. The disorder was more frequent after the third lactation, and during the first month after calving.

Blood sugar values were low and blood ketone bodies high in both digestive and nervous types of acetonaemia. There was no difference between types. There was a tendency for the values to be less extreme in cases not seen for more than 4 days after signs were first noticed by the farmer, but no definite conclusions could be drawn from this.

Treatment was with glucose by vein, glycerine by mouth, or both, and these methods gave the highest proportion of recoveries. Treatment with cortisone and adrenocorticotropic hormone was of doubtful value.

Other cases which differ from normal, and urine tests for the diagnosis of acetonaemia, are discussed.—T. D. Bell.

5395

SHAW, J. C. **Ketosis in dairy cattle. A review.** *J. Dairy Sci.*, 1956, **39,** 402–434. [Dairy Dept., Univ. Maryland, College Park.]

5396
SWENSON, M. J. **Bovine ketosis complex.** *Vet. Med.*, 1956, **51,** 207–211; 218. [Dept. Physiol., Sch. Vet. Med., Kansas State Coll., Manhattan.]

5397
MCCLYMONT, G. L. and SETCHELL, B. P. **Ovine pregnancy toxaemia. 3. Further evidence of the correlation of depth of hypoglycaemia and induction of symptoms.** *Austral. Vet. J.*, 1956, **32,** 22–25. [Nutrit. Res. Lab., Vet. Res. Stat., Glenfield, N.S.W.]

For previous parts see Absts. 5982, Vol. 25; 2621, Vol. 26.

3. Sixty Merino ewes in advanced pregnancy were given ¾ lb. wheaten chaff per head daily and were bled daily before feeding. Analyses of the blood showed that in 16 ewes which developed pregnancy toxaemia the mean blood glucose value, 17·8 mg. per cent., at development of signs was very significantly below normal, 23·3 mg. per cent. Blood ketone levels of affected and normal animals did not differ significantly. In a second trial 9 of 20 fasted pregnant Corriedale ewes developed pregnancy toxaemia. Again blood glucose levels of affected animals were significantly below normal. Four of the 9 recovered spontaneously and recovery was accompanied in all 4 by a rise in blood glucose. The data support the identification of pregnancy toxaemia as a hypoglycaemic encephalopathy.

J. C. Gill.

5398
BRAGG, T. A. **Digestive disturbances in cattle.** *Vet. Med.*, 1956, **51,** 159–162. [Monroe, Ga.]

POISONS OCCURRING IN FOOD

5399
CLEGG, F. G. **An outbreak of copper poisoning in sheep.** *Vet. Rec.*, 1956, **68,** 332–333. [Vet. Invest. Centre, Sutton Bonington.]

Seven pedigree rams, in good condition, of a flock of 15 died showing signs of copper poisoning. The post-mortem findings confirming the diagnosis are described. The rams were grazing on a ryegrass and clover mixture containing sainfoin, and were given 2 to 3 lb. daily of a meal consisting of oats, peas, locust beans and linseed cake. They had been given a mineral supplement containing 1300 p.p.m. Cu, about 5 g. per week, for the past year, and had been drenched with a worm medicine of nicotine and Cu sulphate 10 days before the first death. No further deaths occurred after the mineral supplement was withdrawn. The danger of Cu medication in conjunction with long-term Cu mineral supplements is discussed.

T. D. Bell.

5400
NATIONAL RESEARCH COUNCIL, U.S.A. **The fluorosis problem in livestock production. A report of the Committee on Animal Nutrition.** Publication No. 381, September 1955, pp. v + 17.

Possible sources of F which may give rise to fluorosis in livestock are mineral and concentrate supplements, water supplies, pasture or forage, contaminated either by dust and splashing from the soil or by atmospheric pollution from industrial sources. The toxicity of F depends on the amount ingested, the time over which it is taken and the availability of the form in which it is present, and the development of fluorosis may be affected by physiological stress. The signs of fluorosis are described, and the care necessary for correct diagnosis is emphasised. In this respect F content of bones and teeth is important, and normal values are reported, which show that in older animals higher values than in younger are usual. Some protection against F toxicity is given by the use of pasture, ingestion of soluble aluminium salts, increased intake of Ca and adequate feeding. The value of vitamin and Mg supplements is discussed. Tolerance to F varies with the species, least tolerant being cattle, followed by sheep, pigs, chickens and turkeys. Safe levels of intake are suggested.—T. D. Bell.

5401
GIBBONS, W. J. and HILL, C. B. **Fluorosis in cattle. Case report.** *N. Amer. Vet.*, 1956, **37,** 470–471. [Dept. Med., Sch. Vet. Med., Alabama Polytech. Inst., Auburn.]

5402
REBER, E. F., BRADER, J. (Jr.) and LINK, R. P. **Isolation and identification of a hyperkeratogenic material present in a commercial protein concentrate.** *Cornell Vet.*, 1956, **46,** 320–326. [Dept. Physiol., Coll. Vet. Med., Univ. Illinois, Urbana.]

Fractions of the ether-soluble portion of a commercial protein concentrate showed the presence of tetra-, penta- and hexachloronaphthalenes, which had a hyperkeratogenic effect on calves when given orally in small amounts.—T. D. Bell.

5403
BAXTER, J. T. **Suspected fodder-beet poisoning in pigs.** *Vet. Rec.*, 1956, **68,** 236–237. [Div. Vet. Res., The Farm, Stormont, Belfast.]

Pigs weighing initially 77 lb. were given 3·6 lb. meal per head daily and fodder beet to appetite. They ate 6·8 lb. per head daily of the roots and by the end of 1 month weighed 120 lb. The meal

was then changed from the original, with 15 per cent. animal protein, to one with 10 per cent. vegetable protein, and 4·14 lb. per head were given, with fodder beet to appetite. The variety of beet was also changed at the same time as the meal, from Red Otofte X to Pajbjerg Rex 10. Both varieties had been badly stored, and had a lot of green sprouts and adhering soil. Three weeks after the change of feeding, when they were eating 12 lb. beet daily, the pigs developed diarrhoea and became nervous. Body temperatures were normal but there was some coughing. The pigs improved within 10 days when the Red variety of beet was used again and consumption was limited to 10 lb. per head daily. Any subsequent increases in the allowance of beet brought on the diarrhoea again. The possible reasons for the toxicity of the beet, the presence of green sprouts or soil, or the too sudden change in diet, are discussed.—T. D. Bell.

5404

CLARKE, E. G. C. and COTCHIN, E. **A note on the toxicity of the acorn.** *Brit. Vet. J.*, 1956, **112,** 135–139. [Dept. Physiol., Royal Vet. Coll., London, N.W.1.]

The only substance extracted from acorns which was lethal to mice when injected was hydrolysable tannin. The preliminary experiments leading to the method of extraction and the method are described. The tannin was also lethal to rabbits and calves when injected, but not when given by mouth.—T. D. Bell.

5405

MCCONNELL, J. D. and BARNES, J. E. **The toxicity of the fruits of *Atalaya hemiglauca* ("whitewood") for horses.** *Austral. Vet. J.*, 1956, **32,** 74–76. [Animal Indust. Branch, Northern Territory.]

5406

PRITCHARD, W. R. **Laurel (*Kalmia angustifolia*) poisoning of sheep.** *N. Amer. Vet.*, 1956, **37,** 461–462. [Sch. Vet. Med., Univ. Minnesota, St. Paul.]

5407

MARKSON, L. M. **On failing to poison chickens with *Senecio squalidus*, L.** *Vet. Rec.*, 1956, **68,** 333; 334. [Minist. Agric., Vet. Lab., Weybridge, Surrey.]

A ration containing 10 per cent. of *Senecio squalidus* (Oxford ragwort) was readily eaten by young cockerels and had no ill effect on health. The livers of the birds were normal.

J. S. Thomson.

5408

JENSEN, R., DEEM, A. W. and KNAUS, D. **Fescue lameness in cattle. 1. Experimental production of the disease.**

MAAG, D. D. and TOBISKA, J. W. **2. Ergot alkaloids in tall fescue grass.** *Amer. J. Vet. Res.*, 1956, **17,** 196–201; 202–204. [Sch. Vet. Med., Fort Collins, Colo.]

1. Lameness due to dry gangrene was produced within 50 to 70 days in 5 out of 7 cattle grazing on tall fescue pasture in the autumn. Similar lameness was produced in 4 cattle stall-fed exclusively on tall fescue hay; similar animals given mountain grass hay were not affected. The lesions commonly affected one or both hind feet, occasionally the fore feet or the tip of the tail. The lesions are described, with photographs.

2. Samples of the grass from which the hay for the stall-feeding experiments was obtained were examined. No ergot was seen by eye on either the fescue or the mountain hay. On chemical and photospectrometric investigation alkaloids similar to those found in ergot were found in the fescue, but not in the mountain hay. A qualitative test showed that no selenium was present in any of the samples. The possibility that some form of ergot may develop on unusual parts of the grass, or that the plant may develop the toxic alkaloids, is discussed.—T. D. Bell.

See also Absts. 4402, 5267.

IMMUNITY

5409

THRELKELD, W. L., PRICE, N. O. and LINKOUS, W. N. **An observation on the relationship of cobalt deficiency to internal parasites of sheep.** *Amer. J. Vet. Res.*, 1956, **17,** 246–251. [Virginia Agric. Exp. Stat., Blacksburg.]

Sixteen lambs were put on a Co-deficient diet. When signs of Co deficiency appeared the lambs were divided into 4 groups. Two groups were given additional Co. A month later one of the Co-deficient groups and one of the supplemented groups were infected with 70,000 nematode larvae (90 per cent. *Haemonchus contortus*).

Estimation of the worm burden by weight showed that the Co-deficient group had a much smaller infestation than the group receiving the Co supplement.—G. C. Hunter.

5410

SHUMARD, R. F., EMERICK, R. J., BEMRICK, W. E., HERRICK, C. A., POPE, A. L. and PHILLIPS, P. H. **Effects of trace minerals, dicalcium phosphate, phenothiazine, and combinations of these on the resistance of lambs to *Hæmonchus contortus* and other nematodes.** *Amer. J. Vet. Res.*, 1956, **17,** 252–255. [Dept. Vet. Sci., Univ. Wisconsin, Madison.]

Lambs at pasture had lower worm egg counts and fewer worms and showed better weight gains when given phenothiazine along with trace minerals (NaCl 96·0 ; Fe 0·3 ; Mn 0·15 ; Co 0·06 ; I 0·007 per cent.) and dicalcium phosphate than lambs given any of these alone.—G. C. Hunter.

5411

SPEDDING, C. R. W. **The control of worm-infestation in sheep by grazing management.** *J. Helminthol.*, 1956, **29**, 179–186. [Grassland Res. Inst., Hurley, Berks.]

See also Abst. 5180.

7. BOOK REVIEWS

5412

HALL, V. E., FUHRMAN, F. A. and GIESE, A. C. (Eds.) **Annual review of physiology. Volume 18.** Annual Reviews, Inc., Stanford, California, 1956, pp. vii + 591. Price 60s.

5413

RYTAND, D. A. and CREGER, W. (Eds.) **Annual review of medicine. Volume 7.** Annual Reviews, Inc., Stanford, Calif., 1956, pp. 611. Price 60s.

5414

CHILEAN NITRATE EDUCATIONAL BUREAU, INC. **Bibliography of the literature on the minor elements and their relation to plant and animal nutrition. Volume 4, 4th ed.** 120 Broadway, New York 5, 1955, pp. 150.

5415

CHILEAN IODINE EDUCATIONAL BUREAU. **Geochemistry of iodine. Iodine in rocks, minerals and soils. Annotated bibliography 1825-1954.** Stone House, Bishopsgate, London, E.C.2, 1954, pp. viii + 150.

5416

GREENE, E. C. **Anatomy of the rat.** Hafner Publishing Co., New York : London, 1955, pp. xi + 370. Price 180s.

This work, now a classic, was first published in 1935 by the American Philosophical Society (see Abst. 4761, Vol. 5), and has been reprinted by the Hafner Publishing Company. It is a tribute to the author's painstaking and thorough work that an unchanged reprint has been demanded after 20 years. Even greater numbers of research workers today depend upon the rat's co-operation, and this reprint will be welcomed by all of them who have access to libraries wealthy enough to afford it. The new version is on heavy, glossy paper and more handsomely bound than its predecessor, but unfortunately the photographs have suffered in the process of reproduction ; luckily they form only a small part of the illustrations, and the beautiful drawings are as good as ever.

D. Duncan.

5417

MCILWAIN, H. **Biochemistry and the central nervous system.** J. and A. Churchill, Ltd., 104 Gloucester Place, London, W.1, 1955, pp. vii + 272. Price 40s.

In this book Professor McIlwain presents an account of the present state of knowledge of chemical change in the central nervous system. The main topics considered are the chemical composition of brain, its metabolism *in situ*, the metabolism of isolated cerebral tissues, the metabolism of carbohydrate in brain, amino acids and cerebral activities, vitamins and the central nervous system and cerebral lipids. Other chapters deal with cytochemical and histochemical aspects, changes in the biochemistry of brain during development, the action of acetylcholine, sympathin and related substances and of depressants and excitants, and the speed of chemical change in the brain. The matter is well documented, the comments authoritative and critical. At a time when the central nervous system is attracting much attention and is the subject of many publications this summary is particularly welcome and will be of value to students, teachers and research workers alike.

H. G. Bray.

5418

LAWRENCE, J. H. and TOBIAS, C. A. (Eds.) **Advances in biological and medical physics. Volume 4.** Academic Press, Inc., New York, 1956, pp. x + 356. Price 70s. 6d.

The latest volume in this series again deals with a wide variety of topics. The first article, by D. Harker, deals with the application of X-ray diffraction to crystalline proteins and the second, by G. Gamow, A. Rich and M. Yčas, with the problem of information transfer from nucleic acids to proteins. This stimulating article, in the words of the authors, " summarises recent efforts to find the formal mechanism by which hereditary chemical information presumably stored in long polynucleotide chains is transferred to corresponding polypeptide chains which form the cellular proteins ". D. Mazia discusses the background necessary for a biochemical and biophysical approach to the problem of cell division, and T. H. Wood the lethal effects of high and low temperatures on unicellular organisms. N. K. Freeman contributes

a useful article on infrared spectrometry and its application to biological chemistry, and R. L. Huff and O. J. Judd give a short account of the present state of knowledge of the kinetics of iron metabolism. W. E. Siri considers the application of modern methods to the estimation of the gross composition of the body with special reference to the measurement of body water and fat, and the final article by H. B. Jones is concerned with the interplay of disease and physiological function in the ageing process. Several of the articles illustrate the increasing application of a mathematical approach to biological problems, and the volume as a whole illustrates again the progress which is being made in the treatment of complex systems by mathematical and physico-chemical techniques.

H. G. Bray.

5419

MILLER, C. D., BAZORE, K. and BARTOW, M. **Fruits of Hawaii : description, nutritive value and use.** University of Hawaii Press, Honolulu, 1955, pp. ix + 197. Price $2.75.

The 31 fruits ranging from avocado to water melon include fruits well known outside as well as inside Hawaii, such as banana, coconut, fig, lemon, and lesser known fruits, such as carambola, ketambilla, poha and roselle. For each fruit there are notes on description, history, nutritive value, supply and use with some selected recipes. Appendixes give methods of preserving Hawaiian fruits by freezing, canning, bottling and making jelly, and quantitative data on vitamin and energy values of the fruits.—F. C. Aitken.

5420

BURTON, A. C. and EDHOLM, O. G. **Man in a cold environment. Physiological and pathological effects of exposure to low temperatures. (Monogr. Physiol. Soc. No. 2.)** Edward Arnold (Publ.), Ltd., London, 1955, pp. xiv + 273. Price 30s. net.

This book has been written, its authors say, " in the conviction that it is worth sacrificing some broadness of view to secure consistency and simplicity of presentation ", and let no one disbelieve that statement because of the abrupt plunge into the subject with a discussion of whether the existence and proliferation of life is in defiance of the second law of thermodynamics. The first chapter, on homoiothermy and history, is a pleasant mixture of fact and philosophy ranging from the distribution of human populations on the earth's surface to how often socks ought to be changed. Thereafter the pattern is more that of a textbook, but never a dull textbook. Almost every passage of solid information is enlivened by a comment or illustration which must hold the interest of scientists and the man in the street and his wife as well. If the book were read by a great many people there might be much more rational use of heat and of clothing.

A parallel book on a hot environment would be equally good for a part of the world's population and equally likely to dispel many illusions and misconceptions. What, in effect, is the equivalent in a hot climate of the summary to this book : " Many are cold but few are frozen " ?

I. Leitch.

5421

TANNER, J. M. **Growth at adolescence.** Blackwell Scientific Publications, Oxford, 1955, pp. xii + 212. Price 32s. 6d.

In the preface to this book Tanner lists those at whom it is directed, starting with medical students, and selecting as a particular target physicians concerned with children and adolescents. The reader finds himself at the end of the book far sooner than its 165 pages of text would lead him to expect, owing partly to the large number of clear diagrams, and partly to the facile presentation For this reason it is perhaps specially suitable for medical students in a world of textbooks as " inveterately convolved " as Wordsworth's yew trees.

In its short length it provides a really satisfactory introduction to many aspects of adolescence. The chapters on developmental age, the endocrinology of adolescence, changes in mentality, and the adolescent spurt in animals are particularly well presented and stimulating.

Tanner comments on the relative merits of longitudinal and cross-section surveys, but he omits one advantage of the latter, the comparative ease with which they enable secular changes to be determined. There are some points where the summary of findings is too condensed, a consequence, perhaps, of the scope of the book. On p. 91, for instance, where secular change in growth of children are dealt with, Roberts is quoted as commenting on the increase in weight of factory children between 1833 and 1876. This is taken by Tanner to imply a secular change, without consideration of the influx of country people to the towns over that period.

Again, in Fig. 3, p. 7, the first figure gives what is probably a greatly exaggerated impression of the effect of a cross-sectional survey as, in such a survey, the weighting of the extreme values would be very much less than the figure suggests.

On p. 92 the difference between children 50 years ago and today is stated to be due in part to the " ultimately reached adult size being greater ". In fact, unanimity on this phenomenon has not been reached in the literature, but even allowing for its existence it is debatable which is cause and which effect.

In passing, it may be noted that on line 3, p. 161 "adult" should presumably read "erect" or "standing", and the interesting chapter on technique has for right-hand page heading "The adolescent spurt in animals".

All in all, a worth-while production, with, for any who may disagree with some of its conclusions, what must be one of the most useful bibliographies on the topic.—A. W. Boyne.

5422

ELLIS, R. **A dictionary of dietetics.** Philosophical Library, Inc., 15 East 40th St., New York 16, 1956, pp. 152. Price $6.00.

According to the preface "this book has significance for the layman as well as the dentist, doctor, medical student, student nurse, dietitian, nutritionist and home economics major". In attempting to cater for such diverse tastes the author is likely to satisfy none. The length of definition frequently appears to be in inverse proportion to the complexity of the term; for instance, custard requires 15 lines and cyanocobalamin is dismissed in 2½ lines. Under each letter of the alphabet there is a quick change from the sublime to the ridiculous or vice versa: from polyuria to popcorn, tomato catsup to triphosphopyridine nucleotide, Waldorf salad to Winkelstein intragastric drip. The little bits of dietetic information given in the book probably would be found more readily in a textbook. The artificial arrangement is possibly responsible for such inconsistencies as the statement on p. 76 under Geriatrics: Calcium Requirement: that "the dietary calcium requirements of older people are higher than those for young adults" and the information in the Table of Recommended Daily Dietary Allowances, Food and Nutrition Board, National Research Council on p. 51 that the allowance of calcium for adults is 0·8 g. whether they be 25, 45 or 65 years of age.

F. C. Aitken.

5423

HOBSON, W. and PEMBERTON, J. (with BRANSBY, E. R., DROLLER, H., ROSEMAN, C. and WOODHOUSE, D. L.) **The health of the elderly at home. A medical, social and dietary study of elderly people living at home in Sheffield.** Butterworth and Co. (Publishers), Ltd., London, 1955, pp. xvi + 238. Price 30s.

At the present time, about one in eight of the population of the United Kingdom is of pensionable age and it is estimated that the proportion will be one in five in 30 years' time. It is obviously becoming a matter of some importance to know more about the incidence of disease and disability in this group. Most of our knowledge of the subject is derived from studies of old people in hospital, yet it is estimated that, in Sheffield, for instance, only about 2 per cent. of persons of pensionable age are in hospital at a given time.

The present study was undertaken to describe the state of health and the diets of 476 elderly people living at home in Sheffield, to examine the relationships between health and age, sex, marital state, social class and diet, and to collect information on normal physiological standards in the elderly. The incidence in this sample of disorders common in the elderly is examined and discussed and an attempt has been made to assess quantitatively the amount of disability caused by these disorders.

Of special interest are the results of a diet study in which 303 of the subjects weighed or measured and recorded foods eaten during one week. The diet study showed that a substantial proportion of the subjects, especially of the women, were eating less food than required to supply the calories and nutrients recommended by the British Medical Association for adults with sedentary work and little travelling. The mean daily intakes of those medically graded as fit were higher than for the sample as a whole; which was cause and which effect was not clear, but it is suggested that the intakes of the fit group and the intakes of a small group in residential homes might provide a working basis for estimating the nutrient requirements of the elderly.

The results of clinical examinations are presented in detail.

The collection of sociological data was mainly incidental to the medical study but serves to round off a very comprehensive investigation.

The need for further studies of the elderly is stressed and it is suggested that follow-up studies —from middle age to the grave—would be a fruitful method of studying the ageing process.

Some of the material presented in this book has been published in medical and scientific periodicals (see Absts. 4841, Vol. 23; 2081, Vol. 24; 3554, Vol. 26).—F. C. Aitken.

5424

SHAW, J. H. (Ed.) **Fluoridation as a public health measure.** American Association for the Advancement of Science, 1515 Massachusetts Ave., N.W., Washington 5, D.C., 1954, pp. v + 232. Price 40s.

The American Association for the Advancement of Science has, since its annual meeting in 1940, shown a particular interest in the problems of fluorine metabolism and the effects of fluoride in the prevention of caries. In this, the third and latest of its monographs, there are 11 articles. The first 4 are review articles and deal with the benefits of ingesting fluorides, the state of knowledge of fluoride poisoning and chronic fluorosis, metabolism of inorganic fluorides and the public

health aspects of fluoridation of water. The next two articles are concerned with particular experiments, the first with work in Texas and the second with the long-term work at Newburgh and Kingston in the lower Hudson Valley. There follows a review of the more fundamental work done on the action of fluorine on the outer surface of erupted and erupting teeth, and after it a review of the amount of fluorine in American diets. That amount is thought to be small and there is little information on supplementation except by fluoridation of drinking water. The last three reviews are concerned with engineering aspects of the equipment, some aspects of the origin and state of fluorine in natural waters and chemical methods for its estimation.

This compendium of information on a subject round which discussion still rages is a guide which ought to be studied by all who may have the urge to express opinions and more especially by any who are disputatious rather than scientific in their approach.—D. Harvey.

5425

MURRAY, I. **Good health with diabetes. A patient's handbook.** E. and S. Livingstone, Ltd., Edinburgh : London, 1956, 3rd ed., pp. 51. Price 2s. 6d.

This handbook instructs the diabetic patient how to control his carbohydrate intake, how to control his energy intake if a reduction in weight is desirable, and how to adapt his diet in time of illness. It tells him how to inject insulin, how to test his urine for sugar and how to deal with emergencies such as insulin reaction and diabetic coma.

It is by no means certain that the patient who uses the handbook as guide in matters of diet will achieve positive health. Although more than half of the book is devoted to diet and one chapter purports to deal with the purpose and nature of food it is noteworthy that no indication is given that foods contain anything more than carbohydrates, protein and fat, that certain minerals and vitamins are essential for health, and that diets should be chosen to give an adequate supply of such nutrients. The specimen menus for 1 week appear to supply not more than ½ pint milk daily, so that such diets would scarcely be adequate in calcium for juvenile diabetics.

It is regrettable that an opportunity has been lost to instruct diabetics how to achieve positive health through a nutritionally adequate diet at the same time as they achieve control of their diabetic condition.—F. C. Aitken.

5426

WENGER, R. Leitfaden der Diätetik für Ärzte und Diätassistentinnen. [**Manual of dietetics for doctors and dietitians.**] Springer-Verlag, Vienna, 1955, pp. xi + 165. Price 16s.

The author is the head of the dietitians' school in the First University Medical Clinic in Vienna. He has written an eminently practical book in a somewhat chatty style, rich in exclamation marks. The chapter on physiology is reduced to a bare outline, free of alarming scientific jargon. The rest of the book deals with the dietetic principles to be applied in each of a long series of disorders. The importance of considering the individual needs and tastes of the patient is emphasised more than once, and the point is made in the foreword that in a long illness the meals may be the main interest in the patient's day-to-day life. The diets are almost all based on the Austrian cuisine and the British dietitian would find it necessary to make some adjustments for differences in tastes and availability of foods. There is hardly a word about the child or infant patient.—D. Duncan.

5427

SHEEHY, E. J. **Animal nutrition.** Macmillan and Co., Ltd., London, 1955, pp. viii + 732. Price 30s.

The foreword is by Dr. John Hammond, who wisely says "If the knowledge available in the book could be widely put into practice, we could produce more milk, meat and eggs from available feeding-stuffs."

The book is concerned in the first place with Irish farming ; it is eminently readable and sound on husbandry, if not abreast of recent knowledge on the physiology of farm animals. It is well illustrated and produced and should be useful to students acquiring the elements of nutrition.

D. P. Cuthbertson.

5428

BOCETA DURAN, V. Selecciones Asociadas. (Organizacion de una mejora ganadera y de un plan nacional de control lechero-mantequero por asociaciones de criadores-seleccionadores.) [**Selection by associations. Organisation of cattle improvement and of a national scheme for control of dairy production by associations of selective breeders.**] Comisión Organizadora del Centenario de las Carreras de Ingeniero Agrónomo y Perito Agrícola y de la Escuela Central de Agricultura, Madrid, October 1956, pp. 280.

After a discussion on the general principles of selective breeding, this book deals mainly with a project for setting up a breeders' association for co-operative selection among breeders of Spanish Friesian cattle in Santander. A study has been made of types of Friesian in other countries, particularly in districts of Germany with breeders' associations.

The final section of the book gives suggestions for standards and for management, feeding and methods of selection and certification of approved cattle.—D. Duncan.

5429

WATSON, J. A. S. and MORE, J. A. **Agriculture. The science and practice of British farming.** Oliver and Boyd, Edinburgh : London. 10th ed., 1956, pp. xii + 983. Price 31s. 6d.

This latest edition has been revised with the aid of several co-opted authors, J. A. More having died before the last edition was issued.

Even in 983 pages it is impossible to give an extensive report on modern agricultural science and practice. This is especially noticeable in respect of antibiotics. The book is particularly useful as a general introduction to the subject for the student and as a reference book for the farmer. The amount of space devoted to each subject is, however, too limited to warrant its recommendation to teachers, honours students or specialists. In other words, it is an excellent book for a good foundation on which to build a more detailed knowledge of the science and practice of British farming.

The print is excellent and most of the illustrations are clear and instructive.—J. A. Crichton.

8. SYMPOSIA, PROCEEDINGS AND CONGRESS REPORTS

Les IIIes Journées de Diététique, Rome, September, 1955. **[The third session on dietetics, Rome, September 1955.]** *Presse méd.*, 1956, **64**, 35–36.

A meeting of over 200 from different European countries.

HARRIS (35), vitamins and adrenal function ; MARANON, G. (35), diet for patients with chronic adrenal insufficiency ; DEMOLE and FABRE (35), diet for patients treated with cortisone ; PARETTI (35), balancing the diet ; FRONTALI, G. (35), enrichment of children's foods ; RANDOIN, L. and CAUSERET, J. (35), desirability or otherwise of enriching foods ; LEDERER (35), addition of vitamins to foods ; GREPPI (36), diet in middle age ; ROCHA, A. (36), diet in old age ; RICHET, C. and RICHET, G. (36), syndromes due to unbalanced diet ; AUDIER and MILLIAT, A. L. (36), diet for malnourished old people with cardiac insufficiency ; RICHET, C., BOULIN, UHRY, BOUR and RICHET, G. (36), modification of diet for old people in illness ; MUGLER, A. (36), diet for subjects with high blood cholesterol.

Proceedings of the Third International Congress of Internal Medicine, Stockholm, September 1955. *Acta med. scand.*, **154**, Suppl. 312, pp. 762.

Hypertension, pathogenesis and treatment

MALMROS, H., BIÖRCK, G. and SWAHN, B. (71–78), in a short paper on hypertension, atherosclerosis and diet, briefly report some of the findings in Italy and Sweden made by Keys's team of workers ; DE LANGEN, C. D. (81–86) describes the effects of salt depletion on the peripheral circulation ; SARACOGLU, K. (143–146) contends that it is salt that is harmful, not the sodium ion alone ; STANGL, E. (215–221) discusses the relation between pantothenic acid, the adrenals and hypertension ; administration of panthenol (500 mg.) lowers the blood pressure ; RIZKALLA, Y. (255–258) claims good results, especially in older patients, from daily treatment with liver extract, glutamic acid 5 to 10 g. and vitamin B_6 50 mg.

Collagen diseases

LONG, D. A. (333–335) briefly summarises evidence suggesting that deficiency of sulphur amino acids may be connected with susceptibility to rheumatic fever ; BLIX, G. and WERNER, I. (358–361) discuss the chemistry of connective tissue ; LOHMAN, A. J. M. (419) claims good results from injections of cobalt into patients with rheumatoid arthritis and anaemia ; KELCHNER, C. H. (471–472) presents evidence favouring the use of vitamin K to mitigate the side effects of massive doses of aspirin.

Miscellaneous

GIGON, A. (481–483) suggests that diabetes is a disturbance of assimilation, not of dissimilation ; AZERAD, E., DE BRUX, J., GODECHOT, R. and GRUPPER, C. (484–493) describe histochemical studies of the skin of diabetics ; RACHMILEWITZ, M. and GROSSOWICZ, N. (540–545) found *Bact. coli* as reliable as *Euglena gracilis*, and more rapid, for estimating vitamin B_{12} in serum ; results with *Ochromonas malhamensis* were much higher ; FRAZER, A. C. (721–726) provides evidence that defective fat absorption in children with no pancreatic lipase is due to lack of emulsification of fat in the upper small intestine and discusses the implications for treatment ; ADLERSBERG, D., HELLMAN, L. and ROSENFELD, R. S. (737–741) describe isotope studies on cholesterol metabolism in normal subjects and those with high blood cholesterol ; KERPPOLA, W. (742–745) reports studies of coenzymes containing vitamin B_1, nicotinamide or riboflavin in normal and pathological subjects ; COLLDAHL, H. (756–760) discusses cozymase and nicotinic acid metabolism in patients with asthma or hepatitis.

XVIe Congrès de la Fédération des Sociétés de Gynécologie et Obstétrique de Langue française, Brussels, September 1955. **[16th Congress of the Federation of French-speaking Societies of Gynaecology and Obstetrics, Brussels, September 1955.]** *Presse méd.*, 1956, **64**, 71–74.

ROSA (72), physiology of lactation ; BOURG, R. (72), deficiency or excess of milk ; TAGNON (73), pathogenesis and treatment of *post-partum* obesity ; BERNARD, I. (73), clinical study of post-gravid obesity ; ROCHAT, R. L. and DE WERRA, G. (74), treatment of toxicosis of pregnancy.

Première Réunion scientifique de l'Association des Diabètologues de langue française, Vals, September 1955. **[First scientific reunion of French-speaking Specialists in Diabetes, Vals, September 1955.]** *Presse méd.*, 1956, **64**, 53–54.

DEROT and RATHERY (53), treatment of diabetes with cystine; DELORE, P. and BERNIER (53), diet errors of diabetics; CAMELIN, A., RETOUL, E. and RETOUL, M. (53), vascular prognosis by means of provoked hyperlipaemia; DARNAUD, A., DENARD, G., MORREAU, G., VOISIN, R. and PECH, P. (54), acidotic diabetes in old age; LEDERER, M. J. (54), improvement by weight reduction.

Colloque du C.N.R.S. sur le comportement des homeothermes vis à vis du stimulus froid, Strasbourg, October 1955. **[Colloquium on the reactions of homoiotherms to a cold stimulus, Strasbourg, October 1955.]** *Arch. Sci. physiol.*, 1955, **9**, C3–C229.

KAYSER, C. (5–21), reactions of homoiotherms to cold; BARGETON, D. (47–62), adaptation to cold; long-term effects of heat regulation (rat, mouse); CAHN, T. and HOUGET, J. (141–169), effect of feeding on heat production (rabbit); AGID, R. (171–186), mobilisation of lipids studied by analysis of tissues (rabbit).

Proceedings of the Twentieth Annual Meeting of the American Institute of Nutrition, Atlantic City, N.J., April 1956. *Federation Proc.*, 1956, **15**, Part 1, 541–579.

AFTERGOOD, L., ALFIN-SLATER, R. B. and DEUEL, H. J. (Jr.) (541), effect of cottonseed oil and lard on cholesterol metabolism (rat); ALEXANDER, J. C. and MATTSON, F. H. (541–542), acetin fats and vitamin A metabolism (rat); ALLISON, J. B., MILLER, S. A. and BRUSH, M. K. (542), estimation of nitrogen balance indexes of dietary proteins in cat; ANDERSON, J. T., TAYLOR, H. L. and KEYS, A. (542), serum cholesterol on reducing diets high and low in fat (man); ANDRUS, S. B., MANN, G. V., FILLIOS, L. C. and STARE, F. J. (542), histological changes in experimental atherosclerosis (monkey, rat); BARBORIAK, J. J. (543), pantothenic acid deficiency and hypophysectomy (rat); BIERI, J. G., BRIGGS, G. M., FOX, M. R. S., POLLARD, C. J. and ORTIZ, L. O. (544), essential fatty acid deficiency in chick; BRESSANI, R. and MERTZ, E. T. (544), protein level in relation to lysine requirement (rat); BREWER, W. D., SWANSON, P., BURRILL, L., LEICHSENRING, J., LINKSWILER, H., REYNOLDS, M. and MANGEL, M. (544), nitrogen retention in ageing women; BROMLEY, J. W. and SODERBERG, T. E. (544–545), effect of adrenalectomy on response to *iso*leucine deficiency in rats; BURR, W. W. (Jr.) and TIDWELL, H. C. (545), distribution of labelled lipid in alimentary lipaemia (rat); CALLOWAY, D. H. and KURTZ, G. W. (545), digestibility of modified fats (rat); CARPENTER, K. J. and CLEGG, K. M. (545–546), estimation of metabolisable energy of cereal products from chemical composition; CHALOUPKA, M., WILLIAMS, J. N. (Jr.) and REYNOLDS, M. S. (546), roles of nicotinic acid and tryptophan in maintaining pyridine nucleotides, nitrogen balance and growth (rat); WU CHANG, M. L. and JOHNSON, B. C. (546), metabolism of radio-active nicotinamide in chick; CRAMER, J. W., PORRATA-DORIA, E. I. and STEENBOCK, H. (547), effect of growth hormone and vitamin D on rats on a low-calcium and normal-phosphorus diet; DAY, P. L. and DINNING, J. S. (548), anaemia in vitamin-E-deficient monkeys; DELONG, D. C., HALVER, J. E. and MERTZ, E. T. (548), essential amino acids for chinook salmon; DEUEL, H. J. (Jr.), COX, R. P., ALFIN-SLATER, R. B. and ERSHOFF, B. H. (548–549), effects of anti-oxidants on hypervitaminosis A in the rat; DINNING, J. S., SIME, J. T. and DAY, P. L. (549), metabolic disposal of folic acid; EDWARDS, C. H. and OUTLAND, C. E. (549), relationships of vitamin B_{12}, methionine and choline to metabolism of B vitamins in hepatic tissues (rat); EMERSON, G. A., ESSER, B. and PAGE, A. C. (549), nutritional studies with rats subjected to thyrotoxic stress; EVANS, H. M., NELSON, M. M., BAIRD, C. D. C. and WRIGHT, H. V. (549–550), multiple congenital abnormalities resulting from pantothenic acid deficiency in the rat; FENTON, P. F. (550), dietary protein level and regulation of food intake (mouse); FERGUSON, T. M., RIGDON, R. H. and COUCH, J. R. (550), effect of vitamin E deficiency on embryo eye (turkey); FILLIOS, L. C., ANDRUS, S. B., MANN, G. V. and STARE, F. J. (550–551), experimental atherosclerosis in the rat; FINLAYSON, J. S. and BAUMANN, C. A. (551), growth responses of spaced-fed rats; FORBES, R. M., YOHE, M. and VAUGHAN, L. (551), level of protein in diet and its biological value (rat); FOX, H. M., SWANSON, P. P. and BIRDS, E. (551), role of fat in metabolism under stress conditions (rat); FRITZ, J. C., WHARTON, F. D. (Jr.), HENLEY, R. M. and SCHOENE, R. B. (551–552), preservation of vitamin A in feeds; FRYER, J. H. (552), blood glucose responses to the energy-yielding nutrients; GARVIN, J. E. (552), estimation of phosphatides and bile acids by filter paper electrophoresis; GERSHOFF, S. N. and HEGSTED, D. M. (552–553), effect of vitamin-D-deficient diets containing various Ca : P ratios (cat); GOLDSMITH, G. A., MILLER, O. N. and UNGLAUB, W. G. (553), tryptophan as a nicotinic acid precursor (man); GREENWALD, I. (553), basal metabolism of girls in the Great Lakes region; GUBLER, C. J., CARTWRIGHT, G. E. and WINTROBE, M. M. (553), haemin chromoproteins in copper-deficient and iron-deficient swine; HALL, W. K., SYDENSTRICKER, V. P. and OLIVER, R. W. (554), effects of minor growth factors and antibiotics on growth on suboptimal diet (rat); HALVER, J. E. (554), amino acid test diet for salmon; HALVER, J. E. (554), water-soluble vitamin requirements of chinook salmon; HARPER, L. and OHLSON, M. A. (554–555), dietary practices of three samples of women; HAUCK, H. M. and SUDSANEH, S. (555), dietary study in a Thai village; HAWLEY, E. E. (555), improvement in bread quality as indicated by rat feeding studies; HERTING, D. C., AMES, S. R., EMBREE, N. D. and HARRIS, P. L. (556), nutritional studies on acetylated monoglycerides (rat); HIGH, E. G., BRIGHT, H. B. and POWELL, J. R. (556), *in vitro* hydrolysis and esterification of vitamin A; HILL, C. H. and GARREN, H. W. (556), effect of choline chloride on response of chicks to a transplantable tumour; HORWITT, M. K. 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9. FOOD AND AGRICULTURAL ORGANIZATION (AND OTHER ORGANIZATIONS) OF THE UNITED NATIONS

Monthly Bulletin of Agricultural Economics and Statistics.
Vol. 5, No. 7, July 1956, pp. 48. Price $0.50.
Vol. 5, No. 8, August 1956, pp. 52. Price $0.50.
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Yearbook of Food and Agricultural Statistics. 1955, Vol. 9, Part 2. Trade. Rome, Italy, 1956. Price $3.50.

The State of Food and Agriculture 1956. Rome, Italy, 1956, pp. viii + 143. Price $1.50.

The report begins (pp. 9–60) with a review of production for 1955–56 and a statement of outlook. Production continued to rise in North America and Oceania and in parts of the Far East. International trade in foods was maintained at about the level of earlier years but the accumulation of stocks of grain, largely in North America, has not been halted. In most countries prices have continued to move against the farmer. Consumption levels have become much more stable than in the years immediately after the war. While there is, in general, little change in the world food and agricultural situation, some progress has been reported in the attention being paid in underdeveloped countries to the nutritional needs of the population in relation to agricultural development schemes.

The remaining 2 chapters deal with specialised subjects. One (pp. 61–99) contains an analysis of the development since 1913 of world trade in the main agricultural products; the other (pp. 100–127) reviews the general trends and outlook for world fisheries with examples from selected countries of policies of governments in relation to their fishing industries. The appendix contains 12 tables.

FAO Nutrition Meetings Report Series. No. 11. Joint FAO/WHO Conference on Food Additives, Geneva, 19–22 September, 1955. Rome, Italy, July 1956, pp. 14. Price $0.30. Issued also as *World Health Organization Technical Report* Series No. 107.

The conference was attended by delegates from 12 countries and by observers from 1 country and 4 international committees. Food additives were taken to be "non-nutritive substances which are added intentionally to food, generally in small quantities, to improve its appearance, flavour, texture, or storage properties". The advantages of international action are summarised. Possible lines along which FAO and WHO might assist were the collection and dissemination of scientific and technological information. An additional recommendation was that, to begin with, investigations should be of food colours, preservatives, either anti-microbial or anti-oxidant, and of emulsifiers.

Agricultural Development Paper No. 53. Co-operative marketing for agricultural producers. Rome, Italy, December 1955, pp. ix + 80. Price $1.00.

10. DEPARTMENTAL AND OTHER REPORTS

UNITED KINGDOM

Department of Scientific and Industrial Research. Report of the Food Investigation Board with the Report of the Director of Food Investigation for the Year 1955. Pp. vi + 76.

National Institute for Research in Dairying, University of Reading. Report 1955. Pp. 152.

Copper for suckling and fattening pigs.
Antibiotics and copper sulphate as growth promoters (pig).
Mode of action of antibiotics (pig).
Utilisation of water-soluble vitamins by pigs receiving aureomycin.
Preservation of liquid skimmed milk for pig feeding.
Water requirements of pigs.
Feeding whey to pigs.
Dried skimmed milk as protein supplement for fattening pigs.
Use of sodium metabisulphite and halogenated acetic acid as additions to silage.
Effect of level of roughage on fat content of milk.
Effect of change of diet on function of reticulo-rumen (cow).
Effect of level of roughage during rearing on digestive efficiency in the adult (calf).

Oestrogens in plants.
Effect of oestrogens on yield and composition of cow's milk.
Growth hormone and milk production in the mouse.
Nutritive value of ammoniated molasses (ruminant).
Effect of plane of nutrition of in-calf heifers on growth and subsequent milk yield.
Effect of level of concentrate feeding on milk yield and composition.
Effect of copper sulphate on milk fat percentage.
Estimation of liveweight from body measurements (cow).
Nutritional significance of colostrum.
Undesirable effect of dried skimmed milk in a synthetic milk (calf).
Antibiotics for calves deprived of colostrum under conditions of high " infection ".
Endocrine control of the mammary gland.
Microflora of the alimentary tract (ruminant, pig, chicken).
Estimation of solids-not-fat in milk from fat content and density.
Hypomagnesaemia and grass tetany.
Effect of change of ration on digestion and metabolism (cow).
Role of vitamin B_{12} in utilisation of protein (rat).
Evaluation of nutritive value of protein by analysis of rat livers.
Biological assay of vitamin A.
Vitamin B_{12} and the animal-protein factor.
Vitamin synthesis in ruminant.
Vitamin B content of milk in relation to breed of cow and stage of lactation.
Vitamin D content of pasture.
Possible antivitamin D activity of carotene and vitamin A.
Antibiotics and " infection " in chickens.
Inactivated penicillin and growth of chickens.
Use of radio-active calcium in metabolic studies (rat).
Adaptation to a low level of calcium intake by the adult rat.
Effect of age and level of phosphorus intake on calcium retention (rat).
Origin of milk fat in ruminants.
Paper chromatography of long-chain fatty acids.

MAURITIUS

Annual Report of the Department of Agriculture for the Year 1954. Pp. 97.

Analysis are given of species of local and imported grasses (*Panicum*, *Setaria*, Elephant, *Cenchrus*, *Chloris*, Akaroa, cocksfoot, Kikuyu, *Paspalum*, *Phalaris* and Molasses).

NEW ZEALAND

The Dairy Research Institute (N.Z.), Twenty-seventh Annual Report for the Year 1954-55. Pp. 36.

Effect of short periods of undernutrition after calving on the establishment of lactation in cows.
Dried buttermilk for calves.
Effect on yield and quality of milk of administering oils to cows to control bloat.
Variations in carotene and vitamin A contents of butterfat from a herd during lactation.
Vitamin A and carotene metabolism in dairy cows.

UNION OF SOUTH AFRICA

National Nutrition Research Institute (South African Council for Scientific and Industrial Research), Pretoria, 1956. Pp. 14.

The Institute was established as a unit in June 1954 and was later converted into a separate Institute of the South African Council for Scientific and Industrial Research. An outline of the work in progress is given as follows :
Relationship between nutrition and foetal and child development in the Bantu.
Survey of the nutritional status and dietary pattern of the different age and racial groups.
Kwashiorkor : role of pathogenic organisms in etiology ; incidence of diarrhoea ; effect of different protein supplements ; effect of digestive enzymes ; haematology and effect of folic acid, vitamin B_{12}, iron and protein ; methylation and interaction of nicotinic acid, choline, vitamin B_{12}, folacin and vitamin B_6.
Relation between intellectual function and nutrition.
Relation between salicylic acid and certain vitamins with reference to gastric acid secretion and adrenal cortex function.
Iron metabolism in pregnant Bantu women.
Fatty infiltration and necrosis of the liver.
Effect of phytic acid on mineral absorption.
Effect of vitamins and fatty acids on blood cholesterol.
Effect of nutrition on productivity.
Iodised salt in treatment of goitre.
Composition of South African foods and use of special foods (*e.g.* fishmeal and enriched magou (fermented maizemeal gruel)).

UNITED STATES OF AMERICA

64th and 65th Annual Reports of the Agricultural Experiment Station of the Alabama Polytechnic Institute, January 1, 1953 to December 31, 1954. Pp. 77.

Vitamin E deficiency in young pigs.
Nutritive value of maize of high and low protein contents (chicken, rat).
Changes in chemical and physical properties of pastures influencing their utilisation and nutritive value.
Performance of cows on immature oat forage.
Johnson grass silage and Johnson grass hay in ration of dairy cows.
Lysine deficiency in groundnut meal ration for broilers.
Rickets in caged laying hens.

THE NETHERLANDS

Voedingsorganisatie T.N.O. Report for the year 1955. Pp. 54.

Apparatus for measuring moisture in foods (see *Food Res.*, 1955, **20**, 415–423).
Copper in oils and margarine, investigation of methods of estimation.

Vitamins : chemical estimation of *dl*-pantothenic acid ; microbiological estimation of folic acid ; estimation of vitamin K_3, and vitamin D in oils containing vitamins A and D. A method was found for preserving samples for estimation of vitamin B_1.

Amino acids : notes on estimation of amino-acids with ion exchange substances ; tryptophan by a colorimetric method, cystine and cysteine together ; glutamine with special reference to its harmful effect in coeliac disease.

Preservatives.

Anti-oxidants.

Physical constants of fats.

Microbiological (bacteriological) studies of foods.

Food technology.

Feeding experiments with animals : lactose (rat) ; intermittent supply of protein (rat) ; sterilised milk (pig) ; vitamin C deficiency (guineapig) ; vitamin A deficiency (rat) ; ration for guineapigs in which vitamin C is stable.

Studies on man : metabolism of glutamine and gliadin in coeliac disease ; fat absorption ; wheat in the diet of patients with myotony ; metabolism of unsaturated fatty acids in patients with eczema.

Studies of nutrition of the Netherlands population : skeletal age of infants ; somatometric studies of schoolchildren and recruits ; studies of diet and health of old people ; dental caries ; diet and athletics ; diet on board herring fishing boats.

Studies in tropics : composition of blood ; vitamin C content of potatoes and sweet potatoes.

Nutrition in Aruba : Reports of sections dealing with fish (30–32), grain and bread (33–40), and of subsidised investigations, with the Ran diet (mean Netherlands diet) for rats (41–44) ; estimation of B vitamins and of Na and K for tables of composition of food ; diet of fishermen (45) and of urban and rural schoolchildren ; analyses of studies made during the occupation.

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